



# Arunachal Pradesh Development Report



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## The Core Committee

Constitution of the Core Committee for preparation of State Development Report, Arunachal Pradesh (2003)

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## Foreword

India's growth in the recent years has made it an important player in the global economy. In terms of the size of the economy, measured in PPP terms India ranks 4th in the world after the US, Japan and China. However, in the recent years there is evidence that the gap between rich and poor states is increasing and there is a substantial disparity in social indicators between these states.

One of the important initiatives of the Planning Commission in the Tenth Plan was to sponsor the preparation of State Development Reports with much of the work being done by reputed national level institutes. This exercise was undertaken in recognition of the fact that economic circumstances and performance in individual States varied considerably and it was necessary to examine development challenges for individual states in light of state specific constraints and circumstances. The basic idea was to produce quality reference documents on development profiles of individual States and the possible strategies for accelerating growth and reducing poverty and inequality.

The State Development Report for Arunachal Pradesh reviews its experience and highlights issues critical for the State's

development in the years ahead. I am sure its publication will stimulate debate on growth strategies appropriate for Arunachal Pradesh. I hope the road map indicated in the report will generate a broader awareness of the range of policies issues facing the State and will assist the State to move to a higher growth path and to achieve all round human and economic development.

A handwritten signature in black ink, appearing to read 'Montek Singh Ahluwalia', with a stylized, flowing script.

(Montek Singh Ahluwalia)



## MESSAGE

I am happy to learn that the State Development Report of Arunachal Pradesh is being published and feel that the publication of this Report is most opportune and timely.

Arunachal Pradesh, which is a frontier and tribal State, is at crossroads. It is endowed with plenty of natural resources, which, if properly developed can make Arunachal Pradesh a prosperous State. Prosperity alone cannot make people happy. We need to have sustainable development based on the principles of equity and justice and with due regards to environment.

Not too distant in the past, our horizon was our own belief. But in last few decades our horizon has expanded considerably. While transition of our tribal society has taken place at a fast pace, I for one, proudly observe that we have retained our culture and lifestyles and a bit sad that we have also not been spared by the bane of materialism introduced to us by modern world. We need to have a paradigm shift in our development schemes to address this challenge by incorporating the principles of development enunciated by Pandit Jawaharlal Nehru, our first Prime Minister, who identified himself so closely with us, the tribal people.

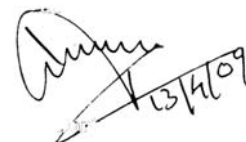
Of late, the Central Government has addressed the crying need of improving connectivity to close infrastructure gaps particularly relating to communication through Prime Minister's development package. A number of development schemes are in the pipeline. Undoubtedly, these schemes on completion will bring socio-economic development in remote villages. The State Development Report of Arunachal Pradesh being a comprehensive document that provides an objective assessment of present socio-economic development

scenario in Arunachal Pradesh will certainly help the State Government in calibrating its development schemes for their effective implementation. I am sure, it would also provide us with relevant information and data to focus on target areas and population for proper development as also to improve the quality of development works.

I am happy to note that the State Development Report of Arunachal Pradesh has been prepared by the Rajiv Gandhi University in collaboration with the Planning Commission of India. On behalf of the State Government and, of course, on my own behalf I would like to appreciate the efforts of the Research Team headed by Prof. Atul Sarma, Member, 13th Finance Commission and former Vice-Chancellor of Rajiv Gandhi University and thank them for bringing out this much needed Report. I would also like to express my gratitude to Shri B.K. Chaturvedi, Member, Planning Commission, Smt. Jayati Chandra, Principal Adviser, Planning Commission and Shri Brahmo Choudhury, Adviser, Planning Commission, New Delhi for their insights and valuable guidance. My sincere appreciation also goes to Prof. K.C. Belliappa, Vice-Chancellor, Dr. S.K. Nayak, Co-ordinator of Rajiv Gandhi University and all those including the officials of the State Planning Department, especially Shri Prashant Lokhande, IAS, Secretary, who have been associated with the task of preparation of this excellent Report.

I have no doubt that this State Development Report will immensely help the State Government in formulating its policy and strategies taking into consideration the ground realities reflected in the Report to meet the challenges of development and will serve as a valuable reference book for the policy makers, planners and research scholars.

I am hopeful, this Report will have a significant role in realising the mission of my Government "People First".

A handwritten signature in black ink, appearing to be 'Dorjee Khandu', with a date '13/4/09' written below it.

(Dorjee Khandu)



बी. के. चतुर्वेदी

**B.K. CHATURVEDI**

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## MESSAGE

The Planning Commission initiated the preparation of State Development Reports (SDR) in coordination with the States concerned. The objective of the SDR is to provide a quality reference document on the development profile, to identify critical development issues of the States concerned. The report prepared largely by the experts and specialised institutes with the cooperation of the State Government would be of immense value to the Centre and State Governments and would assist in the setting of the agenda for higher and more equitable growth of the State.

A Core Committee under the Chairpersonship of Dr. S.P. Gupta, former Member, Planning Commission, was constituted in October 2003. The Core Committee worked out the modalities for preparing the State Development Report for Arunachal Pradesh and decided to assign the job to Rajiv Gandhi University (former Arunachal University), Itanagar and The Energy and Research Institute (TERI), New Delhi.

The report has taken into account the social and economic transitions, structural changes in the State's economy, level of human development, fiscal management, critical gaps in the basic minimum services, poor connectivity, underdeveloped infrastructure, need for capacity building, potential areas of resource based development and the role of Government in the development process while suggesting policy options for the development of the

State. I am confident that the directions and strategies proposed in the report will go a long way in achieving both a higher growth rate and improved level of human development indicators.

I would like to record my appreciation of the work done by Rajiv Gandhi University and The Energy and Research Institute (TERI) in the preparation of the report. I am thankful to the Government of Arunachal Pradesh for rendering full cooperation and support to both the agencies in the preparation of the report. The role of the Pr. Adviser (NE) and Adviser (NE) in liaising with Rajiv Gandhi University, TERI and State Government Departments is noteworthy. I would like to appreciate the work done by the officers of the State Plan Division in providing all necessary help to the Core Committee.

B. K. Chaturvedi -  
**(B.K. Chaturvedi)**

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Rajiv Gandhi University was entrusted with the responsibility of preparing the Arunachal Pradesh Development Report by the Planning Commission, Government of India in August 2005. This is for the first time that any University in the country undertook such a task. Incidentally, this is the second milestone achieved by the University. It also prepared the Human Development Report in 2005. Both these initiatives were the result of my predecessors, Professors Kamal Kant Dwivedi and Atul Sarma. My special thanks are due to Prof. Atul Sarma, Member, 13<sup>th</sup> Finance Commission, who was the main architect of this undertaking and who supervised and monitored the project from its inception to its completion. I take this opportunity to warmly congratulate Dr. S.K. Nayak, Coordinator, his colleagues in the Department of Economics and other departments of Rajiv Gandhi University, and all the other resource persons from all over the country who were involved in this Herculean task.

The Human Development Report of Arunachal Pradesh was not able to cover certain issues, given the nature of its terms and reference. However, the report has been able to deal with new areas like border trade, indigenous industries and demographic transition.

Arunachal Pradesh started its developmental efforts just after Independence, with only three primary schools and virtually zero literacy. Within a span of 50 years, the State has registered an impressive growth in literacy rate, the highest in India. The per-capita income of the State was 56.14 per cent of the national average in 1970-71, which went up to 110 per cent in 1995-96. In the post-reform period, due to the slowing down of the growth rate, it decreased to 84.64 per cent in 1999-2000. However, due to some recovery in growth, it has become 95 per cent of the national average in 2004-2006. Despite all these, achievements in the human development front

are really commendable. However, the liberalisation process which started in the 1990s poses many challenges to the development efforts of the state which needs thorough scrutiny.

Nearly 61 per cent of the population is dependent on agriculture and the practices followed by the farmers are still primitive untouched by modern technology. Even at present, the state is dependent on migrant workers, the highest in the North-east, to meet its increasing demand for labour. It is a state with abundant land but only 5 per cent of the land is suitable for cultivation. As a result, shifting cultivation is largely practiced to meet the livelihood of the people.

Further, with the rise in literacy rate and growth of modern education, young people are in search for white collar jobs, which has resulted in pressure on the government to create more jobs. In a situation of low private investment, the government is compelled to curtail capital expenditure to create more jobs. And as a result the creation of capital goods in the state has suffered.

It is well known that all the North-eastern states are poor in infrastructure. For example, road density is low and there is a strong demand to improve the road connectivity. When new roads are constructed, there is always a threat to the environment. Cost of construction is also high. The state is dependent on the Centre for 90 per cent of its developmental efforts. When it is trying to enhance its resources from hydroelectric power potential, there is simultaneously a danger to its rich culture and bio-diversity. Hence, there is a greater need to balance the two without sacrificing one for the other.

Despite the paradoxes and intricacies of the issues involved, the Report has tried to prescribe certain sets of solutions. However, we are open to healthy criticism and constructive suggestions. These will go a long way in the

final implementation of the report by the state. I hope and trust that this report will serve the interests of the people of the State and put Arunachal Pradesh on the fast track of progress.

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# Executive Summary

The report is structured in 22 chapters. The initial chapter scheme was finalised by the Core Committee constituted by the Planning Commission. However, considering the special characteristics of the State some new chapters like, Transformation, Demographic Transition, Border Trade, Indigenous Industries and Infrastructure are added. The chapters have been organised in a sequential manner keeping in view an analytical framework of development study. The report has highlighted the broader findings of the study and policy options emerging there from.

## Transformation

- Earlier known as NEFA, Arunachal Pradesh came into the picture in 1972 as a Union Territory. Full fledged statehood was granted in 1987.
- Over time social and economic transformation has taken place in the State. Individual ownership in cultivable land is gaining importance over community ownership. Land possession is now considered as a social status. With the introduction of money, economy has resulted in institutional transformation in land, labour and capital markets. Therefore, various contradictions have emerged in the economy of the State.
- The traditional consumption pattern of the people has changed, as new products have entered into their consumption basket, which has resulted in an increase in demand for cash. The traditional land ownership system and other economic institutions have become non-compatible with market system. Therefore, serious contradictions have arisen due to non-compatibility of traditional production system and institutions with those which are in conformity with market system.

- Due to monetisation, slow or no technological change in agriculture and semi-stagnant industrial sector, there is tremendous pressure on the government sector for employment and the government has expanded, which has resulted in a distorted growth of the tertiary sector.

## Demographic Transition

- With an area of 83,743 sq km and a population of 10,97,968 (as per 2001 Census), the State has a very low density of population. It is only 13 persons per sq km, the lowest among all the states in the country.
- The inter-district distribution of population is highly skewed; density is relatively high in the districts with some plains and extremely low in the districts situated in the upper reaches of the State.
- The ST population constituted 64.22 per cent and non-ST 35.78 per cent of the total in 2001.
- The sex ratio of the ST population declined from 1013 in 1961 to 998 in 1991 but increased to 1003 in 2001.
- The growth of population in Arunachal Pradesh is much higher than that in the country. However, during the 1990s the population growth rate declined in the State due to the falling rate of immigration from the rest of the country and falling rate of fertility.
- The fertility rate in the State is falling but the rate of fall is still very low. The mortality rate is, however, on a decline. Because of this, the natural rate of growth of population in the State is still higher than the national average.



- In spite of a clear falling mortality, the health status of the population in the State is worse than that in the rest of the country. Especially, in the remote region of the State, the health conditions remain one of the worst not only in the country but also in the world.
- The cost of providing health service per head in this hilly state is more than two and a half times that for the states situated in the plains.

### *Policy Measures*

- Expansion of the health services in the remote areas of the State.
- Public distribution system should be strengthened to cover all people living below the poverty line.
- Family planning services should be more meaningfully integrated with the health services in the State.
- Precautionary/preventive measures against AIDS should be strengthened.

### **Economic Growth, Structural Changes and Work Force Participation**

- In 1970-71, per capita NSDP of the State was around 56.14 per cent of the national average. Due to better growth performance of the State in the 1970s and 1980s, the difference between Arunachal Pradesh and national per capita income declined till the period of 1990-91. From 1991-92 to 1995-96, per capita income of the State remained higher than that of the country. After 1995-96, the per capita income of the State fell below the national average and the State's per capita income relative to the national income had since been getting lower and lower and became 84.64 per cent of the national average in 1999-2000. However in recent times, it has recovered and stood at 95 per cent of the national average in 2004-2006.
- Arunachal's NSDP growth rate was higher than that of the national income in the 1970s and 1980s. In the 1990s the rate was reversed; Arunachal's growth rate was 4.84 per cent in contrast to the national average of 5.93 per cent per annum. In per capita terms, there was a negative growth during 1994-2003 in the State.
- There is also a change in the sectoral composition of NSDP over time. A sharp declining tendency is observed in the share of primary sector in NSDP

(46.19 per cent in 1990-91 to 31.09 per cent in 2004-05). This decline is mainly due to decline in the share of agriculture (35.09 per cent in 1990-91 to 24.37 per cent in 2004-05), and forestry and logging (9.58 per cent in 1990-91 to 4.30 per cent in 2004-05) in NSDP.

- There has been a moderate rise in the share of secondary sector in NSDP. It went up from 21.56 per cent in 1990-91 to 25.42 per cent in 2004-05. Within the secondary sector, manufacturing sector's share has declined from 6.04 per cent to 2.27 per cent. Share of construction has gone up from 17.98 per cent to 22.51 per cent during the same time. Electricity, gas and water supply sectors' share has improved from -2.47 per cent to 0.64 per cent during the same period.
- The tertiary sector's share in NSDP went up from 32.25 per cent in 1990-91 to 43.50 per cent in 2004-05. The share of transport, storage and communication went up from 0.65 per cent in 1990-91 to 8.19 per cent in 2004-05. Trade, hotel and restaurants' share has gone down from 4.95 to 3.86 per cent, banking and insurances has gone up from 1.49 per cent to 2.61 per cent, share of real estate etc., has declined from 5.29 per cent to 2.09 per cent. However, there has been a sharp increase in the share of public administration from 8.17 per cent to 14.99 per cent during the same period.
- During 1990-91 to 2004-05 the primary sector contributed 8.90 per cent to NSDP growth in contrast to a contribution of 36.79 and 54.36 per cent in 1970s and 1980s. This decline is mainly due to decline in the contribution of agriculture (41.95 per cent in 1980s to 12.03 per cent in 1990s) and forestry and logging sector (5.45 per cent in 1980s to -6.85 per cent in 1990s). There is also a decline in the contribution by mining and quarrying (5.66 per cent in 1980s to 1.60 per cent in 1990s) to total growth of NSDP in the State.
- Secondary sector's contribution to growth has increased from 23.92 per cent in the 1970s and 18.44 per cent in 1980s to 26.41 per cent in the 1990s. The better performance of this sector is mainly due to better performance of construction. However, contribution of electricity has been satisfactory.
- Tertiary sector's contribution to growth has gone up from 27.2 per cent in the 1980s to 64.68 per cent in the 1990s. Contribution by the non-infrastructure



category of tertiary service (which includes public administration and other services) to growth has increased from 14.11 per cent in the 1980s to 40.48 per cent in the 1990s. In the infrastructure category the contribution by transport, storage and communication has increased from 0.79 per cent in 1980s to 24.42 per cent in the 1990s. In other sectors of the infrastructure category like trade, hotel and restaurant, banking and insurance, the contribution has declined from 8.73 per cent to 6.43 per cent in the 1990s.

- In the post-reform period, a sharp inter-district variation in net district domestic product (NDDP) is also observed. The districts like Tawang, Papum Pare, Lower Subansiri, Upper Subansiri, Upper Siang, Changlang and Tirap have higher rate of growth than the State average. In East Siang, a negative growth is observed. In per capita NDDP, six districts namely Tawang, West Kameng, Papum Pare, East Siang, Upper Siang, Dibang Valley have negative growth. The highest growth in per capita NDDP has taken place in Upper Subansiri.

The above growth pattern has percolated down and is reflected in the outcome variables like employment, poverty and human development as discussed below.

## Employment

- The remarkable feature of the total workers in the State is that 79.7 per cent are self-employed. In the rural areas 90 per cent of the ST male and 95 per cent of the ST female workers are self-employed.
- Dependency in agriculture sector in the state is high but it is declining. The share of agriculture in 2004-2005, among all workers, was 76 per cent (NSS 61<sup>st</sup> Round), implying the dominance of agriculture in the State's economy. The declining share of agriculture sector in the income is the most important disturbing trend in the economy of the State. The second important employment generating sector is public administration, education and community services.
- Manufacturing has a low share of 0.6 per cent, while construction has a share of nearly 4 per cent in 2004-05.
- Between 1993-94 and 2004-05, there has been a marginal decline in the share of workers employed in agriculture and increase is noticed in the share of those employed in public administration and construction.
- Overall employment growth was negative for all workers and more significantly for the female workers during 1993-94 to 1999-2000. However, between 1999-2000 and 2004-05 employment growth was positive for all categories of workers.
- The share of unemployed persons both in population as well as in workforce had declined between 1993-94 and 1999-2000, but increased between 1999-2000 and 2004-05. Less than one per cent of the labour force was unemployed in the State. The low unemployment status might be a reflection of the low level of commercialisation and development of the economy.
- Unemployment rates are higher in the urban than in the rural areas.
- Negative employment growth was observed during 1993-94 to 1999-2000 in sectors like agriculture, electricity, gas and water supply, transport, finance and business services, public administration, education and community services.
- Between 1999-2000 and 2004-05, employment hardly grew in manufacturing but it grew substantially in electricity, gas and water supply, trade, hotel, restaurant, transport and business service and public administration.
- The Work Force Participation Rate (WFPR) in the State declined between 1993-94 and 1999-2000 as per the usual status employment for rural males. Between 1999-2000 and 2004-05 it increased consistently in rural and urban areas. However, rural-urban difference still persists.
- Data from the employment exchange shows that the number of unemployed people in the live registration has crossed 26 thousand. NSS data shows that between 1999-2000 and 2004-05, level of unemployment among relatively better educated declined.
- Till now the major chunk of employment generated, outside agriculture sector, has been either in public administration or sectors like construction, which has strong linkages with government spending. Expansion of employment opportunities in the manufacturing sector has to be addressed with a proper policy framework.

- The problem of youth and educated unemployment, which exists along with shortages of skilled manpower in specific sectors and occupations, needs urgent attention, particularly because of its potential role as a source of social destabilisation.

### *Policy Options*

In the light of the employment situation in the State as discussed above, the following options may be taken care of:

- There is a tremendous scope for the expansion of the rural non-farm occupations in the State. Therefore, the State must come out with a rural non-farm sector policy such that many youths can take up the non-farm activities as their career option.
- Some activities like manufacturing and petty trading demand additional attention. Over the past decades, partly as a result of the growing demonstration effect of urban consumption patterns in the rural areas, there has been a phenomenal growth of these sectors in the rural areas.
- There is a clear case for special educational drives for marginalised groups such as villagers in inaccessible and border areas, traditionally marginalised ethnic groups, migrant casual labourers, tenants as well as those living in labour camps.

### **Poverty and Inequality**

- Poverty declined faster in Arunachal Pradesh than in the rest of the country: between 1993-94 and 2004-05 the decline in poverty was 27.10 percentage points in the State and 8.34 percentage points at the national level.
- Poverty in the State is largely a rural phenomenon. Unlike in other tribal states, households living in rural areas are more vulnerable to poverty, which is mainly due to low productive *jhum* cultivation, absence of labour, product and credit market, and poor transport network.
- Arunachal Pradesh has higher normative calorie requirements than the states in the plains.
- Paradoxically, poverty measured by Head Count Ratio has declined but incidence of calorie deficiency has increased in the State.
- Between 1993-94 and 2004-05, proportion of calorie deficient households in the rural areas

remained stagnant around 64 per cent, whereas in urban areas it has gone up by 20.75 percentage points and stood at 47.50 per cent in 2004-05.

### *Policy Options*

- Mismatch between Head Count Ratio of poverty measurement and proportion of calorie deficient households puts certain serious questions on the methodology followed in estimation of poverty particularly in the hilly states.
- Method of measurement of normative calorie requirements of the hilly states must be reviewed.
- In the absence of price index for the hill of North-east, Assam's price index is used to compute the poverty ratio which is not justifiable. Therefore, effort should be made to construct separate price indices for the smaller states such that poverty ratio can be computed correctly.

### **Human Development**

- The level of human development is low in the State. Its rank in human development index (HDI) is 14<sup>th</sup> among the 16 states of India of which 15 are categorised as major states.
- East Siang with an HDI of 0.66 has the highest rank among the old 13 districts of the State. East Kameng has the lowest position in HDI. Dibang Valley (old) occupies the second rank and Papum Pare, the third in HDI.
- Health status, a dimension of human development, varies widely in the State.
- Papum Pare's expectancy of life at birth is marginally above 60 years which is comparable with the national average of 63.30 years but Kurung Kumey's life expectancy at 42.50 years is comparable with that prevailing in Sub-Saharan Africa, the region with the worst health status in the world.
- In literacy, the rate of progress in the State is one of the highest in the country. From almost a total illiteracy in 1947, the State reached a literacy rate of 54.34 per cent in 2001 which is higher than that in Bihar and Jharkhand.
- The spread of literacy is not even and there is high inter-district variation.

### *Policy Measures*

- All-out steps should be taken to expand the health

services to the disadvantaged section of the population—those living below poverty line and those living in the far-flung areas of the State.

- Immunisation should be expanded to cover all the children in the State.
- The expansion of educational institutes should receive priority especially in the remote areas.
- Vocationalisation of education should receive priority.
- Gender-sensitive measures such as gender-budgeting and collection of development indicators along gender lines should receive the attention of the policymakers.

## Potential Sectors for Development

### *Natural Resource Base*

- Coal: Major workable coal resource is available in Namchik-Namphuk coalfield with estimated reserves of 84.23 million tonnes, spread over an area of 35.5 sq km. Lack of good communication and remoteness from the nearest railhead is the main constraint of development of this coal field.
- Oil and natural gas: Available in Kumchai, Diyun and Kharsang area in Changlang district. Here 13 exploratory wells have been completed and exploratory work has been started.
- Limestone and dolomite: Major reserves are found in Rupa (143 million tonnes), Tidding (140 million tonnes), Pangin (225 million tonnes). Rupa mining was started in the 1990s but was stopped owing to various reasons. Considering the growing demand of steel in the international market, the dolomite deposits would also be of importance in near future. Similarly, cement plant with a capacity of 30 tonnes/day at Tezu, which started its commercial production in 1985 using limestone from Tidding, was closed down within a decade.
- Graphite: Major reserves are found in Deed village on Joram-Palin road (50 m thick), Bopi on Tamen-Raga-Daporijo road (2.46 million tonnes), and Lalpani (71 million tonnes) on Tezu-Hayuliang road.
- Other mineral resources: Lead and zinc, ferro silicon minerals, clay, etc., are available. Building materials like sand, boulder, marble, quartzite, granite, etc., are also available in the State.

These are merely indicative of the availability of mineral resources as the entire State has not been surveyed thoroughly for the purpose. The existing data reveals that only around less than 10 per cent of the total geographical area is surveyed by the GSI.

### *Policy Options*

- The existing data reveals that only around less than 10 per cent of the total geographical area is surveyed by the GSI. Therefore, efforts should be made to survey the entire State. Further, whatever the survey that has been done so far, should be made public.
- Since no economic feasibility study has been done for most of the mineral reserves of the region, specific studies need to be done.
- The abrupt stop of Rupa Dolomite mining was mainly due to denial by the military, for the truck movement at the night time. Therefore, coordination with the military is a must for exploitation of mineral resources in the region.
- Rangiya-Lakhimpur-Jonai railway line is the supply line to the State. Therefore, in order to reduce the transport cost, this railway line must be converted into broad gauge in order to transport the mineral resources of the State to the various industrial areas in the country. It may be pointed out that honourable Prime Minister of India announced its conversion in to broad gauge on 31<sup>st</sup> January 2008.
- The State must come out with a clearly defined mineral policy.
- Since the State is located in the seismic prone zone, for sustainable development strict enforcement of building code, geotechnical studies of building code and hazards microzonation mapping should be followed.

### *Forest Resources*

- Out of the total geographical area of 83,743 sq km, forest area of the state is 51,540 sq km.
- The expected annual yield of timber is 74152.55 cubic metres, the annual yield of cane, bamboo and resin are estimated to be 1,53,36,851 Rmt, 278,162 (no.) and 2,28,980 blazes.
- Different programmes like artificial plantation, aided natural vegetation, social forestry, joint forest

management, apanaban, fuel wood plantation under minimum need programme, minor forest production are in operation in the State.

- Though the high power committee has cleared 115 forest-based industries in the State only 14 are in operation.

### *Forestry Potential*

- **Bamboo:** Total area under bamboo in the State is 1218.75 sq km and there is an additional potential of raising 8000 sq km area. Therefore, bamboo-based industries like paper mills is a potential area of development.
- **Cane:** The area under cane has not yet been estimated. Studies suggest that 18 different species are available in the State. Keeping in view the demand of cane in other parts of the country, specific programmes need to be launched to develop this sector.
- **Medicinal plants:** In the State around 500 species of medicinal plants have been identified by different agencies. For commercial exploitation the need of an apex body like State Medicinal Plant Board is urgently felt.
- **Gums, resins, oils, and orchid:** Chir pine resin, *dhuna*, citronella, agar, orchids and other different varieties of oil-yielding plants are abundantly available in the State. Out of 600 species of orchids 150 species are commercially important. All these forest products have not yet been fully exploited due to limited infrastructure availability in the State.
- **Wildlife reserves:** There are four elephant and two tiger reserves in the State. These reserves can be developed to attract tourists.
- **Carbon financing:** As per Kyoto Protocol, the State has enormous potential to develop the forest sector by participating in carbon financing scheme to generate forests. The State has around 1404.13 sq km of fallow land, cultivable waste land and area not available for cultivation. Thus, the schemes related to carbon financing can be taken up to regenerate forest.

### **Constraints to Development of Forest Sector**

- Poor infrastructure, inadequate resource and manpower,
- Constraints related to different forest laws, and

- Poor awareness among the people related to forestry.

### *Policy Options*

- Increase in the investment in forestry sector.
- Scientific management of NTFPs like bamboo, cane, medicinal plants, orchids, etc., and establishing strategic market linkages with private sector.
- Strengthening protection mechanism and legal framework.
- Conservation and development of wildlife and biodiversity.
- Involving indigenous communities especially women for conservation, protection and sustainable development through JFM/local systems for utilising the traditional wisdom and ethos of conservation.
- Ensuring ways and means for sustainable utilisation of forestry resources for poverty alleviation, environmental stability and ecological security.
- Promoting eco-tourism.
- Initiation for carbon trading in the line of State's interest.

### *Land Use Potentials*

- Arunachal Pradesh is a mountainous state covering 83,743 sq km. Part of Himalayas, the State has more than two-third of its area above 1000 m and about one-third area above 2000 m altitude.
- It has a very low proportion of plain area. Below 5° slope, land including riverbed covers only 12,434 sq km and about half of the geographic area is either very steep or overhanging. Its typical geographic set-up is responsible for the rain deficiency in the western part and perhumid conditions in the east-central part. Soils of the State are mostly shallow and recently formed, and have low fertility.
- Land capability in the State is mostly of Class IV type which puts severe limitations on the choice of plants and requires special conservation practices. Nature has posed a great deal of hardship to the people of the State for pursuing any viable economic activity.

These constraints may be overcome by this least densely populated State through a careful understanding of the geophysical parameters of altitude, slope, rainfall, soil, vegetation cover through Normalised Difference



Vegetation Index (NDVI), and agro climatic suitability of different crops. Demand as well as production of cereals is low in the State and there is also little scope for its expansion owing to physical and agro climatic limitations. Besides this, cultivation of cereal crops will accelerate soil erosion as it needs tillage of soil and weeding on regular basis. Economically, cereal cropping is not profitable as yield is low on recently formed, argillaceous and less fertile soils of Arunachal Pradesh.

### Policy Options

- The strength of the State is its varied agro climatic condition that is capable of producing a variety of horticultural and plantation crops such as apple, pear, orange, pineapple, kiwi, tuber crops like ginger, turmeric and vegetables. Cash crops like jute may be grown in perhumid areas of East Siang, Lower Dibang Valley and Lohit.
- Commercial cropping particularly horticulture and herbal medicine is still in infancy in the State. Hence, the government needs to facilitate the farmers with technical know-how and material inputs so that they can grow high-valued crops according to agro climatic suitability. Above all, a network of market should be promoted through non-governmental agencies with proper regulatory system or directly by the government. Further, it is possible only through developing the grower's cooperative and linking them with bulk purchasers such that economy of scale is realised.

## Sectoral Profile of Development

### Rural Development

Provision of social and physical infrastructures is the key to improving the quality of life of the people. In this context the chapter has articulated the status of rural development and suggested various policy options.

- In 1991 only 16.96 per cent of the villages in the State had bus stop facility. Among the districts, Upper Subansiri was the least and East Kameng the most accessible.
- In 1997, 38.53 per cent of the villages in the State were connected by roads. East Kameng had the highest and Kurung Kumey the lowest connectivity. In the rural areas of the State 46.51 per cent of the population had access to *pucca*, 26.71 per cent to *kuccha* road, and 26.56 per cent had no connectivity. Kurung Kumey was the least accessible district

where 1.35 and 21.89 per cent of the population had access to *pucca* and *kuccha* road, respectively.

- In 2001, 44.53 per cent of the rural households were electrified. Papum Pare had the highest (77.19 per cent) and Lohit the lowest (22.85 per cent) coverage of electricity.
- In 2001, 63.34 per cent of the rural households had access to tap as the source of drinking water. In the same year 73.93 per cent of the rural households had no drainage facilities. However, it should be mentioned that treated water is not supplied. Even people in Itanagar city got treated water only three years before. Therefore, the quality of water that people consume is poor as 6.65 per cent of total deaths in Arunachal Pradesh is due to water borne diseases like dysentery, diarrhoea and gastro-enteritis as compared to all India average of 2.41 per cent.
- Only 68.09 per cent of the children in the State had access to immunisation in 2001-02. Kurung Kumey has the highest IMR of 113. In the State, 48.38 per cent of the habitations do not have primary schooling facility within a radius of one kilometre. Only 14.29 per cent of the allopathic medical institutions are located in rural areas.
- In the State, 36.2 per cent of the rural households own radio as compared to 31.5 per cent in rural India. In telephone connectivity the State is at par with national average as 9.2 per cent of Arunachal's households own telephone as compared to 9.1 per cent in the country. Rural telephone connectivity is lowest in East Kameng (0.96 per cent) in the State.
- Only 4.4 per cent of the rural households in the State own motor cycles as compared to the national average of 6.7 per cent. Lowest rate of television used was observed in East Kameng (3.63 per cent) and highest in rural Papum Pare.
- Among the North-eastern states, Arunachal Pradesh occupies the first position in access to banking facilities; 28.6 per cent of the rural people in the State have bank accounts as compared to the national average of 30.1 per cent.
- Deposit-GSDP, Credit-GSDP in the State are 49.7 and 19.6 per cent respectively, which are very low. Thus, credit-deposit comes to 39.44 per cent in the State. The low credit disbursement in the State is mainly because of non-availability of collateral.

- Net sown area per ST household in the State is 1.87 hectare and Dibang Valley has the highest and Tawang the lowest net sown area per ST household.
- An overwhelming majority of the people in the remote areas depend on *jhum* cultivation and supplement their income through hunting and gathering activities. There is high potential of terrace cultivation as 29.49 per cent of the land comes under the low slope category (10-20 degree).
- Rural technology is at the extremely low level. In the remote part people even do not have even access to kerosene.
- Most of the rural development programmes in the State lack coordination.

### Policy Options

- Connectivity needs to be improved.
- Expansion of schooling and health facilities is a *sine qua non* for promotion of inclusive growth.
- Mobile health services in the remote areas through public-private initiatives may be explored.
- Community involvement in delivering the basic services like health and education in Nagaland line may be implemented.
- In order to diversify the livelihood options of the people, marketing network needs to be expanded.
- Agricultural extension services need to be revamped to popularise slope specific new crops.
- In order to expand the credit facilities, self help groups need to be popularised and state specific collateral in the form of community/clan as the guarantor of loan may be explored.
- Traditional technical know-how is on the verge of extinction and technology mission should upgrade the exiting indigenous technology in a way that becomes economically viable.
- Small scale food processing industries along with cold storage facilities should be developed particularly in the remote areas. This requires electricity. In order to make electricity available in the remote areas, the construction of mini-hydel projects should be encouraged.
- Technology being the source of all dynamism and progress, all-out efforts should be made to improve rural technological configuration of production, distribution, etc.
- Agricultural land is yet to be cadastrally surveyed. In order to promote rural banking, it is essential that all cultivable land should be cadastrally surveyed and records of their ownership duly prepared, so that land can be used as collateral for loans from financial institutions.
- Expansion of the market including financial market in rural areas requires strengthening of the contract-enforcing mechanism.

### Urban Development

- Arunachal Pradesh is a late starter in the urbanisation process (in 1971 only) but within two decades, it had overtaken Assam, which has a long history of urbanisation. The level of urbanisation in the State increased from 3.70 per cent in 1971 to 20.41 per cent in 2001. The growth rate of urban population during 1991-2001 is around 100 per cent.
- The process of urbanisation is not a result of economic development rather it is a State-induced one.
- One of the important features of the growth of urban settlements in Arunachal Pradesh is the dominant role of inter-state migration rather than intra-state rural-urban migration.
- As per 2001 census, 89.42 per cent of the urban households of the State were electrified which is marginally ahead of the country with 89.14 per cent. Papum Pare the most urbanised district, has the highest (97.07 per cent) and Lohit has the lowest (73.77 per cent) coverage of electricity.
- In telephone connectivity, the urban areas of the State are ahead of the country. For example, as high as 26.5 per cent of all urban households in the State have telephone connectivity as compared with 23 per cent in India. However, there are substantial inter-district variations.
- In urban banking Arunachal Pradesh is far ahead of the national average. As high as 67.0 per cent of the urban households in the State have bank accounts as compared with 49.5 per cent in urban India.
- In 2001, 89.42 per cent of the urban households had access to tap as the source of drinking water (which is of course not treated). In the same year 36.75 per cent of the urban household had no drainage facilities.

### Policy Options

- Since Arunachal Pradesh is a hilly State with different environmental and geomorphic characteristics, it is suggested that instead of population conglomerating in one or two large towns, it is better to have more small and medium towns in different districts of the State.
- The State falls under Zone-V of the seismic prone areas with a high risk of earthquake and land slide. The pressure on urban land has led to unscientific method of building/designing which has got serious environmental consequences.
- The other environmental issues associated with urbanisation are poor urban waste management. It is estimated that the total urban solid waste accumulated is around 230 tonnes per day which is too high to be managed by the present set-up (Chapter 15). Although the amount may not be alarming but it needs special attention for its proper treatment and disposal.
- Since the current urban administration is not yet well-structured, setting up the urban municipalities is a must. It should be noted that Arunachal Pradesh is the only state in North-east India which does not have any municipality till date.
- Proper institutional safeguards must be given to the urban informal workers as they constitute a significant segment of the urban workers.
- It is necessary to constitute a District Planning Committee in the State for rural-urban integrated development.

### Agriculture

- Agriculture contributes 27 per cent to the NSDP and employs around 63 per cent of the total workers in the State. However, a negative growth rate is observed in the recent years in agriculture sector.
- Positive points observed in the agriculture sector are: (i) net area sown is increasing, and (ii) area under permanent cultivation is increasing and under shifting cultivation declining.
- The weak points are: (i) low availability of permanently cultivable land, (ii) increasing marginalisation of land holding, (iii) yield growth rate is not satisfactory, (iv) percentage of area under HYV seeds has remained constant (around 26.76 per cent), (v) institutional credit access of the

farmers is very low (10 per cent), (vi) ill-defined property rights, and (vii) poor marketing network for the agricultural products.

On the basis of the above trends the following policy measures are suggested:

- Early completion of cadastral survey and evolving of an institutional mechanism to monitor and control land alienation through land reform laws.
- Development of a transparent, equitable and well-defined system of property rights over land.
- Development of location specific farming technologies.
- Creation of marketing network.
- Land lease policy in agriculture should be brought out by the government.
- Composite package which includes supply of high yielding varieties of seeds and seedling, supply of credit, and insurance to cover risk. Buy-back arrangement in the short-run and setting of processing units in the long-run should be the priorities of the government.
- Since economic surplus of the farmers in the State is very small, farmers cooperative should be encouraged such that they can be linked with bulk purchasers to reap the benefit of scale.
- Establishment of an effective data collection, processing and dissemination agency.

### Indigenous Industries

- The State has high potentials in indigenous industrial activities as they are intrinsically linked to the culture of different tribal groups. Therefore, there is a need of identification and promotion of these activities.
- Promotion of agro processing industries.
- This sector suffers from different constraints like lack of raw materials, credit and marketing.
- There is no formal institutional set-up to address their problems.
- In the line of village and *khadi* industries, a State-level Indigenous Industries Commission may be set up to address their problems.

### Resource-based Industries

- The important characteristics of the resource-based industries are that backward linkage is low and

forward linkage is located outside the State. The share of manufacturing in the State income is very low.

- In the early 1990s and 1980s, whatever industries that were there in the State were mainly forest-based. Due to Supreme Court's restriction on commercial timbering in the mid 1990s many existing forest-based industries were closed.
- At present most of the industrial activities are concentrated in the district of Papum Pare where the State capital is located. These industries are of small scale type.

### *Policy Options*

- Development of large industries with strong mutual inter-linkage should be planned. Simultaneous development of industries with mutual inter-linkage will take care of the marketing constraint to a good extent. There will be gains in terms of cost reduction which in turn will improve viability of industrial projects.
- The plan for expansion of road network should take into account the industrial development plan along with the proposed locations of industrial units. Resulting improvement of connectivity will further brighten the viability of industrialisation programme.
- In view of ambiguity of land ownership, government will have to play a pro-active role in making land available for setting up of industries. Long term leasing of land should be arranged if outright purchase is not possible.
- Local entrepreneur should be supported to participate in developing ancillary and downstream industries. This will prepare a class of local entrepreneurs to carry forward the industrialisation process.
- Industrial workers including managerial and technical personnel may have to be brought from outside at least in the initial years. They should be given proper work permits which should clearly state the extent of their rights. To attract the best of talent they should enjoy all civil rights. But to avoid apprehension of indigenous communities of being outnumbered and overwhelmed, the right to acquire landed property should not be extended to the permit holders.
- Above all, the industrialisation process of the State should be environment-friendly.

### *Environment*

The State is endowed with abundant forest, mineral and water resources. The main concerns on environment are: (i) intensification of agricultural practices, (ii) low level of sanitation facilities, (iii) unplanned urbanisation, vehicular growth and urban waste generation. Indoor environment in rural areas poses threat to people's health as they continue to use traditional fuels for cooking.

- Inadequate sewerage network and improper sanitation facilities lead to environmental degradation.
- Though the vehicular density is low (37 as compared to 53 at the national average), vehicular air pollution is expected to become a big concern.
- Urban solid waste generation is quite significant (12 tonnes per day in Itanagar only). Health care waste contributes around 5.58 per cent to the urban waste.
- *Jhuming* is the main cause of soil erosion. The erosion rate is 91 tonnes per hectare per year in the State.
- Central Pollution Control Board has not found a single polluting industry in the State since the industrial base of the State is weak.
- Data on water quality of most of the rivers in the State is not available. However the Brahmaputra that traverses through the State has been reported to exceed the accepted bacteriological level. This is an indication of the quality of river water of the State.
- The dominance of fuel wood as cooking fuel (87 per cent in 2001) has implications for indoor environment and health condition of women and children.

### *Policy Options*

- Enforcement of different environmental laws is constrained by scarcity of skilled manpower. Therefore, financial, technical and skilled manpower requirements of the enforcement agencies need to be taken care of.
- Proper policies need to be formulated to phase out old polluting vehicles, and inspection and maintenance of vehicles on road.
- Policies are needed to ensure management of urban, industrial and health care wastes. Here the involvement of private entrepreneurs and NGOs should be encouraged.



### *Border Trade*

- The State has borders with three countries mainly Bhutan, China and Myanmar with a total international boundary of 1628 km.
- From time immemorial informal trade has been taking place through different passes.
- The products that are identified where the State has the export potential are coffee, floriculture products, fresh fruits and vegetables, spices, tea and handicraft products.
- Different fruits like apple, orange, pineapple, banana, kiwi etc., are produced in the State.
- The State has identified more than 500 herbal medicinal plants and other aromatic plants like citronella, lemon-grass, vanilla, patchouli, agar, etc., having high international demand.
- Identified 50,000 MW hydroelectric potential can be a boon for the State. Considering the differential in peak time demand of India and South East Asia, there lies huge potential in power export to these regions.

### *Policy Options*

- The State can also play a major role in reducing the transport cost for the goods exported from other parts of India to China through sea route. This is possible only after development of proper internal transport communication network in: (a) Tezpur-Bomdila-Bumla, (b) Lakhimpur-Daporijo-Naso, (c) Jonai-Sadhiya-Mekha-Malvinil-Tajobum, and (d) Sadhiya-Tezu-Chirang-Kahoo sectors.
- Finally the Rangiya-Jonai train route should be upgraded to broad gauge so that goods produced from mainland India can be exported to China through these trade routes.

### *Tourism*

- There are eleven identified tourist spots in the State, out of which Tawang, Bhimaskanagar and Itanagar are historical tourist spots. Malinithan and Parasuram Kund are pilgrimage tourist centres and Bomdila, Dirang, Tipi, Along and Pasighat are mountain resort tourist spots. Namdapha National Park is an attractive destination for wildlife lovers. Arunachal Pradesh with rich cultural tradition is a wonderful destination for cultural tourists. So there is enough scope for developing nature-based,

heritage, pilgrimage as well as cultural tourism in the State.

- The constraints to attract tourists to these centres are basically due to: (a) inadequate infrastructural facilities, (b) institutional constraints, (c) limited information, etc.
- A survey was undertaken to study the nature and structure of tourist demand in relation to socio-economic and demographic characteristics of tourists survey. The survey results show the existence of a market particularly for eco-tourism in the State. The study emphasises the need to organise more and more challenging adventures for relatively youthful tourist population. This means greater investment is needed for developing adventure tourism.

### *Policy Options*

- Tourism development will be more productive if it is a part of North-east scenario. More specifically, the circuits of North-eastern region may be divided into different categories like pilgrimage, historical, cultural, recreation, wildlife etc., and the identified tourist spots of Arunachal Pradesh may be linked to those circuits accordingly.
- Public-private partnership should be treated as an essential ingredient of the policy for the development of tourism in the State. At the same time, the State government should also provide road, land, water and electricity to private entrepreneurs for constructing private hotels in different tourist spots of the State.
- Air connectivity is a cost-intensive option but it needs to be developed for promoting tourism. The State government should also build other infrastructural facilities for tourism like proper road, tourist lodges and huts, properly managed website, etc.
- The participation of local people should be encouraged. The tourist destination has to be developed in consonance with the local communities. It may be possible to provide a unique experience to tourists by building low cost infrastructure in the villages (with proper hygiene, sanitation facilities and electricity) in adjoining district headquarters, by using local materials and local design inputs.

- The simplifying of the entry formalities can lead to more tourist arrivals throughout the year. Therefore, steps may be taken to simplify the procedure to obtain inner line permit at the entry points.

### *Power Sector*

- The chapter explores into policy options for utilising the State's power resources for stimulating socio-economic transformation in the longer run.
- A review of the State's power sector performance in past couple of years has indicated a slower progress, at least up to 2005. This is reflected in a smaller and stagnant installed generation capacity, huge untapped hydro-power potentials, low level of power consumption, a sub-optimal equilibrium with no visible energy deficit, high and growing dependence on the central sector generating stations, grossly underdeveloped transmission and distribution (T&D) networks, and alarmingly high aggregate technical and commercial losses (AT&C). Severe resource constraints, difficult topographical characteristics and high levels of inefficiencies are among the main reasons behind such a scenario.
- Even the progress made towards rural electrification could not produce the desired fruits due to lack of necessary distribution infrastructure. Some initiatives towards it are, however, planned under the RGGVY.
- The sector witnessed significant developments, especially for exploiting its immense hydro-potential, in recent past in the background of new policies like Small Hydro Power Policy 2007.
- Many private entrepreneurs have shown interest in the State's power sector. They, along with the Central power utilities, have concluded MoAs to develop as much as 25,722 MW accounting for 42.2 per cent of the total identified potential of the State. Still, more than half of the potential would remain unexploited.
- Even the Centre has been highly generous in supporting the State's efforts, as reflected in the recent 'Prime Minister's Economic Package', as also in the rising activities of Central power utilities in the State.
- All these could enable the State to emerge as a power house of the country in near future and, in the process, earn large resources through selling of power to other states of the country.

### *Suggested Policy Options*

- In the process of developing power resources, a suitable model balancing local aspirations/concerns and revenue considerations need to be evolved. Without this, people's support for the sectoral initiatives may not be forthcoming and, hence, the desired socio-economic transformation may not be achieved. Therefore, mega project should be done in such a way that it does not require much resettlement of people and the environment is least affected.
- Towards this, while the mega projects may be developed taking mainly revenue consideration into account, various decentralised generation options based on alternative technologies, inclusive of solar and biomass, could be used for meeting local demand. Further, the mega hydro projects could have a built-in arrangement for supplying power locally to the nearby areas at a minimum T&D cost.
- A high priority should be accorded to development of T&D networks including the intra-state grid. Without this, the power could neither be evacuated to the load centres outside the State for earning revenue nor could it be supplied to the local population meeting their needs. But, this is a highly challenging task given the difficult local terrain and hence, the Centre has to play a pivotal role in it.
- Since T&D is costly in the state, micro project should be given top priority.
- The financial requirement for the sectoral development being quite high, the State should tap all possible sources inclusive of central agencies, financial institutions, private developers as well as its own resources.
- The Department of Power should aim at generating internal resources through reducing inefficiencies. Towards this, metering at all levels must be prioritised.
- The State government should introduce power sector reforms, as committed under the MoA with the Ministry of Power in July 2002, at the earliest. This could begin with setting up of a State Electricity Regulatory Commission.

### *Transport and Infrastructural Development*

- Arunachal Pradesh has the lowest road development index in the country.
- The road density in the State is 18 km per 100 sq

km of area as against the national average of 75 km and North-eastern regional average of 52 km.

- The rural connectivity is low: out of 3,599 villages in the State only 1407 (40 per cent of the total) has road connectivity.
- The length of national highways in Arunachal Pradesh is only 392 km which is second lowest among all North-eastern states.
- The rate of growth of national highway and other roads is very low, as compared with that of some other states in the North-east.
- The State faces severe problems in road development: hilly terrains susceptible to erosion, seismologically active zone, dense forest cover, heavy rainfall, etc.
- In order to speed up the development of roads the Government of India has initiated the Special Accelerated Road Development Programme in North-East India (SARDP-NE). Arunachal Pradesh received more than Rs. 500 crore for improvement of roads.
- Connecting the villages is a priority of the Government of India which has launched the Pradhan Mantri Gram Sadak Yojana (PMGSY) in order to expedite the process. The State has completed 356.84 km of roads under this programme. A 'Four Year Business Plan for Rural Connectivity' under Bharat Nirman (2005-2009) aims to bring connectivity of 2119 km for 298 habitations in the State.
- The number of vehicles registered during 1999-2000 was 3586, which rose by 55 per cent to 5703 (excluding Dibang Valley) during 2003-04. By the end of 2002-03, the number of vehicles including two wheelers was 21,144 in the State.
- The rate of increase of vehicles being much higher than the road development, there has been a sharp rise in the fatal vehicular accidents in the State.
- In order to ensure road safety, the State has set up State Road Safety Council and District Road Safety Councils.
- The services extended by the State transport department being not adequate, the private sector has assumed increasing importance in recent years. Apart from bus services, the private operators run vans, tata sumos, auto *rickshaws*, etc.

- Tele-density in the State is high as compared with the national average. In recent years the internet services have grown rapidly in the State. In terms of internet growth, Arunachal Pradesh occupies in the North-east the third position after Nagaland and Meghalaya.

### *Policy Options*

- In case of high cost of road construction especially in the steep hills, ropeways may be a viable alternative. In the riverine plains waterways may be the cheapest mode of transport.
- Air connectivity demands priority in view of the high tourism potentiality in the State. Apart from this the remote rural areas where road connectivity is a problem, air connectivity may be explored as an alternative. The recent announcement by the honourable Prime Minister to build airstrips at different places will be a boost to the State.
- Though postal services have improved in the State in recent years, its rural coverage remains as low as before. Still telegraphic facilities are not provided by the post offices.
- Postal services should be strengthened in the rural areas where, in the absence of banks, the post offices can encourage the savings of the rural people with little means.
- Postal services can be improved, only by augmenting transport and telecommunication services.

### *Science and Technology*

Arunachal Pradesh is lagging in science and technology (S&T) which is the vital input for a steady improvement of the quality of life of the people especially of those who are suffering from various deprivations. This chapter identifies the main areas where a big thrust is necessary for a rapid development of S&T in the State. The priority areas include information technology, biotechnology, telemedicine, tele-education, bamboo technology, medicinal plants, etc.

Arunachal Pradesh has established 55 CICs which are engaged in disseminating information on agricultural markets, government schemes, job opportunities, etc., but this is not enough; more CICs should be established. Information technology should be popularised by education and training so that the people can take advantage of e-banking, e-education, etc. In order to make

its patent compatible, traditional knowledge especially on medicinal plants should be digitalised in the State by establishing a 'Traditional Knowledge Digital Library' which is already operating in other parts of the country. Apart from this, BPO or call centres and a centre for bioinformatics should be established in order to generate employment.

### *Policy Options*

The sustainable use of rich bio-resources in the State requires properly-planned biotechnological interventions especially in the forms of collection and selection of elite germplasm, application of plant tissue culture for mass propagation of quality planting materials. Biotechnology should be applied to develop high yielding varieties of crops and bio-fertilisers, and it can be used to control pests and diseases biologically. Biotechnology should also be applied to the improvement of indigenous fruits, vegetables and plantation crops. Much of the farming in the State is organic, planned promotion of this method and its certification can enable the farmers to produce organic products which have an increasing international market. For biodiesel production, potential of different tree-borne oilseeds should be explored and jatropha plantation may be taken up in wastelands in collaboration with experienced parties.

With an incomparable reserve of orchids, aromatic and medicinal plants, timber and non-timber tree species and bamboos, the State should take up different projects aimed at tissue culture and propagation of selected orchids, medicinal plants and bamboo species which have high market demand. A network of telemedicine should be established in order to cover the people deprived of the modern health services. There is a vast scope of expansion of tele-education in the State. Tele-education should include programme on health, nutrition, agriculture, cottage industry, hazard mitigation, etc. Expansion of tele-medicine and tele-education requires development of infrastructural facilities, such as, health care centres, electricity, computers, etc.

This chapter suggests the establishment of an institute of science, technology and environment in the State to carry out research and development for utilisation of the immense natural resources, generate scientific manpower, and provide scientific and technical inputs for industries.

### **Fiscal Issues**

- Over time, non-developmental expenditure like interest payment and pension has increased on an average from 41.37 per cent to 50.32 per cent of

GSDP, during 1995-2000 to 2000-2004. There is also a declining trend in developmental capital expenditure particularly in the areas of agriculture, industry and minerals, rural development, transport and general economic services. Thus, capital formation is declining in the State. The process has resulted in falling revenue surplus and decreasing developmental capital expenditure in the budget of the government and the State is dependent on borrowed fund to meet its increasing non-developmental expenditure. The process has gone to such an extent that the State is neither sustainable nor solvent in public debt front. Thus, the State is on a path of creating more jobs by withdrawing itself from productive capital investment. In a situation of low level of private investment in the State, there is shrinkage in productive capacity of the economy.

In the light of the above mentioned process, the SDR has identified the potential sectors and the associated constraints and suggested various policies options both in the potential sectors and the process variables, so that a sustained economic growth is achieved in future.

### *Fiscal Management*

Over time developmental capital expenditure has gone down and non-developmental revenue expenditure has gone up in the State. Government expenditure is around 70 per cent of the GSDP and contribution of service sector is more than 100 per cent to the growth of GSDP. There is also a distortion, in the sense that non-infrastructure categories service sector contributes around 70 per cent and infrastructure categories around 30 per cent to the growth of service sector. This is the reason why a proper balance is required in expenditure priorities of the State.

### *Policy Options*

- Capital expenditure in the sectors like agriculture, industry and minerals, transport and general economic service needs to be increased.
- Rising interest payment and pension are the main reasons of the increase in non-developmental expenditure. Therefore, low interest loan options may be explored and alternatives like institutional based pension reform may be introduced.
- Identification and redeployment of excess employees is a must.
- All the steps must be taken to use borrowed fund for developmental capital expenditure.



- In order to increase the revenue receipts, steps may be taken to revise land tax rate, revamping of land revenue administration, revising of motor vehicle tax, imposition of professional and urban property tax.
- Finally in the long run, with the increase in power production of the State the power royalty would be sufficient to meet the budgetary need of the State.

### Strategy for Development

- The State has witnessed broad changes in the strategies twice. First the strategy of gradualism in development gave way to the strategy of rapid development and integrationism after the Chinese aggression in 1962.
- Government sponsored industrialisation was the preferred strategy followed till the beginning of 1990s.
- Losses of the government-owned enterprise changed the strategy: public-private partnership and private initiatives are the backbone of the new strategy.
- The new strategy must take into consideration the fact of high transaction cost which keeps the productivity of industrial capital low in the State.
- In Arunachal Pradesh's economy 100 units of input cannot produce 100 units of output. This means the economy consumes more than what it can produce.
- The new strategy should aim at enhancing the reduction of transaction costs which would enlarge the productivity of the economy.
- Strengthening the contract-enforcing mechanism, addressing the problems of inequality and unemployment are the ways of reducing the transaction costs.
- It is observed that the states that have properly identified their potential and developed the institutional back up have grown at a faster rate. The example is Himachal Pradesh. In this context the potential areas for Arunachal Pradesh are: (i) power, (ii) biodiversity, (iii) tourism, and (iv) horticulture. Therefore, developing proper institutional set up like supply of inputs linking with product marketing, and market friendly infrastructure would yield benefits to the people.
- Speeding up the development of the hydro-electric project, expansion of horticulture and plantation, tourism and establishment of agro-industries in the backward districts should be the priorities.

## Chapter 1

# Transformation

Over the period of time, Arunachal Pradesh has undergone many types of changes. These transformations can be conceptualised in three perspectives, namely historical, social and economic. Thus, the objective of the introductory chapter is to analyse all the changes in these perspectives.

### HISTORICAL TRANSFORMATION

#### Introduction

Arunachal Pradesh, the largest state in North-east India, is home to 26 major tribes with a large number of smaller sub-tribes or ethnic groups totalling around 100 who, by and large belong to the Indo-Mongoloid stock.

Arunachal Pradesh is sparsely settled with a population of 10,97,968 and a density of 13 persons per sq km (Census of India 2001). Earlier known as the North Eastern Frontier Tracts and North East Frontier Agency (NEFA), Arunachal Pradesh, was a *terra incognita* for the historians till recent times. The paucity of written documents, lack of script among most of the tribes of the State, except of course among the Monpas (the Bodic script), the Khamtis (Mon-Tai script), the Membas (Hikor script) and the Khambas (Hingna script), and limited exploration and excavation are the major bottlenecks to understand the history and cultural transformation of the ancient and medieval periods of the State. However, we are fortunate to have British archival records, which are of singular importance for the study of the history of the State during the colonial period.

#### Prehistoric Scenario

The history of the State can be traced to the prehistoric period (Dani, 1960). Scholars like Lubbock (1867), E.H. Still (1870), John Anderson (1871), R.D. Banerjee (1924),

J.P. Mills and J.H. Grace (1933-1935), Dani (1960), B.P. Bopardikar (1972), T.C. Sharma (1980), A.A. Asraf (1990) and others have thrown light on some aspects of prehistoric culture of the State. A study of remains reveal pre-Neolithic and Neolithic tools and their typology indicates Arunachal Pradesh's past link with Yunnan and Szechwan in Neolithic phase (Chiang, 1942). E.C. Worman (1947) and M. Wheeler (1959) have argued that North-east India (including Arunachal Pradesh) served as a corridor through which Neolithic tradition from Eastern Asia entered India. The Neolithic assemblage of the area may be compared with the late Bacsonian of Southeast Asia, which reveals significant influence from Sichuan and Yunnan (Sharma, 1990). In this connection, the history of migration of Mongoloid population from the headwater of Hwang-Ho and Yangtse-Kiang into Arunachal Pradesh and other parts of North-east India could be attested by archaeological evidence (Chatterjee, 1974). No direct evidence of settlement and economy of the Neolithic people are known. From the circumstantial evidence, it can be inferred that shifting cultivation must have been practised during the period. No structural remains are found in any prehistoric site, which reveals that the people lived in open field. This phase however witnessed the production of handmade pottery. The Neolithic phase of the State is approximately dated to 1500 B.C. (Sharma, 1991).

#### Early Historical Period and Cultural Interaction

Contrary to the general perception that the region was isolated from the mainstream of Indian history, the people of the area had trade and cultural interaction with the people of Assam, Tibet, Myanmar (Burma) and other parts of India, which can be verified from a number of actual trade routes of medieval period (Ray, 2005). The early Brahmanical literature mentions the Indo-Mongoloid

people living in the hills and valleys of Himalaya and Sub-Himalaya north-eastern hills of India under a blanket term *Kirata* (Barua, 1968), who are identified as the dwellers in the eastern Himalaya and many of the north Assam tribes (Chatterjee, 1974). The medieval texts of Assam, specifically the *Kalikapurana* and the *Yogini Tantra* throw light on pilgrimage centres like, Nadi Tirtha, Parsuram Kunda, etc., located in the north-eastern part of the State.

The post-10<sup>th</sup> century witnessed the prevalence of Brahmaputra culture in the foothills of the State, attested by a number of Brahmanical remains. In this aspect, the temple ruins at Malinithan, Tamresvari (Sadiya) and the chain of forts at Bhishmaknagar, Rukmininagar, Tezu, Itanagar, Bhalukpong with occasional discovery of Brahmanical sculptural art, reveals the fact that during this period, cultural interaction did take place between the people of Brahmaputra valley and the people living in the hills of Arunachal Pradesh. A medieval Assamese *Vaisnava* text refers to some Mishmi Brahmanas, who were probably tribal priests, influenced by the teachings of *Neo-Vaishnavism* (Dutta Choudhury, 1978). It is not surprising, as we have evidence to show that a few frontier tribes like the Noctes and Tangsas, were influenced by the teachings of *Neo-Vaishnavism* (Dutta, 1978).

The period also witnessed the establishment of a number of Buddhist monuments including that of Tawang monastery (17<sup>th</sup> century) in western and northern frontier, revealing the cultural interaction with Tibet (Sarkar, 1980). Simultaneously, though of later period, one can notice a number of *Theravada* Buddhist monuments of 18<sup>th</sup> and 19<sup>th</sup> centuries, in Eastern Frontier of the State, throwing light on Arunachal Pradesh's contact with Myanmar (Kondinya, 1985).

The foundation of Ahom kingdoms in early 13<sup>th</sup> century and their subsequent territorial expansion made them closer with tribes of the North-East Frontier Tracts (Gait, 1926). The *Buranjis*, both in Ahom and Assamese language, provides valuable information on Ahom policy towards Arunachal tribes. The Ahoms followed a policy of conciliation backed by the display of force towards the hill tribes. The Ahom king Pratap Singha (1603 AD) in this context introduced the *posa* system, with regard to various frontier tribes viz., a section of Bhutia, Aka, Nyishi, etc. (Devi, 1968). The word *posa* means a collection or subscription for a common purpose and when this term was used to explain the payments made to the hill tribes, it represents the subscription which was collected by the villagers in order to meet the customary demands of the hill people (Chakravorty, 1977). Mackenzie mentions that each tribe knew the villages of the plains to which they

had to look for *posa* and they claimed to collect from their allotted *paiks* (Mackenzie, 1884). A survey of the *posa* refers to such things as garments of various description, a few animals, iron products and salt. It is also argued that the system created a class of *paiks* called *Bahatias*, who were made to work for their hill masters and thus, a form of slavery started in the hills (Barua, 1985). Those tribes not offered *posa*, were either granted some cultivated lands and fishing water along with *paiks* in the plains or offered trading facilities with the plains on condition of good behaviour and payment of annual tributes.

In pre-colonial period, social relations and economic interdependence between the frontier hills and the Brahmaputra valley existed. There were numerous passes known as *duars* along the Himalayan foothills, through which people of the State interacted with the plains people. There were as many as 19 *duars* or passes existed in the district of Durrang and Lakhimpur, which were divided into three divisions—*Charduar*, *Noduar* and *Chaiduar* (Mumtaza and Taher, 1997). These *duars* were visited by Monpas, Sherdukpens, Nyishis, Akas and other tribes. Reference to *duars* like Dijoo *duar*, Dulungmukh, Likhhabali and Murkongselek to the east of *chaiduar* were used by tribes like Nyishis, Apatanis and Adis. The territory visited by the Bhutias, Monpas and Sherdukpens developed market centres, as they used to bring merchandise from Tawang, West Kameng and even from Tibet and Bhutan. References to market at Udalguri, Mazbat and Doimara are important in this respect.

The locational pattern of trading centres, population composition of catchment areas of these nodal centres and physiography of the region indicate to the large distance trade, which took place between hill tribes frontier region or route zones. In this aspect, transfrontier trade with Moguaung and Khamptilong region of Myanmar was carried through the Khamtis and Singphos in eastern frontier (Phukan, 2002). Similarly in the western frontier, the Tibetan trade was carried through the land of Sherdukpens and Monpa, who had socio-cultural link with Tibet. A number of mountain passes are referred to in medieval text and literature of British period (Barua, 1993; M'Cosh, 1937; and Dutta Choudhury, 1978).

The interactions of tribals of North-East Frontier with the Ahom rulers, however, did not affect any resource constraint for the tribes. The resources taken as tributes/revenue under the *posa* system, were largely compensated through administered trade resorted to by hill tribes, practising various economic activities based on reciprocity and redistribution. As human resource was of utmost significance in the economies of hills as well as the plains,

domestic help and other servile institution continued. In the ethnic frontier region, the institution of chieftainship seems to have emerged clearly during this period.

The British came to Assam during the Anglo-Burmese war of 1824-1826 and occupied it. The economic, commercial as well as strategic and political interests of the British in the hilly region shaped the trends and pattern of colonial intervention. Beginning with the measures for abolition of slavery, colonising the trade of the region, the British established their political paramountcy and colonial legitimacy in the region. The British authorities adopted the *posa* of Ahoms but modified and extended the *posa* system to suit colonial priorities. Monetisation of *posa* was introduced, which facilitated market trade (Ganguly, 1986). Through colonial innovation in the *posa* system, the old ties between the *posa* holders and their allotted *paiks* broke down, which resulted in a cleavage in old-politico-economic ties. Ganguly has rightly pointed out, “Annual system of payments of sums of money in lieu of *posa* also injected money into the tribal economy.” (Ganguly, *ibid*).

They established market trade at important nodal centres of the plains which ultimately gave fillip to indirect colonisation through trade. Attention in this direction was paid to the route zones lying between the Brahmaputra valley on the one hand and the highlands of Tibet and Burma on the other. Old fairs of Ahom time at Udalguri and Doimara were revived. A trade fair at Sadiya was also started in 1867. Once these market centres grew up under encouragement and patronage of the government, the extractable surplus from the foothills and the hills in the forms of forest products began to pour into those markets. On the other hand, the finished goods began to find their outlets into the frontier areas, causing damage to the age-old cottage industries in the area. The economic factors were primarily responsible for tribal unrest in the North-East Frontier since abolition of slavery, changes in the *posa* system, colonisation of trade and coercive measures in the form of economic blockades, which adversely affected the resource bases of different tribes. Ultimately, the hillmen were tied to apron-strings of the *Raj* and became subservient to its commercial and imperial interests (Jha, 2002).

By the end of the 19<sup>th</sup> century Assam became a promising centre for trade and industry. Tea, petroleum, coal and rubber became flourishing industries. Elephant catching and ivory attracted much attention. But the entire prospective economy depended upon the capacity of the colonial administration to maintain law and order in the province which resulted in the Inner Line Regulation

being enacted by a Regulation in 1873 called “Regulation for the peace and good government of certain districts of the Eastern Frontier” (Bose, 1997). According to this act, which was applicable to the districts of Kamrup, Darrang, Nowgong, Sibsagar, Lakhimpur, Garo Hills, Khasi and Jaintia Hills, Naga Hills, Cachar and Chittagong Hills, a restriction line was laid down to regulate the interaction between the tribes and the British subject in the plains bordering the Hills. As a result, the inner line was notified for the Lakhimpur district in 1875 and for Darrang in 1876. This act provided the basis of administration of justice in the frontier of Lakhimpur and Darrang, inhibited by tribal communities. However, the constitutional and administrative growth of Arunachal Pradesh had its genesis in the Act No. XIV of 1874, also known as the Scheduled District Act of 1874 (Luthra, 1971). The next stage of administrative growth can be noticed in the Assam Frontier Tract Regulation of 1880 by which the first Frontier Tract called Dibrugarh Frontier Tract came into being in November 1882 and J.F. Needham was appointed as the first Political Officer. After the Anglo-Adi war of 1911-12, General Bower sent a recommendation to the Government of India that the Assam Frontier Tract should be divided into three sections e.g., 1. Central Section 2. Eastern Section 3. Western Section for effective administration, which was subsequently accepted by the Government of India by a notification of 1914. This notification promulgated that the Assam Frontier Tract regulation would extend to the hills inhabited or frequented by the Adis, Miris, Mishmis, Singphos, Nagas, Khamtis, Bhutias, Akas and Nyishis, and these hill areas were separated from the then Darrang and Lakhimpur districts of Assam. Thus, the North-East Frontier Tract came into existence consisting of three administrative units such as, 1. The Central and Eastern section 2. The Lakhimpur Frontier Tract 3. The Western section in 1914. A contextual analysis of events from 1880 onwards shows that the British policies and measures adopted in this frontier were guided by their imperial and commercial interests beyond the frontiers, Myanmar, Bhutan and Tibet and China—which culminated in the Simla Conference of 1914.

With the passing of the Government of India Act of 1919, some changes in the nomenclature of the sections of North East Frontier Tract were undertaken. Now onwards, the Central and Eastern section were to be known as the Sadiya Frontier Tract and the Western as Balipara Frontier Tract. There was no change in the name of Lakhimpur Frontier Tract. Under the provisions of the Government of India Act 1935, the frontier tracts were declared as ‘excluded areas’ and the government of Assam



was vested with wide discretion and authority in the matters of administration of these areas. In 1937, J.P. Mills was appointed as the secretary of tribal affairs to the government of Assam. In 1943, a new Administrative Tract called 'The Tirap Frontier Tract' was created by taking certain portions of Lakhimpur Frontier Tract and Sadiya Frontier Tract. In the same year N.K. Rustomji was appointed as an advisor to the Governor of Assam to look after the administration of North East Frontier Tract. In 1946, the administrative divisions of Balipara Frontier Tract was bifurcated into Sela-Sub-Agency and Subansiri area. Subsequently Sadiya Frontier Tract was divided into Abor Hill District and Mishmi Hill District.

The British relation of the frontier tracts was guided by the policy what may be called in the word of Col. Henry Hopkinson, the then Commissioner of Assam, 'gold and steel'. This means that they were to be conciliated by granting 'gold' or cash payment in lieu of customary *posa* of the Ahom regime, but when they declined to accept the new terms of the new rulers, 'steel' that is to say, armed force was to be employed to compel them to accept the offer and conditions of the colonial ruler. As it is seen, till 1910, the British government followed a policy of 'let alone the tribes to themselves'. After 1910, beginning with loose political control, direct control and administration were imposed on the tribes, and their territories were tagged to the province of Assam. Up to the Second World War nothing substantial was done for the development of the area which was clearly outlined by the government of Assam in a letter to Government of India in 1931.

In 1951, the plain portions of the Balipara Frontier Tract, Tirap Frontier Tract, the Abor Hill District and the Mishmi Hill District were transferred to the administrative jurisdiction of Assam. The aforesaid area minus the transferred plain portion of the frontier tract together with Naga tribal area were thereafter renamed collectively as the North-East Frontier Agency (NEFA) in 1954. It was kept under Ministry of External Affairs. In 1954, NEFA consisted of six divisions such as Kameng Division (instead of Sela Sub Agency), Siang Division (Abor Hill District), Subansiri Division (Balipara Frontier Tract), Lohit Division (Mishmi Hill District), and Tirap Division (Tirap Frontier Tract) and Tuensang Division (out of the Naga Tribal Area). However in the year 1957, the Tuensang Frontier division was excluded from NEFA and merged with Naga Hills. The Government of India followed a policy and programme of tribal development which was given an ideological framework in the book *A Philosophy for NEFA*. After 1962 Chinese aggression of India, the Government of India tried to integrate the

administrative structure of the NEFA with the state of Assam. The guidance and control of NEFA was transferred from External Affairs Ministry to Home Ministry on August 1, 1965. The Government of India set up a committee for administrative reforms in NEFA under the Chairmanship of Daying Ering and as per the recommendation, the Panchayat Raj Regulation of 1967 was drawn up and promulgated on 2<sup>nd</sup> October 1969. NEFA was constituted into a Union Territory in the name of Arunachal Pradesh on 20<sup>th</sup> January 1972. The earlier Agency Council was converted into a Pradesh Council to serve as Provincial Legislature. Adult franchise was introduced in Arunachal Pradesh in 1972. The first election to the Parliament and Arunachal Pradesh Legislature took place in 1977. And in 1987, Arunachal Pradesh was granted full fledged statehood. Thus the political evolution of Arunachal Pradesh was completed.

The Government of India with the cooperation of the people of the State has attempted an uphill task of planned and systematic development in spite of the inaccessible terrain and age-old tradition of its people. Development is now visible in political, economic, education, social and cultural life of the people. The static period of aloofness and isolation has yielded to a modern period of dynamism which amounts to 'shaking off the dust and rust of ages' for a brighter future of the people of this kaleidoscopic land of the country. However extra attention of all concerned is the need of the time for this tribal State, affected by historical negligence for ages, to bring it up at par with other states of the country.

## SOCIAL TRANSFORMATION

### Introduction

In the tribal social structures of Arunachal Pradesh, the institution that stands out among all others is the household. There are large measures of similarities in certain aspects of social structure but there are also tribe-specific distinctive elements. This distinctiveness has come about as consequences of living in geographically isolated habitats and pursuing different religions as well as different economic activities. The search for viable habitat ensuring a secure livelihood through hunting, fishing, food gathering and cultivation made them move from one place to another. The needs of shifting also made them resilient enough to adapt their respective lifestyles and institutions to the demand of nature. It is the close interaction with nature, and the ability to adapt and adjust that enabled different tribes to convert distinct geographical spaces to social spaces. In these social spaces

arose in time distinctive social structures with characteristic family, kinship, marriage institutions, economic life, political organisation, and so on (Bhagabati, 1998). The traditional social structures underwent changes in the post-Independence period with the new politico-administrative configuration.

## Agents of Change

In bringing about social changes multiple forces have been working together, though their intensities vary from one tribe to another. The overall social outcome in a tribe is, however, determined by its relative access to developmental programmes, exposure to forces of modernisation, relative population size, geographical location and finally its access to the power structure as well as administration.

## Democratic Institutions

- Numerically dominant tribes are playing a prime role in the political sphere.
- Perhaps the most significant impact of changes is traceable in the sphere of education. There were only three schools and 50 students in 1947 but with the initiatives of the government, the State has witnessed a revolution in this field. Literacy increased from 7.23 per cent (1961) to 54.73 per cent (2001). This has far reaching implications in terms of occupational mobility, traditional polity and emerging social structure of the tribes.
- Emergence of a large number of non-government organisations including literary and cultural societies, association of the priests etc. All these have important ramifications which reveal people's response to new possibilities and their growing awareness about newer platforms to redress various emerging issues.
- Emergence of modern secondary and tertiary sectors has led to economic inequalities and along with this, a new social stratification has taken shape.

## Changing Traditional Village Economy

There is a significant change in terms of land tenure system, which is steadily leading to individual ownership by making collective ownership (clan, village, community ownership) a marginal phenomenon. In urban or semi-urban areas, land became a commodity for earning cash and 'brewing social conflicts'. In most of the places of Arunachal Pradesh, adjacent to Assam, sharecropping has made a deep root leading to a new agrarian relationship

(Eshi, 1998; Bejbarua, 2003; Das, 1995; Taidong, 2005). Moreover, Government of Arunachal Pradesh has also introduced a new agricultural policy.

- Some of the tribes/sub-tribes opted for a drastic shift towards settled cultivation. Wherever possible people went for massive terracing of earlier shifting fields for a better productivity, looking for surplus production. And even productions of shifting fields are reaching steadily to local markets which is a clear shift from the traditional notion of *jhum* (Ganguly, 2004; Danda, 1994; Lollen, 2005) and consumption norms of subsistence economy.
- Occupational mobility is very much evident with the rapid spread of education, urbanisation and expansion of induced developmental activities. All these have collectively led to the development of neo-rich class within the tribal societies making roads for economic inequality in a much pervasive way. This is more symptomatic among the dominant tribes of this State.
- In recent times, some initiatives were taken by both the Central and state governments to explore and promote the potentialities of indigenous arts and crafts looking at its prospects for income generating employments. Some refinements in technological inputs are clearly visible and even some valuable innovative experiments are going on which can have greater marketability even beyond the regional frame.
- Existence of trade routes is a testimony to the historical importance of trade among the tribes of this Frontier State. In the present context a few tribes are showing their traditional business acumen and gearing up to avail new economic avenues.

## Changing Socio-political Realities

The whole process of modernisation, greater administrative penetration, developmental initiatives in various forms, introduction of new political systems, contesting religious ideologies along with changes in economic sphere have a great impact on the traditional social structure, social relationships, cultural traits and value systems of the so-called segmental tribal societies of this Frontier State.

- The politico-administrative conditions before 1947 were such that each tribal society, large or small, maintained a sort of autonomous status in its dealings with the world outside its defined social boundary. For a tribal segment, with its essentially

kinship-based social structure, there was very little scope or need to expand the network of social relations involving other tribal segments in the surrounding habitat, except for certain well-defined trade and barter transactions.

- In recent times at broader levels some distinct trends are visible where some larger tribes are trying to subsume smaller tribes within their own fold, whereas some tribes are trying to come out of larger identity in search of their own identity. Considerable fluidity which remains at the core of the formation of expansive identity is also unique to underscore.
- All these processes are part of the politics of numerical strength, which is gradually accentuated within people's psyche. On the other hand, there is a gradual erosion of sense of collectivism at the village as well as family level, which is considered as one of the basic features of the social structure. This is more in case of urban and semi-urban centres and their fringe villages where neo-local nuclear families are growing rapidly.
- Endogamy still represents their ideal form of marriage but large numbers of inter-tribal marriages are traceable. The government also encourages inter-tribal marriage to promote larger tribal solidarity though it has not yet gained wider social sanction even among the educated and progressive tribal families.

In the field of polity significant changes are noticeable. Talukdar (2000) mentioned that for all practical purposes the traditional self-governing institutions governed the various tribal societies in the State till the 60s of the last century when they got an opportunity to interact with a central authority, external to the village or the tribe at the political level. The introduction of the Panchayati Raj in 1969 and the creation of Arunachal Pradesh as a Union Territory in 1972 provided this opportunity and they together set into motion a process of change and development in the society and governance in the State. Talukdar (*ibid*) added, "The impact of the Panchayati Raj was perceptible in the governance of the village and their impact on the traditional institution, by bringing them closure to a wider administration, bringing them face to face with the larger society and opening up new opportunities to the people and the tribal villages. The creation of an integrated Arunachal society is giving rise to new elements in governance in the form of modern democratic institution, a representative state government and electoral politics."

It is true that emergence of State craft has brought an end to frequent inter-and even intra-tribal blood feuds but the new contesting political ideologies are gradually disrupting the finer bonds of traditional polity by loosening its secular structure nurtured and grown within a patrilineal and patriarchal framework. With the introduction of *Gaon Bura* system as well as Panchayati Raj systems, the chieftainships of Wanchos, Noctes, etc., are losing their ground though *Kebang* and such other traditional polity did not lose their importance completely. But politics of 'vote bank' reinstated significance of clan/tribe/stratification or even religion in some parts of Arunachal Pradesh.

Regarding the emerging leadership pattern in the village, Talukdar (*ibid*) rightly mentioned, "It is undergoing rapid transformation and the ascriptive factors are no longer treated as the sole resources for village leadership. The social base of the present leadership is different from that of the traditional one and gradually becoming broad-based. The *Panchayat* leaders unlike their traditional counterpart are generally younger in age and have formal education."

Recently, the State Women Commission has been formed by the government of Arunachal Pradesh, which is the product of a long struggle of women across the tribes largely under the banner of All Arunachal Pradesh Women Welfare Society (APWWS). This has given some hope for the women who in spite of their extensive contribution to domestic and economic fronts (agriculture, food gathering, cottage industries, etc.) are yet to have any inheritance right over landed property which dilutes the question of meaningful involvement of women in development process (Chaudhuri, 2004). Participation of women in decision-making processes or in state polity is still very insignificant though they are performing well in the field of higher education (44.24 per cent literacy rate in 2001). However, there is growing gender sensitivity even in remote areas of the State against child marriage, polygamy, etc., where women remained the ultimate victims to a large extent.

### Contesting Religious Ideologies

Another significant social transformation is traceable in the field of religion. Christianity is spreading very fast in all tribal belts leaving Buddhists (both *Therabeda* and *Mahayana*) and some other tribes who are least affected. Introduction of such an alien belief system to some extent led to disintegration of some of the very important institutions like dormitories of the Wanchos and many of the oral traditions which have sacred dimensions. In order



to counter conversion some NGOs became active under different names. Under their patronage some reformist movements have been taking place in the State.

- Such contesting religious ideologies created a new space within the traditional social relationships. And this is more significant in case of Christian, non-Christian members of a family, clan or other forms of segmental social formation. However, community cohesiveness is still preserved to a large extent though the finer threads of understanding at the family, clan and village level are under strain to some extent.
- Another significant development or extension of 'sacred-secular' continuum is the transformation of village or family level ceremonies into community level festivals. This has consolidated community participation of otherwise scattered villagers who are coming together and taking part in festivities.

## Conclusions

Today tribal situation in Arunachal Pradesh has changed to a considerable extent; whether it is economy, polity, education, material or other elements of culture, religious beliefs and practices. Changes are everywhere which collectively made an impact on the traditional social structures by reshaping social relationships and negotiating with emerging wider socio-political realities. Developmental initiatives in post-1962 phase have made tremendous impact on the tribal societies in general who are managing the State and trying to develop their own human resources to uplift the overall economic condition in order to bridge the gap of emerging economic inequality of the heterogeneous tribes.

Naturally, the old social structures do not exist any more in their pristine state. New elements have seeped into the old patterns very rapidly; 'slavery' have given way to more egalitarian types of social relations, polygyny as an ideal is giving way to monogamy, and the position of women is changing in most tribes. The essentially kin-based societies with rigid lines of demarcations between tribes is fast transforming to a regional society where new lines of inter-tribal communication are emerging cutting through former tribal boundaries.

## ECONOMIC TRANSFORMATION

### Introduction

Douglas North (1994) defined institutions as 'rules of the game'—both formal and informal (norms,

conventions, code of conduct), and organisation and their entrepreneurs as 'players'. The informal institutions are basically conventions and code of conduct defined by the society. The changes in the economy have an impact on the traditional institutions also. The changes in the production and consumption structure and in the distribution of income are normally accompanied with changes in the institutional set-up. Thus, the outcome variable is the change in the institutional structure and the process variable is the change in the nature of production and consumption structure which the society had practised since long. Thus, the forces behind the institutional transformation come from the economy itself.

The framework of this section is based on the above understanding—that the institutional transformation takes place because of change in the taste and preference of the society. The change in the production structure can be analysed in terms of the growth dynamics of the NSDP (explained in Chapter 3) which affects the consumption pattern (as a proxy variable to explain the taste and preference). Thus, outcome variable is the change in the nature of the institutional set-up and the process variable is the change in production and consumption pattern.

## Changing Consumption Structure

One special characteristic of the North-east hill economy is that, per capita consumption expenditure is higher than the national average (Table 1.1). In all the states the increase in per capita consumption expenditure during 1993-94 and 1999-2000 is higher than the national average. However, the exception is urban Arunachal Pradesh. When the division is made between the food and non-food consumption, the percentage share of food item is less, and non-food item is more than the national average in Arunachal Pradesh (Table 1.2).

TABLE 1.1  
Per Capita Consumption Expenditure  
(Inflation and Inequality Adjusted)  
(in Rupees)

	1993-94			1999-2000		
	Rural	Urban	Combined	Rural	Urban	Combined
Arunachal Pradesh	94.02	164.47	104.71	123.42	153.35	129.38
Manipur	108.02	124.19	112.89	116.97	157.27	130.88
Meghalaya	110.28	185.27	124.55	128.99	219.10	145.65
Mizoram	137.88	208.36	174.47	157.64	228.69	202.99
Nagaland	158.43	188.51	164.15	213.98	279.52	228.04
All India	87.90	124.27	97.53	98.49	143.49	111.28

Source: National HDR 2001.

TABLE 1.2

## Composition of Per Capita Consumption Expenditure

	1993-94 (Rural)		1999-2000 (Rural)		1993-94 (Urban)		1999-2000 (Urban)	
	Food	Non-food	Food	Non-food	Food	Non-food	Food	Non-food
Arunachal Pradesh	61.63	38.37	55.06	44.04	60.82	39.18	57.65	42.35
Manipur	67.48	32.58	63.12	36.88	63.82	36.18	56.04	43.06
Meghalaya	60.83	39.18	60.44	39.56	56.38	43.62	47.02	52.98
Mizoram	61.24	38.76	59.36	40.64	54.14	45.86	52.04	47.96
Nagaland	64.99	35.01	58.93	41.07	58.85	41.15	57.64	52.36
All India	63.18	36.82	59.41	40.59	54.65	45.35	48.06	51.94

Source: National HDR 2001.

In the rural areas, the share of non-food expenditure recorded an increment of six percentage points whereas in urban areas the increase was only three percentage points. This suggests that non-food expenditure is gaining importance in the consumption basket of the rural population in Arunachal Pradesh. It is also more than their urban counterpart. Thus, the rural consumption pattern is changing fast as compared to the national average.

### Changing Employment Structure

The changing consumption structure is also accompanied by changing employment structure. The process is observed in all states of North-east. Table 1.3 gives the detail. A declining share of employment in agriculture in the rural areas and an increasing share of agriculture in urban areas is observed. This particular trend reveals that dependency on agriculture is fast reducing and importance of non-agriculture is fast increasing in rural areas. This phenomenon bears the testimony of the changing institutional set-up, which revolves around agriculture sector in many parts of North-east India. Arunachal Pradesh is not the exception.

Thus, the importance of non-food items has increased and share of non-agricultural employment in rural areas has increased. The process has led to an increase in demand for money. The logic is that only 16.6 per cent of the population have access to cash income as they are employed in non-agriculture activities. Since agriculture is at a subsistence level and the marketable surplus is very limited, a strong demand for money income has resulted in high rural-urban migration. (Even if there is marketable surplus, people cannot sell the surplus because of poor marketing network.) Thus in the hilly rural economy, due to low technological change and limited existence of market in the agricultural sector, people are compelled to

search for high productive jobs, from where they receive money income. Therefore, high demand for money income has led to many changes in their traditional economic institutions as follows.

TABLE 1.3

## Employment (Principal and Subsidiary Status) (per 1000)

		Arunachal Agriculture	Arunachal Industry	Arunachal Service	Assam Agriculture	Assam Industry	Assam Service
Rural	1993-94	864	17	116	792	40	168
Rural	1999-2000	834	31	134	677	44	280
Change Rural		-30	14	18	-115	4	112
Urban	1993-94	79	169	750	30	171	799
Urban	1999-2000	87	22	891	60	83	857
Change Urban		8	-147	141	30	-88	58

		Manipur Agriculture	Manipur Industry	Manipur Service	Meghalaya Agriculture	Meghalaya Industry	Meghalaya Service
Rural	1993-94	638	127	234	860	18	123
Rural	1999-2000	753	80	167	865	14	121
Change Rural		115	-47	-67	5	-4	-2
Urban	1993-94	293	155	549	30	28	936
Urban	1999-2000	283	114	601	13	41	947
Change Urban		-10	-41	52	-17	13	11

		Mizoram Agriculture	Mizoram Industry	Mizoram Service	Nagaland Agriculture	Nagaland Industry	Nagaland Service
Rural	1993-94	889	6	104	749	12	240
Rural	1999-2000	855	13	133	797	14	189
Change Rural		-34	7	29	48	2	-51
Urban	1993-94	410	49	541	62	50	887
Urban	1999-2000	303	53	644	84	69	847
Change Urban		-107	4	103	22	19	-40

		Tripura Agriculture	Tripura Industry	Tripura Service	India Agriculture	India Industry	India Service
Rural	1993-94	476	56	464	784	78	138
Rural	1999-2000	457	40	503	763	81	157
Change Rural		-19	-16	39	-21	3	19
Urban	1993-94	60	97	838	123	258	618
Urban	1999-2000	27	39	934	88	242	672
Change Urban		-33	-58	96	-35	-16	54

Source: National Sample Survey, 50th and 55th Round.

### Land and Forest

In the early period, the community jointly owned the land. The members of the community shared the output produced and hardly anything was left for the market.

Timber was the only product, where a market existed before the Supreme Court restriction on tree felling. When the resource system was jointly owned, the forest product (timber) could not be sold. The cash need of the population, has forced the emergence of individual ownership of the resources—both land and forest. Thus, in many parts of Arunachal Pradesh, individual ownership has gained momentum at the cost of community-based ownership.

The form of individual ownership has certain features as follows (Roy 2005, p.29).

- a. Land is not alienable to the non-tribals.
- b. Land can usually be sold to the people belonging to same tribe; there is a limitation in the transfer of land from people belonging to one tribe to people belonging to the other tribes. Inter-tribal transfer of land is found, of course, in the urban areas and rarely in the semi-urban areas. In the rural areas it is not normally found.
- c. The cadastral survey having not been conducted, there is no title deed to the land owned by an individual. In the absence of documentary evidence land cannot be used as collateral for bank loans. This has limited the provision of the bank loans to the farmers. In recent years the government of Arunachal Pradesh has started issuing land possession certificates. But the problem of disbursing bank loans based on land as collateral still remains. The non-alienability of land drastically reduces its collateral value to the banks.
- d. Land as property is still highly encumbered. It cannot be freely willed away. The inheritance of land is more or less guided by traditional practices which prefer a particular order of sons, too often, the eldest one, to others. Daughters normally do not inherit the paternal landed property.

## Rental Market

The individual ownership of land has also resulted in rental market (Roy, *ibid*). Land is leased out to others for cultivation. The rental market is also prevalent in business. The trading license holder charges a fixed rent and lends it out to migrants. The arrangement is such that

the local people own the fixed capital and the migrants own the variable capital. This type of ownership operation has tended to reduce the time span of business planning and the end result is a tendency to reap short-term benefits from the business (Roy, *ibid*).

## Labour

The process of modernisation has also generated the demand of labour. Perhaps this is the reason why immigration rate to the state is 15.54 per cent in 2001 (Sarma and Nayak, 2006). Before the transition, labour was also community based. No money wage was paid and all payments were in kind. Thus, labour market was absent. Still today, in the remote parts of Arunachal Pradesh, daily wage labourers from tribal areas of Orissa and Jharkhand are engaged in road construction.<sup>1</sup> One contrast is also observed: the local people are also engaged by the PWD department as daily wage labourers.<sup>2</sup> Thus demand for cash need has brought the labour market to operate and the transformation of labour institution from being community-based to market-based is quite rampant, both in urban and remote rural areas of Arunachal Pradesh. Thus, the labourers brought from other parts of the country have led to the evolution of modern labour market in the State (Roy, 2005).

## Credit Market

The process of transition and the need for money has also resulted in emergence of the credit market in the State. In the traditional society, the informal credit in kind (food item), was used to be given at the time of crop failure to the people by the village chief in some parts of the State. The repayment system was in the form of labour. In some cases *Mithun* and cow were given in credit and no interest was charged at the time of repayment.<sup>3</sup> With the increase in cash need of the people (particularly for medical and contract works), informal credit market has emerged in many areas including interior region of the State. Thus, credit need has increased and modern credit market has failed to enter owing to collateral problem, which has resulted in market failure in the formal credit market. Thus, increased cash need of the people on the one hand and failure of the formal institutions on the other has led to the growth of informal credit market in the State.

1. This observation was made during the field work for the preparation of Human Development Report of Arunachal Pradesh.

2. *Ibid*.

3. Personal discussion with Dr. Pura Tado, Reader in the department of Political Science, Rajiv Gandhi University, Itanagar.

## Conclusion

In a nutshell it may be argued that subsistence nature of farming coupled with modern consumption structure is the driving force behind the changing economic institutions in Arunachal Pradesh. The rural-urban migration, due to pull factors in the State, has led to a

substantial increase in employment in service sector. Further due to decline in the industrial urban employment they are forced to enter in urban agriculture sector where land market has emerged. Thus, the process of modernisation has led to the transformation of the traditional economic institutions in the State.

## Chapter 2

# Demographic Transition

### Introduction

The relationship between demographic and socio-economic variables is so strong that any change in the socio-economic space is reflected in the demographic space. This relationship is, however, not characterised by a one-way causation from the socio-economic space to the demographic space. There is a mutual causation. A demographic configuration is the realisation of a particular level of the socio-economic variables, but the demographic outcome is also a potent factor in the determination of the socio-economic outcome. Given a highly complex relation spanning the demographic and socio-economic variables, it is difficult to work out the relationship in both ways. So, focus is kept narrow to show how the process of development in Arunachal Pradesh has produced the main demographic outcomes: changes in fertility, mortality and migration. The main topics covered in this chapter are: (1) size and density of population, (2) distribution of population, (3) composition of population, (4) migration, and (5) population growth.

### Size and Density of Population

Arunachal Pradesh has a small population: only 10.98 lakh (according to 2001 census) which is 0.107 per cent of the country's population of 1.03 billion. In North-east India (excluding Sikkim which has a population of 5.40 lakh) only Mizoram's population (8.91 lakh) is smaller than Arunachal Pradesh's. With a hilly and mountainous topography, the State has a very sparse settlement, so sparse that its density of population is lowest in the country. According to 2001 census, the population density in Arunachal Pradesh is only 13 people per sq km against the country's 325.

With a high growth of population, the density has increased in the State over time (Table 2.1), but the expanding population has not spread evenly. It is the river valleys and urban areas which have got the highest concentration of population. The remote areas of the State remain more or less as thinly-populated as before. It may be pointed out that the first population census was conducted in the State in 1961. Prior to 1961, the administrative infrastructure was too inadequate to conduct census in the State. In the absence of census and other evidence it is not possible to quantify the State's population prior to 1961. However, a backward projection gives us a population of 2.68 lakh and a density of 3 people per sq km in 1947. Population increased to 3.36 lakh and its density to 4 people per sq km in 1961. In the subsequent decades population grew rapidly, in each decade on an average 1.90 lakh people were added to the State and the decadal increase of density was around 2 people per sq km.

**TABLE 2.1**  
**Density of Population: Arunachal Pradesh**  
**vis-a-vis the Country**

Year	Population	Density of Population		Arunachal Population as Per cent of Indian Population
		Arunachal Pradesh	India	
1961	3,36,558	4	142	0.077
1971	4,67,511	6	177	0.085
1981	6,31,839	8	216	0.092
1991	8,64,558	10	267	0.102
2001	10,97,968	13	325	0.107

Note: (i) Population size refers to 1st March, the day of census in all years except for 1971 in which year the census was conducted on 1st April.

(ii) The population of Arunachal Pradesh is estimated to have been 2.68 lakh at the time of Independence against the country's 34.54 crore.

Source: Different Population Censuses of Arunachal Pradesh and India.



## Distribution of Population

Arunachal Pradesh has a highly uneven distribution of population. The plains which constitute only five per cent of the area of the State have a relatively dense settlement. We would discuss two aspects of distribution of population: inter-district and rural-urban.

### Inter-district Distribution

Some districts of Arunachal Pradesh have large areas. As many as 10 districts of this State are larger in area than Goa, the smallest State in the country and five districts are bigger in area than Sikkim, the smallest State in North-east India. In terms of population among the 16 districts, Changlang is the largest and Dibang Valley the smallest (Annexure Table A-2.1). Dibang Valley (new) has the smallest density. Kurung Kumey and Upper Siang have also a low density. There are seven districts whose density is lower than the State's density of 13. The districts with a density lower than the State's average cover 50.73 per cent area of the State but only 24.00 per cent of its population. There are eight districts with a density higher than the State's average. These districts cover 35.65 per cent of the State's area but as high as 62.92 per cent of its population.

### Rural-Urban Distribution

Urbanisation is relatively new in Arunachal Pradesh; prior to 1971 there was no urban population. In 1971 census, for the first time, four administrative centres were counted as urban. The population in these towns was 17 thousand forming 3.70 per cent of the State's population of 4.68 lakh. The average population in these urban areas was about four thousand, so small that the settlements counted as urban were more like overgrown villages than towns. However, the tempo of urbanisation increased over time. During the 1970s the urban population grew at 13.96 per cent per annum. By 2001, there were 17 towns and 20.75 per cent of the population was urban.

Annexure Table A-2.2 shows the rural-urban distribution of population in the districts of Arunachal Pradesh. Papum Pare, the district in which the capital of the State is located, has the highest level of urbanisation, 50.85 per cent, and Upper Siang has no urbanisation at all. Upper Subansiri is second in the level of urbanisation (28.47 per cent). East Kameng is third with 26.24 per cent of its population being urban. It can be noted that East Siang's urbanisation level is only fourth; it is somewhat less urbanised than Upper Subansiri and East Kameng, the districts which rank far below East Siang in all indicators of development.

## Population Composition

### *Scheduled Tribes and General Category*

In the simplest composition we make a binary classification. People belonging to different tribes are considered as one category and those not belonging as another. The first category is scheduled tribes (ST) and the second is non-scheduled tribe (non-ST). We do not take into consideration another category, scheduled caste (SC) because this category constitute only 0.56 per cent of the State's population. Moreover, they are not considered to be indigenous and hence, treated like the people of the general category.

The ST and non-ST composition is shown in Table 2.2. In 1961, the ST category formed the overwhelming majority of the population (88.67 per cent), and the non-ST only 11.33 per cent. The relative size of the non-ST category, however, increased in subsequent years. In 1991, this category became as high as 36.34 per cent of the total; in the 1990s its relative size, however, declined, reaching 35.78 per cent of the population in 2001.

TABLE 2.2  
Changes in Population Composition in Arunachal Pradesh

Year	Population			Percentage of Population	
	ST	General	Total	ST	General
1961	298439	38119	336558	88.67	11.33
1971	369408	98103	467511	79.02	20.98
1981	441167	190672	631839	69.82	30.18
1991	550351	314207	864558	63.66	36.34
2001	705158	392810	1097968	64.22	35.78

Note: ST means Scheduled Tribes.

Source: Census of India, 1961 through 2001, Arunachal Pradesh.

The non-tribal population in Arunachal Pradesh is not evenly distributed; their presence is more in the urban than in the rural areas. Kurung Kumey, a hilly district with no urban areas, has the lowest percentage (2.11) of the non-tribal population (Annexure Table A-2.4). At the other end is Lohit, a district with extensive plains bordering the Brahmaputra valley of Assam, has the highest concentration of the non-tribal population (67.58).

### *Sex Ratio*

Sex ratio is a reflection of how different socio-economic and political opportunities are distributed between men and women. Table 2.3 shows the sex ratio of the ST, non-ST and total population of Arunachal

Pradesh. Sex ratios of some states and of the country are also presented in the table. Arunachal Pradesh's overall sex ratio was 894 in 1961, fell to 861 in 1971 and through a fluctuation reached 893 in 2001.

TABLE 2.3

**Sex Ratio in Arunachal Pradesh: A Comparison with the Selected States and the Country's Sex Ratio**

Year	Arunachal Pradesh			Kerala	Haryana	Punjab	Assam	India
	ST	General	Total					
1961	1013	296	894	1022	868	854	869	941
1971	1007	461	861	1016	867	865	896	930
1981	1005	599	862	1032	870	879	910	934
1991	998	657	859	1040	874	888	925	929
2001	1003	723	893	1058	861	874	932	933

*Note:* Sex ratio is the number of women per 1000 men in the population.

*Source:* Different Population Censuses of Arunachal Pradesh and India.

The overall sex ratio of Arunachal Pradesh is not comparable with that of other states because of a large migration. As we have seen before, 35.78 per cent of the population in Arunachal Pradesh belongs to general category most of whom are either migrants from other states or descendants of the migrants.

A look at the sex ratio of the general category gives us an impression of gender-bias in the migration. In 1961, the migrants were largely males: sex ratio of the general category was only 296. Over the years the sex-bias in migration declined. The sex ratio of the general category increased to 723 in 2001. However, it is neither the overall sex ratio nor the sex ratio of the general category that represents the true gender composition; it is the sex ratio of the ST population that portrays the true picture. This is because of the ST people being more or less closed.

The ST sex ratio shows a clear declining trend from 1961 to 1991. However, it was more than 1000 in all censuses except in 1991 when it dropped to 998. Compared with the overall gender composition of the country, Arunachal Pradesh's is much more favourable to the women. In 1961 the sex ratio of the ST population in the state was 1013 against the country's 941. In 2001, ST sex ratio was 1003. The trend of the sex ratio of the ST, of the non-ST and total population is shown in Appendix A-2.1.

## Literacy in Arunachal Pradesh

In the spread of education, Arunachal Pradesh occupies a unique position in the country. At the time of Independence in 1947, there were very little formal educational facilities. After 1947 there was a rapid

expansion of the educational facilities. The first college in the State was established in 1964 and after 20 years a university came into being.

Literacy spread rapidly in the State, given its very poor base. Table 2.4 compares the literacy rate in Arunachal Pradesh with that in India. In 2001, Arunachal Pradesh had a literacy rate of 54.34 per cent against the country's 64.80 per cent. So Arunachal Pradesh was 10.46 percentage points below the national average. The male literacy was 63.83 per cent in Arunachal Pradesh against 75.20 per cent in the country. In female literacy the difference between Arunachal Pradesh and the country is smaller at 9.92 percentage points. As shown in the table, the literacy rate in Arunachal Pradesh was only 7.13 per cent in 1961. In four decades from 1961 to 2001 literacy gained by 47.61 percentage points.

TABLE 2.4

**Literacy Rate in Arunachal Pradesh: A Comparison with the National Rate**

Year	Arunachal Pradesh			India		
	Male	Female	Total	Male	Female	Total
1961	12.24	1.42	7.13	40.40	15.34	28.31
1971	17.82	3.71	11.29	45.95	21.97	34.45
1981	35.12	14.02	25.55	56.38	39.76	43.57
1991	51.45	29.69	41.59	64.13	39.29	52.21
2001	63.83	43.53	54.34	75.20	53.70	64.80

*Source:* Census of India 2001, series-1 India, Provisional population totals, paper-1 of 2001 and Bose (1991).

## Migration

The implementation of the development programmes launched by the Government of India after Independence occasioned a growing stream of migration from the rest of the country. The composition as well as the duration of migration was determined partly by the circumstances inside this State and mainly by the inner line regulation (ILR) which, enacted in 1873, proved fateful: the areas constituting Arunachal Pradesh remained outside the mainstream. The forces of modernisation which swept the rest of the country did not touch Arunachal Pradesh. Most of the people were dependent on swidden cultivation (*jhuming*).

### Nature of Inter-State Migration: Composition

Immediately after Independence almost all government officials from the highest rank to the lowest came from outside to establish direct administration in an area which had seen only 'indirect' or 'political' administration

without any public offices being located here. The local people accustomed to *jhuming* could not supply any labour power. The only way was to depend on migrants from the rest of the country. Given the nature of development work, most of the migrants were unskilled. But what is considered raw or unskilled labour in the rest of the country appeared highly skilled in Arunachal Pradesh. For example, an agricultural labourer is considered unskilled in the plains but in Arunachal Pradesh he became an 'expert' in wet-rice cultivation. He was a diffuser of high technology 'the bullock plough' in an area where the people's best technology was sickle and hoe. Any worker whose skill was above sickle-hoe duo came to be regarded as skilled and was highly demanded in the infrastructure-building activities, laying the foundation for development.

The demand for external skill did not remain unabated long, the spread of education and exposure to new technology became instrumental in developing the local skills. The educated local people entered the service sector especially the public administration and in course of time they spread in different secondary activities, mostly in construction sector. In the beginning all traders were from outside, later locals came to these burgeoning activities. However, till today the trading and industrial activities are dominated by the migrants who rent the license from the locals.

### *Magnitudes of Migration*

Based on the 1991 census we try to make a quantitative analysis of migration in Arunachal Pradesh. Annexure Table A-2.3 shows the rate of migration of different categories. In the entire State 66.37 per cent of the people are non-migrants and 33.63 per cent migrants: a majority of the migrants (14.24 per cent of the State's population) are from other states of the country. Next come the intra-district migrants forming 13.78 per cent of the total population. The migrants from other districts are as unimportant as the migrants from other countries. The inter-district migrants are 2.96 per cent of the total population against a weight of 2.65 per cent from the emigrants.

The rate of migration varies widely among the districts. Tawang has the lowest rate and its opposite is Dibang Valley (Annexure Table A-2.3). As high as 93.00 per cent people are non-migrants in Tawang and in Dibang Valley most of the people (58.96 per cent of the total) are migrants. Out of 11 districts in 1991, in as high as six districts migrants were more than 30 per cent of the total population and only in two districts less than 20 per cent. In-migration within the district West Siang had the

highest rate, 23.87 per cent and Tawang the lowest, 2.51 per cent. Compared with the intra-district migration, the inter-district migration is rather insignificant. This is due not much to physical distance but to cultural, linguistic and ethnic distance. In many cases the physical borders of a district coincide with its linguistic borders and this discourages inter-district migration.

Tawang has the lowest rate (0.83 per cent) of inter-district as well as inter-state (3.25 per cent) in-migration. On the other end, Dibang Valley is at the top in receiving migrants from other states, 27.59 per cent of its population being born in other parts of the country. It has also the second position in receiving international migrants: 6.28 per cent of its people are foreign-born. The immigrants constitute the largest proportion (9.17 per cent of the population) among districts, in Changlang.

### **Population Growth**

In Arunachal Pradesh population started growing after 1947. Prior to Independence, there was no modern hospital nor was there any modern industry in the State. A low-productive agriculture, the total absence of industrial activities outside the household, almost total illiteracy kept the pre-1947 Arunachal Pradesh in the same demographic regime as the rest of the country was prior to 1921. So the 'great divide' for Arunachal Pradesh can be taken to be 1947, after which its population took a path of high growth shaped by both natural increase and migration.

During 1961-2001, the population grew in the State at the average exponential rate of 2.98 per cent per annum compared with the national growth of 2.14 per cent. This is shown in Table 2.5. The ST population grew at the rate of 2.12 per cent while the non-ST grew at a much higher rate of 5.83 per cent. There was a high decadal variation in the growth rate. In the 1960s population grew in the State at the yearly rate of 3.29 per cent, the highest in all decades. In the country also, the 1960s witnessed the highest growth rate of population but in the subsequent decades the rate fell without any reversal. But Arunachal Pradesh did not follow exactly the country's pattern. In the 1970s the rate of growth fell markedly but in the 1980s a reversal took place. In the 1970s the fall in the overall growth was due to the sharp fall in the growth of the tribal population. In the 1960s the tribal population in the State grew at 2.13 per cent per annum but in the 1970s the rate declined to 1.78 per cent.

Since the trajectory of the population growth shifted upwards after the launch of the development programmes and the consequent migration, we should begin with an



effort to identify the factors leading to the migration of people in the State. The operationalisation of the development programme created a gap between the wage rates in Arunachal Pradesh and the rest of the country. The wage differential triggered a steady flow of migration thereby raising the rate of growth of population in the State.

**TABLE 2.5**  
**Population Growth in Arunachal Pradesh:**  
**A Comparison with the National Average**  
(Per cent per annum)

Year	Arunachal Pradesh			India	Difference
	ST	General	Total		
1961-1971	2.13	9.45	3.29	2.22	1.07
1971-1981	1.78	6.65	3.01	2.20	0.81
1981-1991	2.21	5.00	3.14	2.14	1.00
1991-2001	2.45	2.23	2.39	1.95	0.44
1981-2001	2.35	3.61	2.76	2.05	0.71
1971-2001	2.16	4.66	2.88	2.10	0.78
1961-2001	2.12	5.83	2.98	2.14	0.84

*Note:* 1. Growth rate is the estimated value of  $b$  in  $\log p = a + bt$ , where  $p$  is population and  $t$  is time in years;  $b$  is expressed in percentage.

2. Difference is the rate of growth of population in Arunachal Pradesh—the rate of growth of the population in the country.

*Source:* Different Population Censuses of Arunachal Pradesh and India.

## Fertility and Mortality Rates

According to the estimates by the Sample Registration System (SRS), Arunachal Pradesh had a crude birth rate (CBR) of 36.8 and a crude death rate (CDR) of 19.8 in 1971 (Annexure Table A-2.5). The CBR in the State continued to be high in the 1970s and 1980s but CDR started falling in the 1980s. The marked fall in fertility, however, took place in the 1990s. By 2000 the CBR reached 22.3 against the country's 25.8. In the following years the fertility fell further. In 2003, the CBR was 18.9 in the State against the country's 24.8. The fall in CDR was more pronounced. In 2003 the CDR was as low as 4.7 in the State against the country's 8. SRS data on CBR and CDR suffer from a severe underestimation. The population growth rate based on SRS estimates stands in sharp contrast with the census data. The estimates of CBR, CDR and IMR given in the Human Development Report (HDR) of Arunachal Pradesh appear to be consistent with the census but the HDR data are available for a single year only—2001. According to HDR (2005) CBR in Arunachal Pradesh was 34.62, CDR was 11.57 and IMR 77 in 2001. These rates are much higher than their national average.

## The Empirical Estimation

The conceptual framework as well as empirical findings are provided in Appendix A-2.2. The estimated equation (15) in Appendix A-2.2 shows that CBR is negatively related to the literacy rate and positively related to per capita income. In case of CDR (shown in equation 16 in Appendix A-2.2), both literacy rate and per capita income have a negative, and medical services a positive effect on CDR. However, the effect of medical services is not a linear one, the square of medical services having a negative effect on CDR.

## Population Projection

Population projection for the State is difficult in view of its population growth being determined partly by the volume of migration from the rest of the country. The element of migration in the growth of population was very large in the years following the Independence of the country. The relative importance of migration in the population growth declined in subsequent decades. In the 1990s net migration in the State from the rest of the country was very small. This was due mainly to the return migration of many non-ST workers rendered jobless by the close down of the most of the industries during the 1990s in the State. However, the condition changed after 2000 with the undertaking of hydropower projects. As shown elsewhere in this chapter, in-migration in the State has been shaped mainly by the inflow of central funds and the growth of local labour, with more investment especially in the hydropower sector, the demand for semi-skilled labour will increase and this type of skill being not locally available will be met by migrant workers from the rest of the country. This is likely to raise the population growth in the State.

Given a complex set of factors determining the net in-migration in the state and the non-declining rate of growth of the ST population, it is safe to assume that the rate of growth of population the state will not change much up to 2015. However, a high element of uncertainty remains as regards the actual growth that would take place during 2001-2015. Under the circumstances it would be meaningful to use the actual growth rate of the 1990s in the projection of the population. The resulting projection is then based on a highly optimistic assumption about the behaviour of migration that the unfolding of job opportunities created by the new large sized power projects would entail a continuous migration of skilled and semi-skilled workers in the State.

The projected population based on the growth rate of 2.39 per cent per annum is shown in Annexure Table A-2.6. The table also shows the projected 6-14 year age group, which is the potential school going group (schooling ranging from class I to Class VIII). Another important age group (15-59) is the potential working age group. Projection gives us some glimpses of the needs of schooling facilities to be established and the job opportunities to be created.

### Conclusion and Policy Implications

The conceptual framework provides a reasonable fit to the demographic transition in Arunachal Pradesh. It specifically highlights the role of the development programme of the Government of India in entailing migration of workers, both skilled and unskilled, in Arunachal Pradesh. It was these migrant workers who built up the infrastructure which led to the shift of the growth trajectory of the indigenous population in the State. The mortality rate fell but fertility rate remained sticky up to the 1980s. In the 1990s the fertility rate tended to fall which reduced the rate of growth of

population, but compared with the rest of the country, the vital rates—fertility and mortality rates—remain high in Arunachal Pradesh. The demographic situation in the State demands the following measures:

- Expansion of health services in the remote areas of the State. Posting of doctors in the primary health centres (PHCs) in the interior areas should receive a priority.
- Public distribution system (PDS) should be strengthened to cover all people living below the poverty line.
- Family planning services should be integrated more meaningfully with the health services in the State.
- Given the threat of AIDS, the precautionary measures require, among others, a high pitched propagation of the information of the epidemiological condition of this deadly disease.
- Since the strategically sensitive border areas should not suffer from depopulation due to migration of people to the urban areas, efforts should be made to invest more in the development of border areas.

ANNEXURE TABLE A-2.1

### Distribution of Population in Arunachal Pradesh: 2001

District/State	Area (sq km)	Population	Density	Percentage of		Cumulative % of	
				Area	Population	Area	Population
D. Valley	13029	57720	4	15.56	5.26	15.56	5.26
K. Kumey	8818	42518	5	10.53	3.87	26.09	9.13
U. Siang	6188	33363	5	7.39	3.04	33.48	12.17
U. Subansiri	7032	55346	8	8.39	5.04	41.87	17.21
East Kameng	7422	74599	10	8.86	6.79	50.73	24.00
Lohit	11402	143527	13	13.62	13.08	64.35	37.08
West Siang	7643	103918	14	9.13	9.46	73.48	46.54
W. Kameng	4134	57179	14	4.94	5.21	78.42	51.75
Tawang	2172	38924	18	2.59	3.55	81.01	55.30
East Siang	4687	87397	19	5.60	7.96	86.61	63.26
Changlang	4662	125422	27	5.57	11.42	92.18	74.68
L. Subansiri	1317	55726	42	1.57	5.08	93.75	79.76
Papum Pare	2875	122003	42	3.43	11.10	97.18	90.86
Tirap	2362	100326	42	2.82	9.14	100.00	100.00
Arunachal Pradesh	83743	1097968	13	100.00	100.00	100.00	100.00

*Note:* D means Dibang, K means Kurung, W means West, U means Upper, and L means Lower.

Source: Population Census of India (Arunachal Pradesh) 2001.

ANNEXURE TABLE A-2.2

### Rural-Urban Distribution of Population in Arunachal Pradesh: 2001

District/ State	Population			Percentage of Population	
	Rural	Urban	Total	Rural	Urban
Tawang	30548	8376	38924	78.48	21.52
W. Kameng	67906	6693	74599	91.03	8.97
E. Kameng	42177	15002	57179	73.76	26.24
Papum Pare	59961	62042	122003	49.15	50.85
L. Subansiri	85860	12384	98244	87.39	12.61
U. Subansiri	39590	15756	55346	71.53	28.47
W. Siang	82806	21112	103918	79.68	20.32
E. Siang	65432	21965	87397	74.87	25.13
U. Siang	33363	0	33363	100.00	0
D. Valley	47613	10107	57720	82.49	17.51
Lohit	116765	26762	143527	81.35	18.65
Changlang	113034	12388	125422	90.12	9.88
Tirap	85032	15294	100326	84.76	15.24
Arunachal Pradesh	870087	227881	1097968	79.25	20.75

*Note:* D means Dibang, W means west, E means East, W means West, L means Lower and U means Upper.

Source: Census of Arunachal Pradesh, 2001.

ANNEXURE TABLE A-2.3

### Migration in Arunachal Pradesh: 1991

District/ State	Non- migrants	Migrants	Born within Arunachal Pradesh		Born outside Arunachal Pradesh	
			Same Districts	Other Districts	Other States	Other Countries
Tawang	93.00	7.00	2.51	0.83	3.25	0.41
West Kameng	69.44	30.56	7.23	3.41	14.99	4.88
East Kameng	76.34	23.66	17.66	1.38	4.08	0.54
Lower Subansiri	60.69	39.31	17.99	3.41	16.82	1.09
Upper Subansiri	74.03	25.97	17.83	2.42	5.30	0.42
West Siang	60.59	39.41	23.87	2.86	11.67	1.01
East Siang	74.82	25.18	9.98	2.37	11.22	1.61
Dibang Valley	41.04	58.96	17.90	7.19	27.59	6.28
Lohit	60.59	39.41	11.56	2.83	22.09	2.93
Changlang	58.38	41.62	11.47	3.49	17.49	9.17
Tirap	80.82	19.18	6.72	2.01	9.68	0.77
Arunachal Pradesh	66.37	33.63	13.78	2.96	14.24	2.65

Source: Census of India 1991.

ANNEXURE TABLE A-2.4

## Population Composition of Arunachal Pradesh, 2001

Districts	Total	ST	General	Percentage	
				ST	General
Tawang	38,924	29,191	9,733	74.99	25.01
West Kameng	74,599	36,951	37,648	49.53	50.47
East Kameng	57,179	49,585	7,594	86.72	13.28
Papum Pare	122,003	69,007	52,996	56.56	43.44
Kurung Kumey	42,518	41,619	899	97.89	2.11
Lower Subansiri	55,726	46,893	8,833	84.15	15.85
Upper Subansiri	55,346	49,552	5,794	89.53	10.47
West Siang	103,918	84,922	18,996	81.72	18.28
East Siang	87,397	60,420	26,977	69.13	30.87
Upper Siang	33,363	26,094	7,269	78.21	21.79
Lower Dibang Valley	50,378	22,005	28,373	43.68	56.32
Dibang Valley (New)	7,342	4,827	2,515	65.75	34.25
Lohit	125,086	40,552	84,534	32.42	67.58
Anjaw	18,441	14,249	4,192	77.27	22.73
Changlang	125,422	45,351	80,071	36.16	63.84
Tirap	100,326	83,940	16,386	83.67	16.33
Arunachal Pradesh	1,097,968	705,158	392,810	64.22	35.78

Note: ST means Scheduled Tribes.

Source: Census of India 2001, Series 13 Arunachal Pradesh, Final Population Totals.

contd...

Year	Arunachal Pradesh			India		
	CBR	CDR	G	CBR	CDR	G
1986	37.3	14.2	2.31	32.6	11.3	2.13
1987	38.8	15.2	2.36	32.1	11.0	2.11
1988	37.3	14.9	2.24	31.5	10.7	2.08
1989	35	14.8	2.02	30.7	10.3	2.04
1990	29.7	13.2	1.65	29.5	9.8	1.97
1991	29.2	12	1.72	29.2	10.1	1.91
1992	26.6	9.4	1.72	28.7	9.3	1.94
1993	27.6	8.6	1.9	27.5	9.0	1.85
1994	28.5	9.9	1.86	26.5	9.0	1.75
1995	23.8	6	1.78	28.3	9.0	1.93
1996	21.9	5.5	1.64	27.5	9.0	1.85
1997	21.4	5	1.64	27.2	8.9	1.83
1998	21.9	5.9	1.6	26.5	9.0	1.75
1999	22.3	6	1.63	26.0	8.6	1.74
2000	22.3	6	1.63	25.8	8.5	1.73
2001	22.2	5.7	1.65	25.4	8.4	1.70
2002	20.6	5.2	1.54	25.0	8.7	1.63
2003	18.9	4.7	1.42	24.8	8.0	1.68

Note: G means rate of natural growth per annum.

Source: SRS Bulletins.

ANNEXURE TABLE A-2.5

## Trend of CBR, CDR and Population Growth in Arunachal Pradesh: A Comparison with the Country, 2001

Year	Arunachal Pradesh			India		
	CBR	CDR	G	CBR	CDR	G
1971	36.8	19.8	1.7	-	-	-
1972	35.8	20.9	1.49	36.3	15.9	2.04
1973	35.2	22.6	1.26	35.3	15.7	1.96
1974	32.1	20.6	1.15	34.8	15.3	1.95
1975	32.2	22.8	0.94	34.4	15.0	1.94
1976	33.2	19.4	1.38	34.2	15.2	1.90
1977	33.8	19.5	1.43	33.3	14.5	1.88
1978	36.7	17	1.97	33.1	13.9	1.92
1979	32.6	17.1	1.55	33.3	13.1	2.02
1980	33.1	15.4	1.77	33.8	12.7	2.11
1981	31.1	14.6	1.65	33.8	12.3	2.15
1982	34.7	15.9	1.88	33.8	12.1	2.17
1983	34.7	16.6	1.81	33.8	12.1	2.17
1984	35.2	16.1	1.91	33.6	12.1	2.15
1985	36.7	15.3	2.14	33.2	11.8	2.14

contd...

ANNEXURE TABLE A-2.6

## Population Projection

Year	Projected Population	6-14 Age Group	15-59 Age Group
2001	1097968*	274492	603882
2002	1124256	281131	618489
2003	1151725	287931	633449
2004	1179583	294896	648771
2005	1208115	302029	664463
2006	1237337	309334	680535
2007	1267265	316816	696996
2008	1297918	324479	713855
2009	1329312	332328	731122
2010	1361465	340366	748806
2011	1394396	348599	766918
2012	1428123	357031	785468
2013	1462667	365667	804467
2014	1498045	374511	823925
2015	1534280	383560	843854

Note: \* Actual population enumerated in the 2001 census.

Source: Census of Arunachal Pradesh, 2001.

## APPENDIX A-2.1

## Trend of Sex Ratio in Arunachal Pradesh

$$\text{ST sex ratio} = 1011.00 - 0.29t \quad (1)$$

$$(373.2) \quad (2.6)$$

$$R^2 = 0.70 \quad n = 5$$

$$\text{ST sex ratio} = 1013.43 - 0.78t + 0.012t^2 \quad (2)$$

$$(380.0) \quad (2.5^*) \quad (1.6^*)$$

$$R^2 = 0.87 \quad n = 5$$

$$\text{Non-ST sex ratio} = 337.20 + 10.50t \quad (3)$$

$$(9.5) \quad (7.5)$$

$$R^2 = 0.95 \quad n = 5$$

$$\text{Overall sex ratio} = 874.60 - 0.04t \quad (4)$$

$$(54.3) \quad (0.1^*)$$

$$R^2 = 0.001 \quad n = 5$$

$$\text{Overall sex ratio} = 893.17 - 3.75t + 0.09t^2 \quad (5)$$

$$(141.4) \quad (5.0) \quad (5.1)$$

$$R^2 = 0.93 \quad n = 5$$

In all trend equations  $t$  is time measured in years and parenthesised figures are  $t$  values;  $n$  is the number of observations. The origin of  $t$  is 1961. Asterisked  $t$  values are not significant at 5 per cent level. ST sex ratio seems to suffer a decline, but the negative coefficient of  $t$  is not significant at 5 per cent level. Moreover the degrees of freedom is very low. A quadratic time-path seems to give a better fit but again neither the quadratic coefficient or nor the linear coefficient of time is statistically significant. The sex ratio of the non-ST has a positive trend. Overall sex ratio has no linear trend during this period (equation 4), but a quadratic function provides an excellent fit (equation 5); coefficients of both  $t$  and  $t^2$  are significant at 5 per cent level.

## APPENDIX A-2.2

## Conceptualising Population Growth in Arunachal Pradesh

In Arunachal Pradesh the development activities initiated by the Central government were financed by a continuous inflow of funds. In this framework the inflow of Central funds is taken as exogenous. The conceptual framework and its empirical estimation follow closely (Roy, 2005). The Central inflow, in Roy (2005), is, however, treated indigenously. In Arunachal Pradesh there was no labour market, so labourers were brought from the rest of the country by paying them a higher wage rate. The wage differential between Arunachal Pradesh and other areas is a function of the gap in the demand for labour and its supply in this State. This relation is formalised as

$$W_a/W = f_1(G, L_i) \quad (1)$$

In equation (7),  $W_a$  is the wage rate in Arunachal Pradesh,  $W$  is the wage rate in areas supplying labour force to Arunachal Pradesh,  $G$  is the Central funds flowing into the State and  $L_i$  is the supply of local labour.  $W_a/W$  is an increasing function of  $G$  but a decreasing function of  $L_i$ .

The migration of workers ( $L_m$ ) in Arunachal Pradesh from outside is a function of  $W_a/W$ :

$$L_m = f_2(W_a/W) \quad (2)$$

The inflow of funds along with the migration of workers facilitates the development of educational institutions ( $S$ ):

$$S = f_3(G, L_m) \quad (3)$$

Educational facilities and income per head ( $Y_p$ ) are hypothesised to determine the level of education ( $E$ ):

$$E = f_4(S, Y_p) \quad (4)$$

The local labour force ( $L_i$ ) grows with the spread of education and expansion of ST population:

$$L_i = f_5(E, P) \quad (5)$$

The Central funds and the migration of people from the rest of the country shape the growth of the medical services:

$$M = f_6(G, L_m) \quad (6)$$

The crude birth rate (CBR) is a function of the spread of education and the growth of per capita income:

$$\text{CBR} = f_7(E, Y_p) \quad (7)$$

The death rate (CDR) depends on the expansion of health services, spread of education and the growth of per capita income:

$$\text{CDR} = f_8(E, Y_p, M) \quad (8)$$

We have eight endogenous and only three exogenous variables. The system is over-identified, but does not suffer from serious biases of simultaneous equations.



## Empirical Estimation

$$100^* (Wa/W) = 891.09 - 63.94 \log Li + 1.60 \log G \quad (9)$$

$$(5.4) \quad (4.4) \quad (0.8)$$

$$R^2 = 0.49 \quad n = 32$$

In equation (9) the coefficient of  $\log G$  is insignificant but the coefficient of  $\log Li$  is significant with the expected sign. The number of observations ( $n$ ) is 32 covering the period 1970-71 to 2001-02.

The wage differential induced the migration to Arunachal Pradesh:

$$\Delta \log Lm = 0.344 + 0.0032 (100^* Wa/W) \quad (10)$$

$$(6.4) \quad (7.4)$$

$$R^2 = 0.62 \quad n = 32$$

Equation (10) has both the parameters significant at one per cent level.

The inflow of Central funds ( $G$ ) and the migrant workers became instrumental in the growth of educational institutions. In our estimation, the pre-primary and primary schools are taken to represent the educational institutions. The estimated relation:

$$\log S = -2.29 + 0.88 \log G + 4.27 \Delta \log Lm \quad (11)$$

$$(3.6) \quad (15.24) \quad (3.3)$$

$$R^2 = 0.94 \quad n = 32$$

All the parameters in equation (11) are significant. There is some multi-collinearity between  $G$  and  $Lm$ . Though their relationship is not direct, yet it comes simply through the medium of the relative wage rate,  $Wa/W$ .

In explaining the spread of education both the demand and supply factors are considered. On the supply side there is the educational institution ( $S$ ) and on the demand side, per capita income ( $YP$ ).

$$\log E = 5.81 + 0.75 S + 0.47 \log YP \quad (12)$$

$$(25.3) \quad (7.9) \quad (5.9)$$

$$R^2 = 0.98 \quad n = 33$$

The coefficients of both the arguments in equation (12) are highly significant. The period covered in equation (12) is 1970-1971 to 2002-03.

The next estimated relation, the growth of local labour ( $Li$ ) as a function of spread of education ( $E$ ) and the growth of ST population ( $P_1$ ) is as follows:

$$\log Li = 9.20 + 0.24 \log P_1 + 0.0023 E \quad (13)$$

$$(10.6) \quad (3.4) \quad (2.2)$$

$$R^2 = 0.99 \quad n = 33$$

One problem with equation (13) is that  $Li$  includes all the ST workers as provided in the census, but in our conceptual framework  $Li$  is the population on paid jobs. But no time series data is available on this.

Another important development is the growth of medical services in the State. The estimated relation is

$$M = 0.74 + 0.44 \log P_2 + 0.13 \log G \quad (14)$$

$$(1.1) \quad (2.0) \quad (0.6)$$

$$R^2 = 0.90 \quad n = 34$$

The medical services ( $M$ ) is measured by the number of hospital beds in the State.  $P_2$  is the non-ST population. The non-ST population is supposed to represent both the demand and supply. The estimated relation on CBR:

$$CBR = -43.03 - 0.68 E + 11.30 \log YP \quad (15)$$

$$(0.6) \quad (2.5) \quad (1.2)$$

$$R^2 = 0.67 \quad n = 33$$

The data on CBR as well as CDR is from Sample Registration System (SRS). The specification seems to be too simple to be convincing; but fitness is too good to be neglected. Moreover, the interpretation is simple. We can invoke Becker's formulation of the demand for children as an increasing function of income (Becker, 1960). We can also argue *a la* Easterlin (1975) that Arunachal Pradesh up to the 1980s was in the stage when its fertility from the supply side was increasing due to growth in nutrition but demand for children did not decline. Only in the 1990s, the demand for children declined.

So the sign of the coefficient of  $\log YP$  { $YP$  is per capita Net State Domestic product (NSDP)} is theoretically valid. The negative sign of education ( $E$ ) is also theoretically expected.

The estimated equation for CDR is as follows:

$$CDR = 91.75 - 0.21 E - 10.06 \log Y_p + 0.029 M - 0.00001 M^2 \quad (16)$$

$$(3.2) \quad (1.5) \quad (2.5) \quad (2.4) \quad (1.8)$$

$$R^2 = 0.95 \quad n = 33$$

All the parameters are significant at 10 per cent but the significance level of the coefficient of  $E$  is 14.4 per cent. Both  $E$  and  $\log Y_p$  have the expected sign but not the medical services ( $M$ ). The coefficient of  $M$  is positive and that of  $M^2$  is negative

which is not expected. The reason is, of course, that the medical services in the State had been growing robustly in the 1970s and 1980s but in the 1990s there was a slowdown. The slowdown in public health services was largely compensated by the expansion of health services in the private sector especially in the urban areas. However, our data does not include the health services in the private sector.

*Notes:*

1. In general the migrants from outside do not enjoy property rights in land or in any fixed assets in Arunachal Pradesh, but this restriction does not apply to all migrants or non-ST population. In the first place, migrants cannot be equated to non-ST. True that all migrants are non-ST but all non-ST people are not migrants. Migrant are only a subset of the non-ST people. We can mention here three groups of non-ST people enjoying property rights in Arunachal Pradesh.
  - a. There are a few communities spread over Assam and Arunachal Pradesh. The major segments of these communities are in Assam and culturally they are identified with that State. In spite of their presence in Arunachal Pradesh for generations they are not treated as ST, though in Assam they are treated so.
  - b. Prior to 1947 some government servants from other areas of the country settled in Arunachal Pradesh and they were allotted land by the government. They do not belong to ST category but they enjoy property rights in land.
  - c. In the years following the Chinese War in 1962, the Government of India settled some refugees and ex-service men in Arunachal Pradesh in order to augment the defence of the country. They were provided with land and they enjoy its ownership. In fact the traditional institution vests the ownership of land in some entities such as community, clan, etc. This prevents land being alienated to a person belonging to other communities or clans. An effect of this institution is the restricted internal migration (inter-district, and some times intra-district) in the State.

## Chapter 3

# Economic Growth, Structural Change and Workforce Participation



### Introduction

Arunachal Pradesh has undergone remarkable economic changes within a comparatively short period of time. The relatively isolated economies of the tribal communities of the area, which were later reorganised as Arunachal Pradesh, were gradually integrated into the larger economy only after Independence, and more particularly after the Indo-China war of 1962. Apart from the relatively late exposure to modernisation, another specificity of the historical transformation of the Arunachal Pradesh economy was the role of the State as the prime mover in this process of gradual transformation and integration of the economy. The State's economy has not only experienced a remarkable growth over the past decades, it has diversified from an agriculture and forestry based subsistence economy into a market economy. The predominantly barter economies are in the process of being transformed into a monetised economy. The market institutions are still underdeveloped in many respects, and there is a great deal of regional variations in the degree of integration with the market economy, but a remarkable feature of the transformation process is the way the geographical, historical and policy-induced specificities of the State have shaped the trajectories of economic change. Some important aspects of the process of economic change have been examined in this chapter.

### Per Capita Income

In 1970-71, the per capita net state domestic product (NSDP) of Arunachal Pradesh was 56.14 per cent of the per capita national income. Starting from a very low base, Arunachal Pradesh's per capita income increased at a faster rate than the country's national income. On

average, during 1970s Arunachal Pradesh's per capita income was 63.38 per cent of the national per capita income. Throughout the decade of the 1980s, because of the relatively higher growth of the states per capita NSDP, the gap between Arunachal Pradesh's income per head with the national average tended to narrow down. From 1991-92 to 1995-96 the per capita income in Arunachal Pradesh remained higher than that of the country. After reaching the peak level of 110 per cent of national per capita income in 1995-96, the growth of income in Arunachal Pradesh slowed relative to that of the national income and this was reflected in the falling ratio of Arunachal Pradesh's per capita income to average per capita income in the country. In the year 1999-2000, Arunachal Pradesh's per capita income was only 84.64 per cent of the national average. There was, however, a phase of recovery since then. During 2004-2006, on an average, the State's per capita NSDP was 95 per cent of the national average.

### Growth of NSDP: 1970-71 to 2004-05

During the entire period from 1971 to 2004-05, for which data is available, the NSDP has registered an average annual growth rate of 7.05 per cent per annum. The growth rate was much higher in the 1970s (7.07 per cent) and in the 1980s (7.81 per cent) than in the 1990s (4.85 per cent) (Table 3.1). It is important to note that the growth of the NSDP has shown a sharp decline since 1993-94. During the 1990s, generally described as the post-reform decade, while the performance of the national economy showed improvements over the previous decades, the growth of the State's economy suffered a significant setback.

TABLE 3.1  
Growth Rate of Arunachal's NSDP

Period	Growth Rate of	
	NSDP	Per Capita NSDP
1970-71 to 1979-80	7.07	4.03
1980-81 to 1989-90	7.81	4.69
1990-91 to 1999-00	4.85	2.01
1993-94 to 2004-05	3.63	1.70
1970-71 to 2004-05	7.05	4.32

Note: NSDP data are from State Domestic Product of Arunachal Pradesh for different years published by the Directorate of Economics and Statistics, Government of Arunachal Pradesh.

### Changes in Sectoral Composition of NSDP: 1970-71 to 2004-05

The changing sectoral composition of the State's NSDP captures the structural transformation of the economy. In 1970-71, the primary sector contributed 59 per cent of the State's economy (Figure 3.1). The share of the sector steadily declined to 31 per cent in 2004-05 (Table 3.2). This decline was largely due to the fall in the relative contribution of forestry and logging. The contribution of agriculture declined from 38 per cent to 24 per cent during the same period, while that of fishing increased from 0.04 per cent to 1.1 per cent. The contribution of the secondary sector increased from 20 per cent to only 25 per cent during 1970-71 to 2004-05. The share of the manufacturing had increased from less than 1 per cent in 1971 to more than 6 per cent in the 1980s but in the 1990s it declined and reached 2.27 per cent in 2004-05. The bulk of the secondary sector activity is construction.

It is interesting to note that services in Arunachal Pradesh in recent years have come to occupy the most predominant position, making a contribution to the State's net domestic product, which is higher than that of agriculture. Thus, the decline in the share of agriculture has not been accomplished with the expansion of the secondary sector; rather the tertiary sector has expanded rapidly. The share of the tertiary sector was around 43 per cent of the NSDP in 2004-05. Within the service sector, public administration was relatively more important, yielding 15 per cent of income in the State. A significant aspect of the structural transformation of the State, as captured by the changes in sectoral composition of State domestic product is that in the last 35 years, the contribution from manufacturing activities could never reach 7 per cent of the State income. Another aspect is that the specificity of the State's economy lies in the overwhelming and increasing dominance of the service sector in the states economy.

FIGURE 3.1

### Changing Sectoral Composition of NSDP in Arunachal Pradesh: 1970-71 to 2004-05

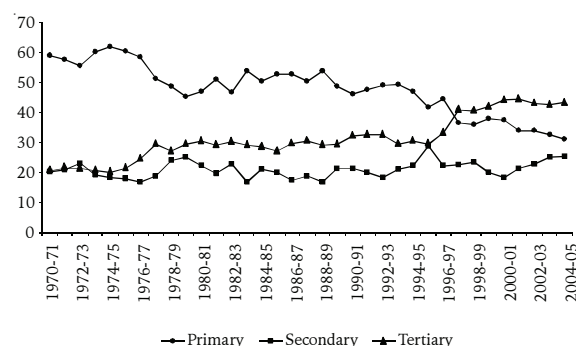


TABLE 3.2

### Sectoral Composition of NSDP of Arunachal Pradesh

Industry	1970-71	1980-81	1990-91	2000-01	2004-05	Changes 1970-71 to 2004-05
Agriculture	38.33	36.91	35.09	31.16	24.37	-13.96
Forestry and Logging	20.72	10.23	9.58	3.64	4.30	-16.42
Fishing	0.04	0.08	0.72	1.06	1.07	1.03
Mining and Quarrying	0.11	0.06	0.79	1.04	1.34	1.23
<b>Primary Sector</b>	<b>59.19</b>	<b>47.28</b>	<b>46.19</b>	<b>36.89</b>	<b>31.09</b>	<b>-28.10</b>
Manufacturing	0.85	6.51	6.04	4.43	2.27	1.42
Construction	19.58	18.69	17.98	15.58	22.51	2.93
Electricity, etc.	-0.10	-2.99	-2.47	2.14	0.64	0.74
<b>Secondary Sector</b>	<b>20.33</b>	<b>22.21</b>	<b>21.56</b>	<b>22.16</b>	<b>25.42</b>	<b>5.09</b>
Transport, Storage, etc.	1.55	0.36	0.65	5.89	8.19	6.64
Trade, Hotel, etc.	1.96	4.42	4.95	4.79	3.86	1.90
Banking & Insurance	0.11	0.60	1.49	1.78	2.61	2.50
Real Estate, etc.	0.79	7.79	5.29	2.46	2.09	1.30
Public Administration	9.98	10.36	8.17	13.80	14.99	5.01
Other Services	6.09	6.98	11.72	12.23	11.77	5.68
<b>Tertiary Sectors</b>	<b>20.48</b>	<b>30.51</b>	<b>32.25</b>	<b>40.96</b>	<b>43.50</b>	<b>23.02</b>
<b>Total</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

Note: Changes in percentage points are over the period 1970-71 to 2004-2005.

Source: Estimates of Domestic Product, Arunachal Pradesh, Directorate of Economics and Statistics, Itanagar, 2002.

### Growth of Various Sectors: 1970-71 to 2004-05

During the period 1970-71 to 2004-05, the growth rate of the service sector was the highest, followed by that of the secondary and the primary sectors. So far as the growth rate in various sub-periods under study are concerned, in the 1970s and in the 1990s the service sector had registered the highest growth rates among the three sectors, but in the 1980s it was the primary sector, which had grown at a faster rate. In sectoral terms, the primary sector, starting from a growth rate of 4.61 per

cent in the 1970s, reached a high growth of nearly 9 per cent per annum in the 1980s, but witnessed a remarkable slowdown in its growth during 1990-91 to 2004-05. Agriculture, after growing at an annual average rate of 9.18 per cent in the 1980s also witnessed a sharp deceleration in the 1990s. While this broad pattern was true for all other sub-sectors, within the primary sector, perhaps, the striking feature is the negative growth of forestry and logging since the 1990-91 (Table 3.3). The secondary sector as a whole has witnessed a decline in growth rate during the three decades. Manufacturing sector expanded at the average annual rate of 9.4 per cent while construction grew at a rate of 7.11 per cent per annum. However, both these sectors registered remarkably lower growth rates during the 1990s in comparison to the earlier decades. The tertiary sector expanded quite rapidly in the 1970s registering a growth of 11.39 per cent annually. In the 1980s tertiary sector's growth slowed to 7.62 per cent, but what is remarkable is that in spite of overall slowing down of the economy in the 1990s the tertiary sector grew at 7.53 per cent per annum and public administration grew at a high rate of 8.68 per cent (Table 3.3).

**TABLE 3.3**  
**Growth Rate of Industries in Arunachal Pradesh: 1971-2005**

<i>Name of the Industries</i>	<i>1970-71 to 1979-80</i>	<i>1980-81 to 1989-90</i>	<i>1990-91 to 2004-05</i>	<i>1970-71 to 2004-05</i>
Agriculture	6.4	9.18	1.22	5.95
Forestry and Logging	0.32	4.05	-7.92	2.48
Fishing	16.1	34.3	4.8	18.55
Mining and Quarrying	14.4	37.3	9.99	16.04
<b>Primary Sector</b>	4.61	8.48	-0.26	5.40
Manufacturing	14.2	7.85	-0.61	9.44
Construction	7.70	6.26	3.89	7.11
Elect., Gas, etc.	0	0	0	0
<b>Secondary Sector</b>	8.03	6.43	3.69	7.49
Transport, Storage and Comm.	9.77	13.3	12.49	12.63
Trade, Hotel, etc.	17.6	9.69	-0.89	8.39
Banking and Insurance	27.96	20.77	11.39	16.45
Real Estates, etc.	3.57	4.54	4.03	10.50
Public Adm.	10.81	5.29	8.68	8.05
Other services	9.58	9.5	7.61	9.44
<b>Tertiary Sector</b>	11.39	7.62	7.53	9.17
NSDP	7.07	7.81	3.55	7.05
Population	3.04	3.12	1.14	2.75
NSDP per capita	4.03	4.69	1.61	4.32

*Source:* Calculated from *Estimates of Domestic Product*, Directorate of Economics and Statistics, Government of Arunachal Pradesh, Itanagar, 2002.

The decade of the 1990s witnessed the structural imbalances of the State's economy. In the beginning of the 1990s the State-owned non-timber industries faced closure because of accumulated losses. The process of industrial closure got aggravated with the imposition of restriction on the felling of trees by the Supreme Court. The timber-based industries which constituted the backbone in the State's industrialisation were closed down after 1996-97. The down-turn of industrial sector and the non-expanding primary sector were translated into a semi-stagnation of the State economy. However, the economy did not slide down into a state of negative growth because of the expansion of the tertiary sector especially the public administration whose relative importance in the NSDP progressively increased.

### Sectoral Contributions to the Growth of NSDP

During 1970-71 to 2004-05 the contribution of agriculture to the growth of the Arunachal Pradesh's economy was higher than that of any other sectors. Though agricultural growth was not very high compared with other sectors, yet its relatively higher share in the State's NSDP resulted in its higher contribution to the growth of the economy. During 1970-71 to 2004-05, on an average, the contribution of agriculture to NSDPs growth was 31.16 per cent, while its share was 32.52 per cent (Table 3.4). Forestry and logging, which is an important sector of Arunachal Pradesh's economy, having on an average, a share of 8.78 per cent of NSDP during 1970-71 to 2004-05, has grown only at a rate of 2.48 per cent per annum. As a result, its contribution to the economic growth was just 3.51 per cent. The primary sector as a whole made a contribution of 32.40 per cent to the growth of the State's economy during the period.

Manufacturing sector has grown at a high rate of 9.44 per cent during 1970-71 to 2004-05, but its small size—its average contribution being 3.77 per cent of NSDP—kept its relative contribution to the growth of NSDP to 5.73 per cent. In contrast, construction with a growth rate of 7.11 per cent per annum during the period produced 21.28 per cent of the growth of the State economy. This large contribution emanated mainly from its relatively large size—during the period construction contributed on an average 18.58 per cent of the State's income. The overall contribution of the secondary sector was 22.64 per cent of the State's economic growth. Tertiary sector contributed 44.96 per cent of the growth of NSDP during the period. Within the tertiary sector, public administration, which forms the largest sub-sector with a 11.99 per cent share of NSDP, contributed 15.56 per cent of the growth of NSDP.



**TABLE 3.4**  
**Sectoral Contribution to NSDP Growth**  
**in Arunachal Pradesh**

Sl. No.	Sectors	1971-1980	1981-1990	1990-91 to 2004-05	1970-71 to 2004-05
1	Agriculture	35.56	41.95	12.03	31.16
2	Forestry and Logging	0.82	5.45	-6.85	3.51
3	Fishing	0.16	1.30	1.52	2.36
4	Mining and Quarrying	0.25	5.66	1.60	2.51
5	<b>Primary Sector</b>	36.79	54.36	8.90	32.40
6	Manufacturing	2.91	5.93	-1.65	5.73
7	Construction	21.53	12.51	22.32	21.28
8	Electricity, Gas and Water Supply	-0.52	0.00		
9	<b>Secondary Sector</b>	23.92	18.44	26.41	22.64
10	Transport, Storage and Comm.	2.66	0.79	24.42	8.33
11	Trade, Hotel and Restaurant	9.40	5.43	1.91	6.44
12	Banking and Insurance	1.09	3.30	4.52	4.70
13	Real Estate, Ownership of Dwellings and Business Services	0.37	3.57	-0.30	5.44
14	Public Administration	17.54	5.63	28.25	15.56
15	Other Services	8.23	8.48	12.23	14.23
16	<b>Tertiary Sector</b>	39.29	27.20	64.68	44.96
	<b>Total</b>	100.00	100.00	100.00	100.00

Source: Calculated from *Estimates of Domestic Product*, Arunachal Pradesh, Directorate of Economics and Statistics, Itanagar, 2005.

There is a significant decadal variation in the relative sectoral contributions to the growth of NSDP in Arunachal Pradesh. In the 1970s agriculture contributed 35.56 per cent of the State's economic growth, which increased to 41.95 per cent in the 1980s but declined steeply to a modest 12.03 per cent during 1990-91 to 2004-05. It was in the 1980s that the primary sector's contribution soared to the peak rate of 54.36 per cent and in the last period it had dropped to only 8.90 per cent. In the post-1990 phase, forestry and logging made a negative contribution of more than 6 per cent. It is interesting to note that the secondary sector's contribution to the NSDP growth dipped in the 1980s and rose sharply in the last period. The contributory role of the tertiary sector followed almost a similar pattern as that of the secondary sector—in the 1970s the tertiary sector's contribution amounted to 39.29 per cent, and then rose to 64.68 per cent during 1990-91 to 2004-05.

### Inter-District Variations in Level of Income

The levels of income at the district level, as captured by the per capita net district domestic product (NDDP) shows considerable inter-district variations. Between

1993-94 and 2003-04, the average per capita income of the poorest district, Lower Subansiri, was just 53.47 per cent of that of the richest district, Dibang Valley. Among the 13 districts, six districts, viz., Dibang Valley, West Kameng, East Siang, Tawang, Upper Siang, and Papum Pare had a per capita income higher than that of the State. At the lower end of the income ladder, the districts having a low per capita income included East Kameng, Changlang and Lower Subansiri (Annexure Table A-3.1).

### Growth of Income in the Districts: 1993-94 to 2003-04

Sharp variations in the growth of income in different districts of Arunachal Pradesh are noticed during 1993-94 to 2003-04. The highest growth in district domestic product was registered in Upper Siang; its income grew at the average annual exponential rate of 7.84 per cent, the highest among all the 13 districts of the State. The NDDP of Papum Pare grew at the average rate of 5.0 per cent per annum during the period. East Siang had a negative growth of 0.84 per cent (Table 3.5). Dibang Valley, the district having the highest per capita income among all the districts of Arunachal Pradesh had a growth rate of 0.24 per cent, a rate which is much below the State average. Lower Subansiri, the district with the lowest per capita income experienced a growth rate of 4.49 per cent.

**TABLE 3.5**  
**District-wise Growth Rate of Net District**  
**Domestic Product: 1993-94 to 2003-2004**

Name of the District	1993-94 to 2003-04	
	Growth Rate of Net Domestic Product	Growth Rate of Per Capita Net Domestic Product
Tawang	3.29 (7)	-0.58 (9)
West Kameng	1.71(11)	-1.33(12)
East Kameng	2.57(9)	1.70(5)
Papum Pare	5.00(3)	-0.59(10)
Lower Subansiri	4.49(5)	3.30(2)
Upper Subansiri	5.24(2)	4.27(1)
West Siang	2.53(10)	1.14(7)
East Siang	-0.84(13)	-0.03(8)
Upper Siang	7.84 (1)	-0.71(11)
Dibang Valley	0.24(12)	-2.66(13)
Lohit	2.95(8)	1.30(6)
Changlang	4.33(6)	2.37(4)
Tirap	4.64(5)	2.96(3)
Arunachal Pradesh	3.10	1.53

Note: Growth rates are average yearly exponential growth rate of net domestic product of a district/Arunachal Pradesh and that of per capita net domestic product of a district/Arunachal Pradesh respectively. Figures within brackets refer to rank of districts.

Source: Same as table 3.4

## Composition of District Domestic Product

The sectoral composition of district product provides some interesting insights into the inter-district variation in the changes in the structure of production in Arunachal Pradesh. There were at least four districts, where, on an average, agriculture contributed less than 25 per cent of the district domestic product during 1993-94 to 2000-01. It is not just that in the highly urbanised Papum Pare district agriculture contributed around 13 per cent of the NDDP, but also in few others, such as West Kameng (14.45), Tirap (27.52) and Upper Subansiri (25.74), the share of agriculture is considerably low. In fact, the only district, which, on an average, derived more than 40 per cent of its district domestic product from agriculture, was East Siang (Annexure Table A-3.3). West Kameng, Lohit, Changlang and Tirap districts had a relatively high dependence on forestry and logging. As a whole, the share of the primary sector in the NDDP ranged from 18.21 per cent in Papum Pare to around 55 per cent in Changlang. The other district deriving more than 45 per cent of the district domestic product from the primary sector were Dibang valley, East Siang and Upper Siang."

The relatively insignificant contribution of manufacturing to the State's economy is brought out sharply from the analysis of its contribution at the district level. Out of the 13 districts, in as many as 9 districts, the share of manufacturing in NDDP was less than 2.5 per cent. The share of manufacturing was highest in Tirap (10.45 per cent), while the least industrialised district, Tawang, derives less than 1 per cent of its income from manufacturing. Within the secondary sector, construction has come to play a more significant role than manufacturing. In 5 of the 13 districts, on an average, it has contributed to more than 20 per cent of the NDDP. The relative prominence of the tertiary sector in the State's NSDP also gets manifested at the district level. In the 2 districts of Papum Pare and Tawang, its share has been more than 50 per cent, while in 9 others it ranges from 30-40 per cent. The lowest share of the tertiary sector was 27.25 per cent in Upper Siang district.

The considerable inter-district variations in the share of different sectors in the NDDP, clearly brings out the spatial unevenness in the transformation of the State's economy. The district level analysis, nevertheless, does point out the great deal of similarity in the nature of economic transformation across the districts, so far as some broad features of the transformation process, such as the relative insignificance of manufacturing and the predominance of the service sector are concerned.

Although the 10-year period under consideration here is too short to study the changes in the structure of the domestic product, the fall in the share of the secondary sector along with that of the primary sector, at the district level is too pervasive to be neglected (Annexure Table A-3.3). In all the districts, without any exception, the relative importance of the tertiary sector has increased. The fall in relative share of the primary sector is 1.78 per cent points and that in the share of the secondary sector is 0.43 per cent points for the entire state. The total fall in the shares of these two sectors is 2.21 per cent points which is matched by the rise in the share of tertiary sector. In the tertiary sector, public administrations relative share has increased in all the districts.

The share of agriculture has declined in all but two districts of the state—Upper Subansiri and Upper Siang. In Upper Siang agriculture's share increased by 2.18 per cent points per annum and in Upper Subansiri the share of agriculture increased slowly by 0.17 per cent points per annum. In Arunachal Pradesh as a whole the share of agriculture fell marginally by 0.25 per cent points per annum. The share of forestry and logging fell in all the districts, with the highest fall of 2.44 per cent points per annum in Tirap. The fall in the share of forestry and logging in the composition of domestic product was also pronounced in West Kameng, which experienced a yearly fall of 2.36 per cent points. In Arunachal Pradesh forestry and logging lost its share in NSDP by an average of 1.53 per cent points per annum during 1993-94 to 2000-01. The share of manufacturing industry in domestic product grew very slowly in some districts, in others the share remained unchanged or even went down further (Annexure Table A-3.3).

## Sectoral Distribution of Workers

Along with the changes in the structure of production, the sectoral distribution of the workers in Arunachal Pradesh has also undergone some important changes. The share of primary sector workers came down from 80.40 per cent in 1971 to 62.27 per cent in 2001. The share of workers engaged in the secondary sector increased from a negligible 0.44 per cent to 11.41 per cent during the same period, and the share of the tertiary sector workers went up from 19 per cent to around 26 per cent during the same period. While changes in the distribution of workers broadly follow the direction of changes in the structure of production, the pace of changes in the employment structure is much slower. Two important aspects of this changing pattern of employment in Arunachal Pradesh



are, firstly, the pace of transformation has been much slower in the rural than in the urban areas; and secondly, women in general and rural women in particular, are moving out of agriculture rather at a much slower pace. Even in 2001, for example, 74 per cent of rural workers were still engaged in the primary sector. In the case of female workers, their share in primary sector was as high as 89 per cent in rural areas and 82 per cent in all areas. (Table 3.6).

When the composition of workers is analysed at a disaggregated level, it is noticed that although the share of cultivators had been declining, that of agricultural labourers had been increasing during 1971-1991 (Table 3.7). Less than 3 per cent of workers in the State are engaged in the manufacturing sector. Over the years the share of workers engaged in the household manufacturing has declined and that in non-household manufacturing has slightly increased. Although the share of workers in construction increased substantially during 1971-1991, it decreased during 1981-1991, bringing down the share of workers in the secondary sector during the latter period. Within the tertiary sector, share of workers engaged in trade and commerce as well as in other services, that includes public administration went up substantially.

### Occupational Structure of Workers at District Level

The industrial classification of main workers at the district level shows a marked unevenness in the process of workforce restructuring in the State. In 1981, the share of cultivators in total main workers ranged from 84 per cent

in Upper Subansiri to only 47.47 per cent in Dibang Valley. In all the districts, a negligible percentage of total workers were engaged in household manufacturing, and in non-household manufacturing the highest share was in Lohit district, which was only 4.7 per cent. The share of workers in construction in total main workers ranged from a low of 5.96 per cent in Tirap to a high of 13.40 per cent in West Kameng. During 1980s the shift of workers away from agriculture continued in all the districts, but with an uneven pace. In districts such as East Kameng and Lohit, more than 70 per cent of the workers were still in the cultivator category, while in others, such as Dibang Valley it had come down to less than 40 per cent in 1991. Around 20 per cent of workers in Dibang Valley were agricultural labourers and their share in rural areas was even higher. But in none of the districts, the share of manufacturing showed a significant rise. It was rather construction activities whose share reached in between 6 to 11 per cent in a number of districts. Similarly, the share of 'other services' ranged from 35 per cent in Tawang to 12 per cent in East Kameng (Annexure Table A-3.4 and A-3.5).

Although, figures in Annexure Table A-3.6 are based on both main and marginal categories of workers, yet the essential features of workforce restructuring at the district level could be made out from it. Among all the districts, Papum Pare has the lowest share in cultivation, which is less than 25 per cent, while three districts have more than 70 per cent of the total workers in cultivation. The share of agricultural labourers in total workers is the highest in Dibang Valley, while it is the lowest in Tirap. In all the

TABLE 3.6  
Sectoral Distribution of Workers by Industries in Arunachal Pradesh: 1971-2001

Areas		Primary				Secondary				Tertiary			
		1971	1981	1991	2001	1971	1981	1991	2001	1971	1981	1991	2001
Total	Male	68.78	63.21	54.60	51.57	0.65	13.13	12.34	14.54	30.56	23.66	33.06	33.93
	Female	97.12	95.11	89.93	81.70	0.14	2.00	2.21	5.74	2.74	2.89	7.87	12.55
	Total	80.44	75.28	67.44	62.27	0.44	8.92	8.66	11.41	19.12	15.80	23.90	26.32
Rural	Male	72.30	68.00	62.34	64.59	0.55	11.85	11.09	12.18	27.15	20.15	26.57	23.23
	Female	97.38	96.10	92.61	89.04	0.11	1.74	1.87	4.47	2.50	2.16	5.52	6.49
	Total	82.92	79.08	74.13	74.14	0.36	7.87	7.50	9.17	16.72	13.06	18.37	16.69
Urban	Male	5.39	6.75	6.72	6.70	2.58	28.25	20.10	22.63	92.03	65.00	73.18	70.64
	Female	45.99	30.60	22.46	15.40	5.75	18.93	10.69	17.22	48.26	50.47	66.85	67.39
	Total	8.01	9.25	8.86	8.40	2.78	27.27	18.82	21.57	89.21	63.47	72.32	70.03

Sources: i. Census of India: Arunachal Pradesh (1971) Series-24, Part-II (B)  
 ii. Census of India: Arunachal Pradesh (1981) Series-24, Part-III (A&B)  
 iii. Census of India: Arunachal Pradesh (1991) District Census Handbook, 1991, Series-III.

TABLE 3.7

## Changes in Sectoral Distribution of Workers in Arunachal Pradesh

Sectors	Percentage of Workers		
	1971	1981	1991
Cultivators	78.34	71.26	60.36
Agricultural Labourers	1.96	2.49	5.13
Livestock/Forestry/Fishing	0.14	1.51	1.77
Mining and Quarrying	0	0.02	0.18
<b>Primary Sector</b>	<b>80.44</b>	<b>75.28</b>	<b>67.44</b>
Manufacturing in Household Industry	0.31	0.32	0.19
Manufacturing other than in Household Industry	0.04	1.64	2.49
Construction	0.1	6.97	5.98
<b>Secondary Sector</b>	<b>0.44</b>	<b>8.92</b>	<b>8.66</b>
Trade and Commerce	0.58	2.22	3.31
Transport, Storage and Communication	0	0.41	1.13
Other Services	18.54	13.17	19.47
<b>Tertiary Sector</b>	<b>19.12</b>	<b>15.8</b>	<b>23.9</b>
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>

Sources: Census of India (Arunachal Pradesh) 1971, 1981 and 1991 Economic Tables.

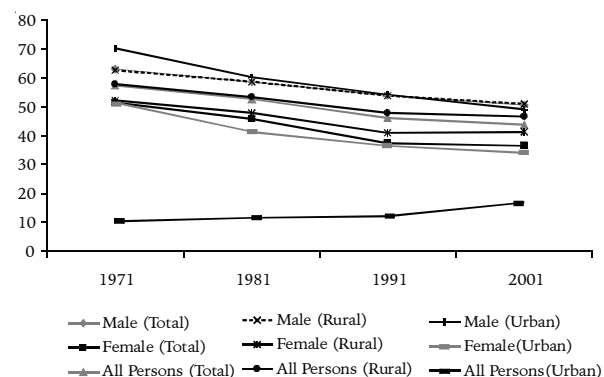
districts the share of workers in household industry remains below 1.5 per cent of the total workers.

### Trends in Workforce Participation: 1971-2001

The overall work participation rate (WPR) in Arunachal Pradesh went down from around 58 per cent in 1971 to nearly 44 per cent in 2001 (Figure 3.2). The rural WPR has all along been higher than that in the urban areas. WPR in Arunachal Pradesh, during 1981-1991, for both males and females, were higher than the national average. However, the gap between the two was wider in case of female work participation rate (FWPR). In 2001, FWPR of the State was 36.45 per cent in comparison with the national average of 25.68 per cent. The gap between male and female WPRs in the State was lower than that at the national level. This can be attributed to the relatively higher percentage of ST population as well as the low levels of development in the State.

FIGURE 3.2

## Work Participation Rates in Arunachal Pradesh: 1971-2001



There has been a persistent decline in both male and female WPRs in rural areas, and for males in urban areas. In particular, there has been a remarkable decline in the FWPR in the rural areas.<sup>1</sup> The gap between male and female WPRs had been increasing during 1971-1991 but in the 1990s it has declined, partly because of a sharper fall in male work participation rate during the period. As expected, gender gap in work-participation is much higher in the urban areas than the rural areas. The FWPRs have been very low in the urban areas, although it has shown a rise from 11 per cent in 1971 to 17 per cent in 2001.

The inter-district variations in work participation rates have been presented in Annexure Table A-3.7 through Table A-3.9. In 2001, the overall WPR varied from 56.31 per cent in Tawang district to 36.32 per cent in Papum Pare district. In urban WPR the highest was recorded in Tawang, but East Siang had the lowest overall WPR. In terms of rural WPR, Tawang and Papum Pare were at the top and the bottom respectively. So far as female work participation rates are concerned, in 2001, Tawang, closely followed by Tirap had the highest FWPR, while Papum Pare the lowest. In case of urban FWPRs, which were significantly below those in rural areas in all the districts, East Kameng was at the top while Lohit had the lowest value. The rural FWPR, which shows a great deal of inter-district variations, was highest in Tirap and lowest in Papum Pare. So far as the gender gap in work

1. The relationship between economic development and female work participation rate has been a widely-debated issue. Often it is conceptualised in terms of a U-shaped curve. At initial stages of development a good portion of non-agricultural productive activity takes place in households where females find it easy to combine their traditional domestic responsibilities with part-time productive endeavour. With movement to higher levels of development as the production structure gets more formalised, the scope of such informal work shrinks. A second set of arguments emphasises the role of shrinkage in span of working age, resulting from greater consciousness of the need for learning rather than earnings in early years of life on the one hand and lowering of average exit age with the growth of organised sector on the other, in contributing to the decline of work of both males and females (Durand, 1975). At an advanced stage of development, spread of education among women, skill-acquisition as well as rising levels of living enhances the employability of women in the economy, particularly in the service sector, leading to rising work participation rates among females.

**TABLE 3.8**  
**Work Participation Rates in Arunachal Pradesh and India: 1971-2001**  
*(Percentages)*

<i>Arunachal Pradesh</i>		1971	1981	1991	2001
All Populations	Male	63.14	58.63	53.76	50.69
	Female	51.28	45.67	37.49	36.45
	Total	57.65	52.63	46.24	43.97
Rural	Male	62.78	58.50	53.69	51.13
	Female	52.27	47.64	40.86	41.33
	Total	57.88	53.42	47.69	46.47
Urban	Male	70.32	60.24	54.18	48.99
	Female	10.58	11.62	11.95	16.69
	Total	51.57	41.47	36.39	34.19
<i>India</i>					
All Populations	Male	52.7	52.6	51.6	51.93
	Female	13.9	19.8	22.3	25.68
	Total	34.0	36.8	37.5	39.26
Rural	Male	53.6	53.8	52.5	52.36
	Female	15.5	23.2	26.7	30.98
	Total	36.1	38.9	40.0	41.97
Urban	Male	48.9	49.1	48.9	50.85
	Female	7.1	8.3	9.2	11.55
	Total	29.6	30.0	30.2	32.23

*Note:* (i) Work Participation Rates = {Total Workers (Main + Marginal)/Total Population} × 100  
(ii) Figures for 2001 are based on provisional population totals.  
*Source:* Census of India 2001, Series-13, Arunachal Pradesh, Provisional Population Totals, Paper-3 of 2001.

participation was concerned, West Kameng had the highest and Lower Subansiri the lowest gap in overall work participation. The gender gap in work participation was considerably lower in rural than in urban areas. West Kameng, followed by Lohit, had the highest gender gap in rural WPR while Lower Subansiri and Tirap had the lowest gender gap. The gender gap in WPR was significant in urban areas—it was the highest in Tirap and Changlang and was the lowest in East Kameng and Lower Subansiri. So far as the determinants of inter-district variations in overall WPR are concerned, it is found that WPR is negatively correlated with literacy in 1991 as well as in 2001.<sup>2</sup>

## Conclusion

The significance of the process of structural transformation of Arunachal Pradesh's economy lies in the speed with which a set of relatively isolated, *jhum*-based

economies got transformed into a money-based economy within few decades. The analysis of the level and growth of the per capita income of the state, notwithstanding the limitations of the data, clearly points out that starting from a very low base the State's economy has grown, on average, at a comparatively high growth rate. But in the 1990s, particularly after 1993-94, the growth rate of the economy slowed down substantially. There has been a decline in the share of the primary sector in NSDP, but the share of the manufacturing sector continues to be abysmally low in the State. On the other hand, there has been a phenomenal growth of the service sector. This sector has maintained a higher growth rate than the other two sectors, and its contribution to the growth was substantial during 1970-71 to 2001-02. The declining significance of the primary sector, the relative insignificance of the secondary sector in general, and that of manufacturing in particular as well as the growing importance of the service sector in the State's economy come out in bolder relief at the district level analysis. However, the spatially uneven process of transformation as well as the high degree of inter-district variations of per capita income has also been brought out by the foregoing analysis.

The work participation rates in the State had been consistently declining during 1971-2001, for all categories of workers, with the sole exception of urban female workers. With increasing opportunity for formal education, the young age population in general, and young girls in particular have been withdrawing from the workforce to get educated before they enter the job market. Other possible reasons could be the move away from labour-intensive shifting cultivation practices, withdrawal of the old and the women from the economy as a result of betterment of standard of living, changes in the family composition of the migrants to the State, etc. So far as the changing sectoral composition of workers is concerned, it is noticed that there is a steady decline in the share of workers in the primary sector. While the proportion of workers in the secondary sector has increased, mainly because of the growth in the construction sector, that of the workers in the tertiary sector has shown a remarkable rise.

Our analysis shows that agriculture, construction, transport, storage, communications, trade, business and public administration are the dynamic activities in the economy. In terms of growth of inputs, there has been a

2. The results of the regression analysis are as follows: For 1991,  $WPR_{91} = 65.623 - 0.459 Lit_{91}^* (-6.030)$ ,  $R^2 = 0.802$ ,  $Adj R^2 = 0.780$ ,  $N = 11$ , and for 2001,  $WPR_{01} = 67.322 - 0.420 Lit_{01}^* (-3.463)$ ,  $R^2 = 0.522$ ,  $Adj R^2 = 0.478$ ,  $N = 12$ ; where \* implies significance at 1 per cent level and figures within the brackets are t-values.

robust expansion of land under cultivation in general and that under permanent cultivation in particular, both the quantity and quality of the labour force has improved through both migration from outside the State and improvement in the levels of educational attainment, and finally, there has been a steady growth of physical capital, though the magnitude of its increase, in the absence of data, is difficult to ascertain. However, the prime mover of the growth of the economy has been the flow of funds from the Centre. For a number of historical, political and strategic considerations, outlined in earlier chapters, the State has been playing a central role in modernising, and thereby increasing the productive capacity of the economy. Under special constitutional provisions, the State has been receiving central funds to the tune of around 70 per cent of the State's revenue and around 50 per cent of its NSDP. As a proportion of the State income, the inflow from the Centre has been declining in recent years, but the absolute value of the inflow in real terms is not falling—in fact it is increasing. During the 17 years from 1986-87 to 2002-03 the real inflow increased at the constant annual growth of 2.55 per cent. However, the inflow as a percentage of the State income declined on an average by 2.15 points per year. The relative importance of the inflow in the State budget has changed little since the mid-1980s. During the period 1986-87 to 2001-02, the inflow of funds from the Centre constituted about 80 per cent of the total revenue of the State. In 2002-03

however the proportion declined to about 68 per cent<sup>3</sup> (GoAr P, 2005). There is an urgent need to expand and consolidate the earnings of the State's own financial resources.

The chapters on various sectors of the economy have identified several key areas, which needs urgent attention for creating a strategy of sustainable and inclusive growth.<sup>4</sup> The prospect of creating an industrial base in the State seems daunting in the light of the ecological and economic specificities of the State. However, a carefully designed strategy for establishing specific industries having strong forward and backward linkages is the need of the hour. At the same time, the earlier reliance on state-owned and state-initiated industrialisation should be reviewed in the light of the changes in the economic environment at the national as well as the regional level. The hydro-power potential of the state has been much talked about. But the success of this sector depends on massive investment in the power sector both by the public as well as the private sector. Making the private sector interested in long-term and heavy investments in the state requires an imaginative public policy. Effective and efficient institutional structures are key to the development process. Issues like transparency and accountability in governance are going to play an increasingly significant role in fostering economic growth in Arunachal Pradesh.

3. For a detailed discussion on the fiscal issues and the dependence of the state government on Central government see the chapter on fiscal issues.

4. Also see the chapter devoted to development strategy, which contains a review of the strategies followed so far and suggest various measures to develop a locally relevant development strategy, keeping in mind the various specificities of the State.

ANNEXURE TABLE A-3.1

## Per Capita Net Domestic Products in Districts of Arunachal Pradesh: 1993-94 to 2003-04

<i>District</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>Rank</i>	<i>Std. Deviation</i>
Tawang	9287	12082	10265.00	3	996.84
W. Kameng	10698	14740	12108.27	2	1279.56
E. Kameng	6703	8939	7638.18	12	797.21
Papum Pare	7848	10582	9211.09	6	781.70
L.Subansiri	5811	8415	6715.09	13	985.75
U.Subansiri	6075	9670	7844.18	10	1200.83
West Siang	7842	9465	8737.36	8	574.70
East Siang	8223	12203	10150.55	4	1647.37
Upper Siang	8912	10374	9662.56	5	463.21
Dibang Valley	10181	13890	12559.82	1	1363.41
Lohit	7655	9891	8771.73	7	751.60
Changlang	6364	9626	7757.18	11	1119.33
Tirap	7166	10391	8295.91	9	1240.53

*Note:* Unit of Minimum, Maximum, Mean and Std. Deviation is Rupee.

*Source:* Computed from *Estimates of District Domestic Product*, Directorate of Economics and Statistics, Government of Arunachal Pradesh, Itanagar, various years.

ANNEXURE TABLE A-3.2

## Growth Rates of District Domestic Product in Arunachal Pradesh: 1993-94 to 2003-04

	<i>Tawang</i>	<i>West Kameng</i>	<i>East Kameng</i>	<i>Papum Pare</i>	<i>Lower Subansiri</i>	<i>Upper Subansiri</i>	<i>West Siang</i>	<i>East Siang</i>	<i>Upper Siang</i>	<i>Dibang Valley</i>	<i>Lohit</i>	<i>Changlang</i>	<i>Tirap</i>
Agriculture	-1.21	0.67	1.83	1.69	6.12	7.29	-0.88	-9.08	59.06	-8.56	1.33	5.67	8.37
Forest, etc.	-6.05	-14.79	-16.43	-9.62	-19.30	-21.23	-23.10	-13.96		-11.00	-10.05	-5.99	-9.33
Fishing	-0.83	7.02	0.52	8.08	-1.60	-2.22	-8.93	1.94	24.06	4.90	8.99	16.84	-12.55
Mining and Quarrying		9.79		53.97			33.55				1.63	8.40	18.67
<b>Primary Sector</b>	-2.49	-6.51	-0.32	0.05	3.39	4.23	-2.81	-9.15		-7.13	-1.22	3.81	4.04
Manufacturing	-0.42	-0.01	-0.19	0.12	0.98	-0.30	0.06	0.12	0.26	0.12	0.10	0.11	0.10
Construction	0.81	0.59	0.60	0.60	0.59	0.60	0.59	0.60	0.60	0.59	0.60	0.58	0.59
<b>Secondary Sector</b>	2.14	4.35	1.21	-0.26	1.36	1.04	1.20	1.17	0.88	0.97	0.90	0.99	0.87
Transport, Storage, etc.	12.73	12.79	12.62	12.61	12.67	12.66	12.62	12.58	12.56	12.64	12.62	12.57	12.60
Trade, Hotel	1.16	1.14	1.10	1.14	1.13	1.14	1.15	1.15	1.06	1.14	1.13	1.14	1.13
Banking and Insurance	12.40	12.58	12.62	12.58	12.58	12.56	12.61	12.67	12.43	12.66	12.54	18.86	12.54
Real Estate, etc.	4.57	4.93	4.97	6.74	4.76	4.85	5.21	4.63	4.75	4.61	5.16	4.49	4.77
Public Admin.	9.72	9.73	9.66	9.70	9.66	9.68	9.65	9.66	9.68	9.69	9.65	9.67	9.34
Other Services	8.09	8.09	8.03	8.09	8.11	8.09	8.10	8.09	8.09	8.09	8.10	8.10	8.08
<b>Tertiary Sector</b>	7.98	8.12	8.44	9.18	8.44	8.20	8.31	8.03	8.40	8.32	8.42	7.97	8.15

*Source:* Computed from *Estimates of District Domestic Product*, Directorate of Economics and Statistics, Government of Arunachal Pradesh, Itanagar, various years.



ANNEXURE TABLE A-3.3

## Structure of District Domestic Product in Arunachal Pradesh: Average for the Period 1993-94 to 2000-01

	<i>Tawang</i>	<i>West Kameng</i>	<i>East Kameng</i>	<i>Papum Pare</i>	<i>Lower Subansiri</i>	<i>Upper Subansiri</i>	<i>West Siang</i>	<i>East Siang</i>	<i>Upper Siang</i>	<i>Dibang Valley</i>	<i>Lohit</i>	<i>Changlang</i>	<i>Tirap</i>
Agriculture	29.33	14.45	36.55	12.86	36.57	25.74	32.45	45.00	32.48	39.69	29.01	34.02	27.52
Forest, etc.	5.22	20.25	5.01	4.05	4.49	3.41	3.68	3.04	5.79	3.45	7.95	10.52	7.38
Fishing	0.74	0.49	2.04	0.87	1.30	0.13	1.12	0.87	1.18	1.32	1.08	2.04	0.54
Mining and Quarrying	0.06	0.05	0.02	0.43	0.09	0.18	0.07	0.01	0.01	0.04	0.06	8.17	0.43
<b>Primary Sector</b>	35.35	34.13	43.62	18.21	42.45	29.46	37.32	48.91	48.21	45.05	38.10	54.64	35.90
Manufacturing	0.88	2.04	0.89	1.66	0.96	1.08	1.62	1.37	1.05	3.18	5.43	4.67	10.45
Construction	6.07	24.49	24.07	21.08	22.39	21.59	18.61	14.86	31.88	15.54	15.13	13.36	17.15
<b>Secondary Sector</b>	7.66	25.86	25.63	24.98	23.86	23.09	20.71	16.62	33.30	19.01	20.89	18.43	28.11
Transport, Storage, etc.	2.64	4.07	1.56	6.81	2.91	6.11	6.64	4.69	4.57	8.39	8.92	3.43	3.91
Trade, Hotel	4.75	5.63	3.66	5.53	3.92	5.48	6.17	5.36	3.80	5.72	5.93	4.47	4.49
Banking and Insurance	1.55	1.89	2.67	5.14	2.47	1.73	2.00	1.62	1.71	1.31	1.41	3.59	2.10
Real Estate, etc	2.48	2.08	2.75	2.52	3.28	2.33	2.01	2.39	2.57	2.02	1.35	2.78	2.93
Public Admin.	9.69	11.82	16.78	32.15	15.45	10.96	12.57	10.18	10.67	8.16	8.83	10.26	13.43
Other Services	35.88	14.51	3.33	4.67	5.75	20.63	12.58	10.21	3.92	10.34	14.58	4.34	9.13
<b>Tertiary Sector</b>	56.99	40.01	30.75	56.82	33.63	47.45	41.97	34.46	27.25	35.94	41.01	26.93	35.98

*Note:* Values against each sector are percentages of contribution by it to Net Domestic Product.

*Source:* Computed from *Estimates of District Domestic Product*, Directorate of Economics and Statistics, Government of Arunachal Pradesh, Itanagar.



**ANNEXURE TABLE A-3.4**  
**Industry-wise Distribution of Workers in Districts of Arunachal Pradesh: 1981**

<i>District</i>		<i>Cultivators</i>	<i>Agri. Lab</i>	<i>Livestock Forestry etc.</i>	<i>Mining and Quarrying</i>	<i>Household Industries</i>	<i>Other than Household Industries</i>	<i>Const.</i>	<i>Trade and Commerce</i>	<i>Transport, Storage and Comm.</i>	<i>Other Services</i>
West Kameng	T	57.72	1.90	3.68	0.01	0.48	1.82	13.40	3.21	0.54	17.25
	R	60.57	1.95	3.81	0.00	0.47	1.56	12.97	2.75	0.44	15.49
	U	1.99	0.96	1.22	0.06	0.58	6.87	21.89	12.13	2.44	51.86
East Kameng	T	81.65	0.84	1.07	0.00	0.06	0.38	7.48	1.30	0.11	7.12
	R	81.65	0.84	1.07	0.00	0.06	0.38	7.48	1.30	0.11	7.12
	U	-	-	-	-	-	-	-	-	-	-
L/Subansiri	T	73.82	1.03	0.94	0.00	0.31	0.91	6.67	1.98	0.36	13.98
	R	82.70	1.12	0.55	0.00	0.26	0.39	3.91	1.17	0.12	9.80
	U	1.70	0.29	4.14	0.00	0.70	5.21	29.12	8.55	2.38	47.91
U/Subansiri	T	83.60	0.45	0.16	0.00	0.12	0.52	2.36	1.18	0.13	11.48
	R	83.60	0.45	0.16	0.00	0.12	0.52	2.36	1.18	0.13	11.48
	U	-	-	-	-	-	-	-	-	-	-
West Siang	T	78.02	1.29	0.52	0.00	0.64	0.74	4.91	1.95	0.34	11.61
	R	85.41	1.30	0.43	0.00	0.34	0.52	3.67	1.11	0.23	6.99
	U	10.22	1.16	1.36	0.00	3.38	2.72	16.23	9.68	1.36	53.89
East Siang	T	70.88	5.31	0.57	0.11	0.54	1.07	7.67	2.35	0.35	11.17
	R	77.22	5.51	0.46	0.12	0.35	0.78	7.23	1.33	0.13	6.89
	U	11.60	3.49	1.60	0.03	2.34	3.78	11.73	11.89	2.37	51.15
Dibang Valley	T	47.47	13.06	1.93	0.00	0.23	1.83	8.58	4.16	0.63	22.11
	R	47.47	13.06	1.93	0.00	0.23	1.83	8.58	4.16	0.63	22.11
	U	-	-	-	-	-	-	-	-	-	-
Lohit	T	59.63	2.73	1.96	0.00	0.32	4.73	6.16	3.41	0.82	20.25
	R	64.20	2.94	1.87	0.00	0.21	4.79	5.16	2.51	0.58	17.75
	U	3.23	0.15	3.63	0.00	2.02	4.64	21.67	0.30	4.44	59.93
Tirap	T	76.68	1.64	2.27	0.02	0.12	2.28	5.96	1.57	0.41	9.04
	R	76.68	1.64	2.27	0.02	0.12	2.28	5.96	1.57	0.41	9.04
	U	-	-	-	-	-	-	-	-	-	-
A.P.	T	71.30	2.49	1.51	0.02	0.32	1.64	6.97	2.17	0.41	13.18
	R	75.05	2.57	1.45	0.02	0.24	1.48	6.15	1.74	0.30	11.02
	U	5.55	1.12	2.75	0.01	1.72	4.51	21.60	8.77	2.41	51.57

Source: Census of India, 1981, Economic Tables.

**ANNEXURE TABLE A-3.5**  
**Industry-wise Distribution of Workers in Districts of Arunachal Pradesh: 1991**

<i>District</i>		<i>Cultivators</i>	<i>Agri. Lab</i>	<i>Livestock Forestry etc.</i>	<i>Mining and Quarrying</i>	<i>Household Industries</i>	<i>Other than Household Industries</i>	<i>Const.</i>	<i>Trade and Commerce</i>	<i>Transport, Storage and Comm.</i>	<i>Other Services</i>
Tawang	T	51.7	5.8	1.7	0	0.3	0.5	2.0	2.9	0.5	34.5
	R	51.7	5.8	1.7	0	0.3	0.5	2.0	2.9	0.5	34.5
	U	-	-	-	-	-	-	-	-	-	-
West Kameng	T	43.3	3.8	3.1	0.0	0.7	2.1	11.2	5.0	1.2	29.6
	R	47.2	4.0	3.2	0.0	0.8	1.9	10.8	4.5	1.0	26.6
	U	2.3	1.9	1.1	0.0	0.2	4.0	15.6	10.9	3.7	60.3
East Kameng	T	76.7	1.5	1.0	0	0.1	0.5	5.8	1.7	0.2	12.5
	R	76.7	1.5	1.0	0	0.1	0.5	5.8	1.7	0.2	12.5
	U	-	-	-	-	-	-	-	-	-	-
L/Subansiri	T	62.2	2.5	1.1	0.0	0.1	1.1	6.6	2.9	1.0	22.6
	R	76.4	2.8	0.7	0.0	0.1	0.8	4.7	1.1	0.4	13.2
	U	5.5	1.4	2.4	0.0	0.4	2.4	13.9	10.2	3.5	60.2
U/Subansiri	T	68.0	1.0	0.3	0.0	0.4	0.5	5.7	2.8	1.0	20.3
	R	68.0	1.0	0.3	0.0	0.4	0.5	5.7	2.8	1.0	20.3
	U	-	-	-	-	-	-	-	-	-	-
West Siang	T	64.9	2.2	0.4	0.0	0.1	1.4	6.0	3.9	1.4	19.8
	R	73.1	2.4	0.5	0.0	0.1	1.2	5.4	2.5	1.2	13.6
	U	8.5	0.7	0.3	0.0	0.1	3.2	9.8	12.9	2.6	62.0
East Siang	T	57.9	9.9	1.8	0.0	0.1	4.4	7.0	3.6	1.1	17.2
	R	64.2	10.8	1.7	0.0	0.1	4.6	5.9	2.4	1.0	13.2
	U	9.5	3.3	2.6	0.0	0.3	3.0	14.8	12.9	5.2	48.1
Dibang Valley	T	37.8	19.2	2.4	0.0	0.1	4.4	7.3	5.2	2.5	21.1
	R	42.8	21.4	2.2	0.0	0.1	4.6	7.2	3.5	1.9	16.4
	U	2.5	3.9	4.4	0.0	0.3	3.0	7.8	17.4	6.7	54.2
Lohit	T	51.5	6.1	2.6	0.0	0.2	6.0	5.7	4.4	2.1	21.4
	R	62.8	7.3	2.6	0.0	0.2	4.1	4.0	2.3	1.6	15.2
	U	2.7	1.1	2.4	0.0	0.3	14.3	13.2	13.1	4.5	48.3
Changlang	T	62.5	9.2	3.5	1.5	0.2	4.2	4.2	2.7	0.7	11.3
	R	62.5	9.2	3.5	1.5	0.2	4.2	4.2	2.7	0.7	11.3
	U	-	-	-	-	-	-	-	-	-	-
Tirap	T	72.7	0.6	1.8	0.1	0.0	3.7	4.3	2.2	0.6	13.9
	R	77.8	0.6	1.8	0.2	0.0	3.8	3.6	1.6	0.4	10.3
	U	0.1	1.3	1.2	0.0	0.1	2.0	15.3	11.0	3.3	65.8
Arunachal Pradesh	T	60.4	5.1	1.8	0.2	0.2	2.5	6.0	3.3	1.1	19.5
	R	66.7	5.5	1.7	0.2	0.2	2.2	5.2	2.3	0.8	15.3
	U	5.0	1.7	2.2	0.0	0.3	5.3	13.2	12.0	3.9	56.4

Source: Census of India 1991, Arunachal Pradesh District Profile 1991, Registrar General of India, New Delhi.

ANNEXURE TABLE A-3.6

## Industry-wise Distribution of Total Workers in Districts of Arunachal Pradesh: 2001

District	Percentage to Total Workers (Main + Marginal)			
	Cultivators	Agricultural Labourers	Workers in Household Industry	Other Workers
Tawang	43.00	2.11	0.45	54.44
West Kameng	35.42	3.99	1.03	59.56
East Kameng	70.95	2.74	0.33	25.98
Papum Pare	24.36	3.35	1.41	70.88
Lower Subansiri	72.24	3.36	0.62	23.78
Upper Subansiri	68.68	2.05	0.50	28.77
West Siang	63.24	2.01	1.37	33.38
East Siang	52.23	5.78	1.92	40.07
Upper Siang	65.08	2.39	0.17	32.36
Dibang Valley	53.99	7.19	0.60	38.22
Lohit	57.64	6.53	0.69	35.14
Changlang	69.94	5.40	0.98	23.68
Tirap	75.35	0.72	0.32	23.61
Arunachal Pradesh	58.44	3.85	0.86	36.85

Source: Census of India, 2001.

ANNEXURE TABLE A-3.7

## Rural Work Participation Rates in Arunachal Pradesh: 1991-2001

Districts	1991			2001		
	Total	Male	Female	Total	Male	Female
Tawang	55.61	61.71	48.38	58.63	65.74	49.37
West Kameng	44.78	56.06	31.21	47.29	59.35	31.01
East Kameng	50.77	53.98	47.43	49.54	50.14	48.94
Papum Pare	43.60	50.72	35.19	36.53	43.53	28.96
Lower Subansiri	51.88	53.35	50.38	47.94	48.07	47.81
Upper Subansiri	47.38	51.37	42.78	43.97	44.70	43.24
West Siang	44.19	49.59	38.30	42.46	45.55	39.19
East Siang	42.86	49.37	35.72	41.09	45.23	36.74
Upper Siang	52.41	58.64	48.83	51.30	57.34	44.17
Dibang Valley	47.86	57.22	36.31	46.68	53.37	38.87
Lohit	45.98	54.92	35.27	44.52	52.13	35.73
Changlang	45.53	53.15	36.70	49.15	52.77	45.23
Tirap	52.82	55.25	50.06	51.19	51.48	50.87
Arunachal Pradesh	47.69	53.69	40.86	46.47	51.13	41.33

Note: Work Participation Rates has been calculated for total workers which includes both Main and Marginal Workers.

Source: Census of India, 2001, Series-13, Arunachal Pradesh, Provisional Population Totals, Paper-3 of 2001.

ANNEXURE TABLE A-3.8

## Urban Work Participation Rates in Arunachal Pradesh: 1991-2001

Districts	1991			2001		
	Total	Male	Female	Total	Male	Female
Tawang	-	-	-	38.26	54.86	18.59
West Kameng	37.77	54.36	15.64	33.96	48.15	17.26
East Kameng	-	-	-	33.83	44.60	21.82
Papum Pare	35.64	53.20	14.10	36.12	49.71	20.66
Lower Subansiri	35.36	52.15	13.02	33.14	44.68	20.65
Upper Subansiri	-	-	-	30.80	42.94	17.11
West Siang	37.06	53.27	12.25	36.63	52.64	15.98
East Siang	34.90	51.96	12.10	30.59	45.93	13.30
Upper Siang	-	-	-	-	-	-
Dibang Valley	34.95	50.76	11.74	33.18	48.80	12.68
Lohit	37.21	56.65	8.28	31.16	48.15	10.45
Changlang	-	-	-	36.17	53.20	14.13
Tirap	40.42	61.78	8.81	35.80	55.49	11.49
Arunachal Pradesh	36.39	54.18	11.95	34.16	48.99	16.69

Note: Work Participation Rates has been calculated for total workers which includes both Main and Marginal Workers.

Source: Census of India, 2001, Series-13, Arunachal Pradesh, Provisional Population Totals, Paper-3 of 2001.

ANNEXURE TABLE A-3.9

## Combined Work Participation Rates in Arunachal Pradesh (Rural + Urban): 1991-2001

Districts	1991			2001		
	Total	Male	Female	Total	Male	Female
Tawang	55.61	61.71	48.38	56.31	64.55	45.71
West Kameng	44.08	55.88	29.72	46.09	58.40	29.69
East Kameng	50.77	53.98	47.43	45.42	48.63	42.76
Papum Pare	40.22	51.78	26.31	36.32	46.71	24.79
Lower Subansiri	50.12	53.21	46.88	46.08	47.63	44.50
Upper Subansiri	47.38	51.37	42.78	40.22	44.17	36.12
West Siang	43.14	50.20	35.05	41.30	47.07	34.95
East Siang	41.24	49.94	31.31	38.45	45.41	31.01
Upper Siang	52.41	58.64	44.83	51.30	57.34	44.17
Dibang Valley	45.77	56.11	32.65	44.31	52.53	34.51
Lohit	44.12	55.31	30.09	42.04	51.38	31.16
Changlang	45.53	53.15	36.70	47.88	52.82	42.43
Tirap	51.79	55.85	47.08	48.84	52.13	45.23
Arunachal Pradesh	46.24	53.76	37.49	43.97	50.69	36.45

Note: Work Participation Rates has been calculated for total workers which includes both Main and Marginal Workers.

Source: Census of India, 2001, Series-13, Arunachal Pradesh, Provisional Population Totals, Paper-3 of 2001.

## Chapter 4

# Labour and Employment

### Introduction

Access to productive employment is one of the important means of securing well-being. The employment-unemployment situation in north-eastern states has an added significance because of its perceived linkages with insurgency and political instability, particularly because the latter, apart from its other negative impacts, hampers the growth prospects significantly by raising transaction costs (Sarma, 2005).

### Workforce Participation Rates

The proportion of population engaged in 'economically productive work' is one of the widely used indicators of human resource use. Workforce participation is studied not only as a measure of the economic contribution of the labour force but also to understand the degree to which people are integrated into the economy. In Arunachal Pradesh the workforce participation rate (WFPR) among the rural males has increased from 422 per 1000 persons in 1999-2000 to 504 in 2004-05. In case of urban males also there has been an increase in the WFPR from 399 per 1000 persons to 463 during the same period. During the period 1993-94 to 1999-2000 as per the usual status criteria, there had been a decline in the male WFPR for the State both in the rural and urban areas. In urban areas there has been a noticeable increase in the WFPR for urban males during 1999-2000 to 2004-05, but the WFPR is still lower than what it was in 1993-94. In case of females, during the period 1993-94 to 1999-2000, as per the usual status criterion, there had been a significant decline in the WFPR in rural areas, while that in urban area, notwithstanding its low level, had remained almost constant. But this trend seems to have been reversed in the latter period. As per current weekly status (CWS) and current daily status (CDS) there has been a decline in FWPR of both male and female workers, both in the rural

as well as in the urban areas during the first period and since 1999-2000 there has been an increase in FWPR in all these categories. A particularly noticeable feature, however, is the sharp rural-urban difference in the work force participation rates of female workers in the State (Table 4.1).

**TABLE 4.1**  
**Workforce Participation Rates (WFPR) in**  
**Arunachal Pradesh: 1993-94 to 2004-05**  
(No. of persons employed per 1000 persons)

State	Male			Female		
	WFPR (1993- 94)	WFPR (1999- 2000)	WFPR (2004- 05)	WFPR (1993- 94)	WFPR (1999- 2000)	WFPR (2004- 05)
Arunachal Pradesh	US	Rural	497	422	504	409
		Urban	515	399	463	101
	CWS	Rural	498	417	503	410
		Urban	513	348	466	104
	CDS	Rural	489	375	490	399
		Urban	503	341	463	133
All India	US	Rural	553	531	546	328
		Urban	521	518	566	155
	CWS	Rural	531	510	545	267
		Urban	511	509	566	139
	CDS	Rural	504	478	531	220
		Urban	498	490	561	120

Source: NSS Reports No. 409 and 458 and NSS 61st Round.

So far as age group-wise participation is concerned, for most of the age groups there has been a decline in WFPR during the period 1993-94 to 1999-2000, whereas an increase has been observed during 1999-2000 and 2004-2005. In overall terms, the WFPR has declined during the first period under consideration and has increased in the subsequent period, except for the younger age groups, i.e., those between 10-14 years, (Annexure Table A-4.1). The trends in age group-wise labour force participation

rate (LFPR) have been broadly the same. Except for the very young, the participation of all other age groups has increased during the period under study (Annexure Table A-4.2). Apart from the sharp fall in the overall LFPR from 445 in 1993-94 to 363 per thousand persons in 1999-2000, it is important to note that, except for urban females, the decline has been severe for all other groups under consideration, during 1999-2000 but during the latter period, i.e., 2004-05 there has been an increase in the LFPR for all age groups.

### Composition of Employment

The changing composition of employment in Arunachal Pradesh, for various categories of workers, is presented in Tables 4.2, 4.3, and 4.4 for the three NSS rounds. In 2004-05, it is found that out of the total workers in Arunachal Pradesh, 79.7 per cent were self-employed, while nearly 6.1 per cent worked as casual labourers and the rest worked as regular salaried workers. The proportion of self-employed workers was remarkably higher in the rural than in the urban areas. In fact, it is regular salaried employment that has the largest category of employment in urban Arunachal Pradesh. The share of self-employed was around 93 per cent in rural female categories, while it was 40.5 per cent among urban females. In terms of social groups, it is very clear that the share of regular salaried employment was remarkably low in the case of ST workers (9 per cent) than non-ST workers (27 per cent). Casual labour category also had a lower share among the ST than the non-ST. In rural areas, as high as 90 per cent of total workers and 95 per cent of women workers in the ST category were self-employed.

The important changes that happened during 1993-94 and 2004-05 are as follows. Firstly, between 1993-94 to 1999-2000 there has been a decrease in the share of self-employed workers, a marginal decline in the share of salaried employment and a rise in the share of casual workers. During the period 1993-94 and 2004-05, while in the urban areas the share of self-employed and that of salaried employment has declined, but as far as the share of casual workers is concerned, which was around 15 per cent in the earlier two rounds, has gone down to 8.4 per cent in 2004-05. Between 1999-2000 and 2004-05, however, there has been an increase in the share of the self-employed people and a decline in the share of casual labourers. Thus, between 1993-94 and 2004-05 we see that there has only been marginal changes in the composition of employment in Arunachal Pradesh. In the rural areas, there has been a growth of casual wage labour along with a decline in the share of salaried employment, while the share of self-employment has remained almost

TABLE 4.2  
Composition of Employment in Arunachal Pradesh: 1993-94 (UPSS basis)

Location	Employment Category	Male	Female	Persons
<b>All Social Groups</b>				
Rural	Self-Employed	76.19	93.57	83.61
	Regular Employed	17.39	5.07	12.13
	Casual Labour	6.42	1.36	4.26
Urban	Self-Employed	18.93	31.18	20.66
	Regular Employed	67.01	52.55	64.97
	Casual Labour	14.06	16.27	14.37
All	Self-Employed	68.99	91.65	78.09
	Regular Employed	23.63	6.53	16.76
	Casual Labour	7.38	1.82	5.15
<b>ST Social Group</b>				
Rural	Self-Employed	90.57	96.68	93.24
	Regular Employed	7.79	2.26	5.38
	Casual Labour	1.64	1.05	1.38
Urban	Self-Employed	0.00	25.94	3.95
	Regular Employed	36.44	74.06	42.16
	Casual Labour	63.56	0.00	53.89
All	Self-Employed	88.28	96.26	91.73
	Regular Employed	8.52	2.69	6.00
	Casual Labour	3.20	1.05	2.27
<b>Non-ST Social Group</b>				
Rural	Self-Employed	73.29	92.91	81.62
	Regular Employed	19.33	5.67	13.52
	Casual Labour	7.39	1.42	4.85
Urban	Self-Employed	19.53	31.36	21.19
	Regular Employed	67.96	51.81	65.69
	Casual Labour	12.51	16.82	13.12
All	Self-Employed	65.56	90.70	75.52
	Regular Employed	26.32	7.32	18.79
	Casual Labour	8.12	1.98	5.69

Source: NSS 50<sup>th</sup> Round.

stagnant. Given the substantial role of the government sector in providing regular salaried jobs in the State, the impact of a job squeeze in the government sector on the overall employment structure comes out very clearly from the data presented here. Secondly, it is important to note that there has been a decline in the relative importance of self-employment among the ST workers, and it has been accompanied by a rise in the share of both regular salaried employment as well as casual labour. Thirdly, among the male workers in rural areas belonging to ST category, there has been a fall in the share of self-employment, along with a corresponding rise in the share of casual labour and regular employment. The only group of workers, which has not witnessed any significant change in the structure of employment, is rural females belonging to ST category. In fact, their share in regular salaried employment has increased marginally, while the shift away from self-employment, which has been a consistent feature in case of most of the categories, has not been

TABLE 4.3

## Composition of Employment in Arunachal Pradesh: 1999-2000 (UPSS basis)

Location	Employment Category	Male	Female	Persons
<b>All Social Groups</b>				
Rural	Self-Employed	70.17	92.98	79.31
	Regular Employed	20.14	1.38	12.63
	Casual Labour	9.69	5.64	8.07
Urban	Self-Employed	21.57	35.54	23.89
	Regular Employed	59.31	58.10	59.11
	Casual Labour	19.13	6.36	17.00
All	Self-Employed	66.24	91.51	76.01
	Regular Employed	23.31	2.83	15.39
	Casual Labour	10.45	5.66	8.60
<b>ST Social Group</b>				
Rural	Self-Employed	80.48	97.01	88.10
	Regular Employed	12.51	1.14	7.27
	Casual Labour	7.02	1.84	4.63
Urban	Self-Employed	19.90	60.71	30.12
	Regular Employed	72.25	39.29	64.00
	Casual Labour	7.85	0.00	5.88
All	Self-Employed	77.43	96.28	85.98
	Regular Employed	15.51	1.91	9.34
	Casual Labour	7.06	1.81	4.68
<b>Non-ST Social Group</b>				
Rural	Self-Employed	60.81	86.69	69.42
	Regular Employed	27.07	1.75	18.65
	Casual Labour	12.12	11.56	11.93
Urban	Self-Employed	22.23	12.40	20.99
	Regular Employed	54.13	75.39	56.83
	Casual Labour	23.64	12.21	22.19
All	Self-Employed	56.68	84.18	65.35
	Regular Employed	29.97	4.24	21.86
	Casual Labour	13.35	11.58	12.79

Source: NSS 55<sup>th</sup> Round.

TABLE 4.4

## Composition of Employment in Arunachal Pradesh: 2004-05 (UPSS basis)

Location	Employment Category	Male	Female	Persons
<b>All Social Groups</b>				
Rural	Self-Employed	76.4	92.6	83.3
	Regular Employed	16.5	2.9	10.8
	Casual Labour	7.0	4.4	5.9
Urban	Self-Employed	41.3	47.9	42.7
	Regular Employed	51.1	40.5	48.9
	Casual Labour	7.5	11.6	8.4
All	Self-Employed	72.3	90.6	79.7
	Regular Employed	20.6	4.7	14.2
	Casual Labour	7.1	4.7	6.1
<b>ST Social Group</b>				
Rural	Self-Employed	84.7	94.9	89.3
	Regular Employed	11.5	3.0	7.6
	Casual Labour	3.8	2.1	3.1
Urban	Self-Employed	40.8	50.0	44.1
	Regular Employed	55.9	41.8	50.7
	Casual Labour	3.3	8.2	5.1
All	Self-Employed	82.5	93.4	87.4
	Regular Employed	13.7	4.3	9.4
	Casual Labour	3.8	2.4	3.2
<b>Non-ST Social Group</b>				
Rural	Self-Employed	55.2	82.3	63.8
	Regular Employed	29.5	2.9	21.0
	Casual Labour	15.3	14.8	15.1
Urban	Self-Employed	41.6	44.7	42.0
	Regular Employed	49.3	38.4	47.9
	Casual Labour	9.1	16.9	10.1
All	Self-Employed	51.7	78.7	59.2
	Regular Employed	34.6	6.3	26.7
	Casual Labour	13.7	15.0	14.1

Source: NSS 61<sup>st</sup> Round.

seen in the case of female workers of this category. Although, given the small size of the sample in some of the disaggregated categories, some of these trends might not be reflecting the ground realities, but by and large the restructuring of employment as shown in these tables brings out the broad contours of change in the employment scenario of the State.

### Distribution of Workers across Industries

Tables 4.5 through 4.7 presents the distribution of workers at the broad industry level in Arunachal Pradesh. The share of agriculture in 2004-05, among all workers, was 76 per cent, implying the continuing significance of agriculture in the State's economy. It is important to note that the next important activity was public administration, followed by education and community services, which clearly underlines the significance of the government sector in generating employment outside agriculture.

Manufacturing has a low share of 0.6 per cent, while construction has a share of nearly 4 per cent. Among the other activities, trade, hotels and restaurants account for 4 per cent of the workers employed. The industrial diversification of workers is even less pronounced in the case of rural workers in general and rural female workers in particular. While the share of rural males and females in public administration and others is significantly less than that of their urban counterparts. In urban areas, the share of female workers was higher than that of male workers in construction. Among urban males, around 51 per cent were in public administration, while 27 per cent were in trade, hotels and restaurants. The share of ST workers in agriculture, particularly in rural areas and among females, was considerably high.

So far as changes between 1993-94 and 2004-05 are concerned there has been a marginal decline in the share of workers employed in agriculture, while an increase is



**TABLE 4.5**  
**Industry Group-wise Distribution of Workers in Arunachal Pradesh: 1993-94**

Industry Group	Category of Workers								
	R_M	R_F	R_P	U_M	U_F	U_P	T_M	T_F	T_P
<b>All Social Groups</b>									
Agriculture	79.07	96.16	86.39	7.09	19.27	8.65	70.15	94.09	79.79
Mining and Quarrying	0.06	0.04	0.05	0.00	0.00	0.00	0.05	0.04	0.05
Manufacturing	0.42	1.32	0.80	12.36	9.84	12.04	1.90	1.55	1.76
Electricity, Gas and Water Supply	1.38	0.11	0.84	4.01	1.73	3.72	1.70	0.15	1.08
Construction	3.90	1.00	2.66	9.56	7.72	9.32	4.60	1.18	3.22
Trade, Hotels and Restaurants	0.32	0.00	0.18	17.14	5.24	15.62	2.41	0.14	1.49
Transport	2.56	0.37	1.62	6.37	0.00	5.56	3.03	0.36	1.96
Finance and Business Services	0.66	0.00	0.37	3.20	1.90	3.03	0.97	0.05	0.60
Public Admn., Education and Community Services	11.64	0.99	7.08	38.08	54.30	40.16	14.91	2.43	9.89
All	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
<b>ST Social Group</b>									
Agriculture	90.10	96.82	93.06	0.00	0.00	0.00	87.78	96.38	91.52
Mining and Quarrying	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Manufacturing	0.00	0.19	0.08	13.36	0.00	11.79	0.34	0.19	0.28
Electricity, Gas and Water Supply	0.00	0.00	0.00	8.64	0.00	7.62	0.22	0.00	0.13
Construction	1.86	1.06	1.51	0.00	0.00	0.00	1.81	1.06	1.48
Trade, Hotels and Restaurants	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Transport	0.56	0.00	0.31	0.00	0.00	0.00	0.54	0.00	0.31
Finance & Business Services	0.56	0.00	0.31	0.00	0.00	0.00	0.54	0.00	0.31
Public Admn., Education and Community Services	6.93	1.93	4.73	78.00	100.00	80.58	8.76	2.37	5.98
All	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
<b>Non-ST Social Group</b>									
Agriculture	76.87	96.03	85.02	7.32	19.83	8.92	67.06	93.62	77.59
Mining and Quarrying	0.07	0.05	0.06	0.00	0.00	0.00	0.06	0.05	0.06
Manufacturing	0.50	1.56	0.95	12.33	10.13	12.05	2.17	1.83	2.04
Electricity, Gas and Water Supply	1.65	0.13	1.01	3.86	1.78	3.60	1.96	0.19	1.26
Construction	4.30	0.99	2.89	9.86	7.95	9.62	5.09	1.21	3.55
Trade, Hotels and Restaurants	0.39	0.00	0.22	17.69	5.39	16.11	2.83	0.17	1.77
Transport	2.96	0.45	1.89	6.58	0.00	5.73	3.47	0.44	2.27
Finance and Business Services	0.68	0.00	0.39	3.30	1.95	3.13	1.05	0.06	0.66
Public Admn., Education and Community Services	12.57	0.80	7.56	36.80	52.98	38.87	15.99	2.44	10.62
All	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Note: R\_M= Rural Males, R\_F = Rural Females, R\_P= Rural Persons, U\_M= Urban Males, U\_F = Urban Females, U\_P = Urban Persons, T\_M= Total Males, T\_F= Total Females, T\_P = Total Persons.

Source: NSS 50th Round.

noticed in the share of those employed in public administration, etc., as well as in construction. The increase in the share of workers employed in public administration is more pronounced in the case of urban workers in general and urban male workers in particular.

Among the ST workers, there is a decrease in the share of those employed in agriculture, while there is an increase in the share of those engaged in public administration. In the urban areas, ST women have increased their visibility in two activities, construction and trade, hotels and

TABLE 4.6  
Industry Group-wise Distribution of Workers in Arunachal Pradesh: 1999-2000

Industry Group	Category of Workers								
	R_M	R_F	R_P	U_M	U_F	U_P	T_M	T_F	T_P
<b>All Social Groups</b>									
Agriculture	75.62	95.11	83.42	6.45	19.95	8.69	70.02	93.19	78.98
Mining and Quarrying	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Manufacturing	2.80	2.68	2.75	0.50	0.00	0.42	2.62	2.61	2.62
Electricity, Gas and Water Supply	0.53	0.00	0.32	2.19	0.00	1.83	0.66	0.00	0.41
Construction	6.66	1.12	4.44	12.93	2.56	11.20	7.17	1.16	4.84
Trade, Hotels and Restaurants	1.00	0.09	0.63	33.32	34.21	33.47	3.61	0.96	2.59
Transport	0.19	0.00	0.12	1.20	0.00	1.00	0.28	0.00	0.17
Finance and Business Services	0.27	0.21	0.24	1.00	0.52	0.92	0.33	0.21	0.28
Public Admn., Education and Community Services	12.93	0.79	8.07	42.41	42.76	42.46	15.32	1.87	10.12
All	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
<b>ST Social Group</b>									
Agriculture	86.25	98.51	91.90	14.32	41.64	21.16	82.64	97.36	89.31
Mining and Quarrying	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Manufacturing	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Electricity, Gas and Water Supply	0.72	0.00	0.39	1.13	0.00	0.85	0.74	0.00	0.40
Construction	7.35	0.85	4.35	17.54	0.00	13.15	7.86	0.84	4.68
Trade, Hotels and Restaurants	0.50	0.07	0.30	16.73	30.85	20.27	1.32	0.69	1.03
Transport	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Finance and Business Services	0.09	0.00	0.05	0.00	0.00	0.00	0.08	0.00	0.05
Public Admn., Education and Community Services	5.09	0.57	3.01	50.27	27.51	44.57	7.36	1.11	4.53
All	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
<b>Non-ST Social Group</b>									
Agriculture	65.97	89.80	73.89	3.30	0.00	2.88	59.26	0.00	67.93
Mining and Quarrying	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Manufacturing	5.35	6.86	5.85	0.70	0.00	0.61	4.85	6.63	5.41
Electricity, Gas and Water Supply	0.36	0.00	0.24	2.62	0.00	2.29	0.60	0.00	0.41
Construction	6.04	1.54	4.54	11.08	4.91	10.30	6.58	1.65	5.02
Trade, Hotels and Restaurants	1.44	0.13	1.01	39.96	37.31	39.62	5.57	1.39	4.25
Transport	0.37	0.00	0.25	1.67	0.00	1.46	0.51	0.00	0.35
Finance and Business Services	0.43	0.53	0.46	1.40	1.00	1.35	0.53	0.54	0.54
Public Admn., Education and Community Services	20.05	1.14	13.76	39.26	56.78	41.48	22.10	3.02	16.09
All	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Note: R\_M= Rural Males, R\_F = Rural Females, R\_P= Rural Persons, U\_M= Urban Males, U\_F = Urban Females, U\_P = Urban Persons, T\_M= Total Males, T\_F= Total Females, T\_P = Total Persons.

Source: NSS 55th Round.

restaurants. Thus, the unevenness in the process of occupational diversification has been clear from the disparities in the access to non-agricultural occupations by various categories of workers. Rural workers in general and rural female workers have continued to be tied to agriculture. While at some level it signifies the unequal opportunities available to females than to males, micro-studies suggest that the shift of the rural male workers to

non-agriculture has led to a process of feminisation of agriculture in the sense that women are substituting men in farm work (Mishra, 2003).

### Growth of Employment: 1993-94 to 2004-05

So far as growth of employment between 1993-94 and 1999-2000 is concerned, for the State as a whole, the

TABLE 4.7  
Industry Group-wise Distribution of Workers in Arunachal Pradesh: 2004-05

Industry Group	Category of Workers								
	R_M	R_F	R_P	U_M	U_F	U_P	T_M	T_F	T_P
<b>All Social Groups</b>									
Agriculture	74.0	92.7	81.9	4.7	35.3	11.1	65.8	90.1	75.6
Mining and Quarrying	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Manufacturing	0.4	0.3	0.4	4.5	0.0	3.6	0.9	0.3	0.6
Electricity, Gas and Water Supply	1.5	0.0	0.9	0.3	0.0	0.2	1.4	0.0	0.8
Construction	5.0	2.8	4.0	9.0	4.7	8.1	5.4	2.9	4.4
Trade, Hotels and Restaurants	3.6	0.4	2.3	25.6	14.1	23.2	6.2	1.0	4.1
Transport	1.1	0.0	0.6	3.0	0.0	2.3	1.3	0.0	0.8
Finance and Business Services	1.0	0.2	0.6	1.6	0.0	1.2	1.1	0.1	0.7
Public Admn., Education and Community Services	13.4	3.6	9.3	51.4	45.9	50.2	17.9	5.6	12.9
All	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>ST Social Group</b>									
Agriculture	83.3	94.9	88.6	13.0	37.9	22.1	79.8	92.9	85.8
Mining and Quarrying	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Manufacturing	0.1	0.2	0.1	1.6	0.0	1.0	0.2	0.2	0.2
Electricity, Gas and Water Supply	0.7	0.0	0.4	0.0	0.0	0.0	0.6	0.0	0.3
Construction	2.5	1.3	1.9	11.2	3.8	8.5	2.9	1.4	2.2
Trade, Hotels and Restaurants	1.3	0.2	0.8	12.9	14.7	13.6	1.9	0.7	1.4
Transport	0.5	0.0	0.3	1.7	0.0	1.1	0.6	0.0	0.3
Finance and Business Services	1.1	0.2	0.7	0.0	0.0	0.0	1.1	0.1	0.6
Public Admn., Education and Community Services	10.6	3.2	7.2	59.6	43.6	53.7	13.0	4.6	9.2
All	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
<b>Non-ST Social Group</b>									
Agriculture	50.3	82.6	60.6	1.5	31.4	5.3	37.8	77.7	48.9
Mining and Quarrying	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Manufacturing	1.2	0.8	1.1	5.7	0.0	4.9	2.3	0.7	1.9
Electricity, Gas and Water Supply	3.8	0.0	2.6	0.4	0.0	0.4	2.9	0.0	2.1
Construction	11.3	9.6	10.8	8.1	6.0	7.8	10.5	9.2	10.2
Trade, Hotels and Restaurants	9.4	1.1	6.7	30.5	13.3	28.3	14.8	2.3	11.3
Transport	2.7	0.0	1.8	3.4	0.0	3.0	2.9	0.0	2.1
Finance and Business Services	0.7	0.2	0.5	2.2	0.0	1.9	1.1	0.1	0.8
Public Admn., Education and Community Services	20.7	5.8	15.9	48.2	49.3	48.4	27.7	10.0	22.7
All	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: R\_M= Rural Males, R\_F = Rural Females, R\_P= Rural Persons, U\_M= Urban Males, U\_F = Urban Females, U\_P = Urban Persons, T\_M= Total Males, T\_F= Total Females, T\_P = Total Persons

Source: NSS 61st Round.

employment growth was negative for all workers, but more significantly for the female workers. Location-wise, deceleration in employment growth was sharper for urban males, urban females and rural females. There was a contrasting pattern of employment growth for non-ST and ST workers—while for non-ST workers in general and non-ST female workers in particular, the employment scenario worsened, but for the ST workers employment

gains were substantial. Thus, the overall negative growth in employment was because of a strong decline in employment of the non-ST workers (Table 4.8).

Between 1999-2000 to 2004-05, employment growth was 5.8 per cent for all workers. It was remarkably higher in the urban areas than in the rural areas. Unlike the earlier period, employment growth was positive for all categories of worker. While there was a substantial gain

**TABLE 4.8**  
**Industry Group-wise Growth of Employment in Arunachal Pradesh: 1993-94 to 1999-2000**

Industry Group	Growth of Employment (%)								
	R_M	R_F	R_P	U_M	U_F	U_P	T_M	T_F	T_P
<b>All Social Groups</b>									
Agriculture	-0.76	-2.07	-1.37	-9.05	-2.20	-6.83	-0.84	-2.07	-1.42
Mining and Quarrying	-100.00	-100.00	-100.00				-100.00	-100.00	-100.00
Manufacturing	37.12	10.45	21.78	-47.29	-100.00	-48.12	2.31	7.04	3.97
Electricity, Gas and Water Supply	-14.78	-100.00	-15.60	-16.45	-100.00	-17.30	-15.25	-100.00	-16.08
Construction	9.32	0.02	8.07	-2.84	-19.12	-4.02	6.80	-2.22	5.70
Trade, Hotels and Restaurants	20.62		21.81	3.22	32.95	5.70	6.14	35.10	8.22
Transport	-34.91	-100.00	-36.02	-30.09		-30.09	-33.48	-100.00	-34.33
Finance and Business Services	-13.92		-7.76	-23.83	-21.62	-23.65	-17.27	24.47	-12.89
Public Admn., Education and Community Services	1.75	-5.52	1.38	-5.94	-6.56	-6.04	-0.37	-6.14	-0.87
All	-0.02	-1.89	-0.80	-7.61	-2.76	-6.91	-0.81	-1.91	-1.25
<b>ST Social Group</b>									
Agriculture	18.30	21.18	19.66				18.47	21.36	19.84
Mining and Quarrying									
Manufacturing		-100.00	-100.00	-100.00		-100.00	-100.00	-100.00	-100.00
Electricity, Gas and Water Supply				-4.69		-4.69	46.13		46.13
Construction	49.84	16.57	43.10				52.83	16.57	45.72
Trade, Hotels and Restaurants									
Transport	-100.00		-100.00				-100.00		-100.00
Finance and Business Services	-12.52		-12.52				-12.52		-12.52
Public Admn., Education and Community Services	13.20	-1.44	11.20	24.29	25.74	24.50	16.24	6.84	14.88
All	19.16	20.83	19.91	33.73	55.92	37.42	19.67	21.15	20.32
<b>Non-ST Social Group</b>									
Agriculture	-9.79	-14.35	-11.84	-23.09	-100.00	-27.27	-9.94	-14.44	-11.95
Mining and Quarrying	-100.00	-100.00	-100.00				-100.00	-100.00	-100.00
Manufacturing	37.12	10.93	22.14	-47.04	-100.00	-47.89	2.72	7.42	4.37
Electricity, Gas and Water Supply	-28.32	-100.00	-29.02	-17.70	-100.00	-18.59	-24.57	-100.00	-25.32
Construction	-2.09	-6.73	-2.70	-10.47	-19.12	-11.21	-4.04	-8.69	-4.61
Trade, Hotels and Restaurants	15.21		16.04	0.59	20.99	2.00	2.93	22.90	4.13
Transport	-34.51	-100.00	-35.66	-30.09		-30.09	-33.18	-100.00	-34.06
Finance and Business Services	-14.16		-7.08	-23.83	-21.62	-23.65	-17.78	24.47	-12.92
Public Admn., Education and Community Services	0.01	-8.01	-0.28	-11.23	-11.34	-11.25	-2.97	-10.22	-3.52
All	-7.47	-13.39	-9.75	-12.19	-12.36	-12.21	-8.06	-13.35	-9.98

Note: (i) R\_M= Rural Males, R\_F = Rural Females, R\_P= Rural Persons, U\_M= Urban Males, U\_F = Urban Females, U\_P = Urban Persons, T\_M= Total Males, T\_F= Total Females, T\_P = Total Persons.

(ii) Blanks occur in the cells where employment was zero in the 50th Round; -100 per cent occur in the cells where employment was zero in the 55th Round.

Source: NSS 50<sup>th</sup> and 55<sup>th</sup> Round.

in employment for both male and female workers of ST category, for non-ST workers employment growth was negative, primarily because of shrinking employment opportunities for rural non-ST workers (Table 4.9).

The limited coverage of the data makes it difficult to conclude regarding the growth of employment at the

industry level. However, during 1993-94 to 1999-2000 there was negative growth in sectors like agriculture, electricity, gas and water supply, transport, finance and business services, public administration, education and community services, while employment increased in manufacturing, construction, trade, hotel and restaurants.

**TABLE 4.9**  
**Industry Group-wise Growth of Employment in Arunachal Pradesh: 1999-2000 to 2004-05**

Industry Group	Growth of Employment (%)								
	R_M	R_F	R_P	U_M	U_F	U_P	T_M	T_F	T_P
All Social Groups									
Agriculture	3.8	5.8	4.8	6.4	34.7	20.4	3.9	6.1	4.9
Mining and Quarrying									
Manufacturing	-29.4	-31.0	-30.0	75.9		75.9	-15.4	-31.0	-20.1
Electricity, Gas and Water Supply	29.3		29.3	-23.6		-23.6	22.1		22.1
Construction	-1.7	27.7	3.2	5.3	35.6	7.3	-0.6	28.2	3.8
Trade, Hotels and Restaurants	35.0	43.1	35.6	7.5	0.7	6.5	17.2	8.3	16.1
Transport	47.4		47.4	35.9		35.9	43.8		43.8
Finance and Business Services	35.7	0.3	27.6	23.9	-100.0	21.5	33.2	-1.0	26.5
Public Admn., Education and Community Services	5.0	44.3	8.1	17.8	21.8	18.5	8.4	33.0	11.1
All	4.3	6.4	5.1	13.3	20.1	14.6	5.2	6.8	5.8
ST Social Group									
Agriculture	12.5	12.1	12.3	10.7	23.5	17.7	12.5	12.2	12.3
Mining and Quarrying									
Manufacturing									
Electricity, Gas and Water Supply	11.6		11.6	-100.0		-100.0	9.8		9.8
Construction	-9.0	23.1	-3.8	3.2		7.0	-7.3	25.6	-2.4
Trade, Hotels and Restaurants	36.9	46.6	38.0	7.2	8.5	7.7	21.5	14.9	19.6
Transport									
Finance and Business Services	88.4		92.5				88.4		92.5
Public Admn., Education and Community Services	31.1	59.3	34.6	16.8	38.0	21.1	26.8	50.2	30.4
All	13.3	12.9	13.1	12.9	25.9	16.7	13.2	13.2	13.2
Non-ST Social Group									
Agriculture	-12.8	-10.6	-11.9	-3.5		28.2	-12.7	-9.8	-11.5
Mining and Quarrying									
Manufacturing	-31.7	-41.5	-34.9	72.3		72.3	-17.5	-41.5	-23.6
Electricity, Gas and Water Supply	47.8		47.8	-21.1		-21.1	31.2		31.2
Construction	4.4	31.2	9.0	6.6	18.4	7.5	4.8	30.1	8.7
Trade, Hotels and Restaurants	33.8	40.0	34.1	7.6	-7.5	6.2	16.0	1.9	14.8
Transport	36.4		36.4	31.1		31.1	34.6		34.6
Finance and Business Services	1.8	-27.9	-5.5	23.9	-100.0	21.5	10.0	-28.9	2.9
Public Admn., Education and Community Services	-7.4	25.7	-5.6	18.3	10.5	17.1	-0.2	17.0	1.2
All	-7.9	-9.1	-8.3	13.5	13.7	13.5	-4.5	-7.8	-5.5

Note: (i) R\_M= Rural Males, R\_F = Rural Females, R\_P= Rural Persons, U\_M= Urban Males, U\_F = Urban Females, U\_P = Urban Persons, T\_M= Total Males, T\_F= Total Females, T\_P = Total Persons.

(ii) Blank means there was no employment in relevant cell in 1999-2000. -100% means that whatever employment was there in 1999-2000 was no more in 2004-2005 for relevant cells.

Source: NSS 55<sup>th</sup> and 61<sup>st</sup> Round.

In fact in the later period, rural employment growth was robust. Between 1999-2000 to 2004-05 the significant changes were the decline in employment in manufacturing and substantial growth in electricity, gas and water supply, trade, hotels, restaurants, transport, finance and business services and public administration. Also remarkable was the fact that rural females gained in

sectors like construction, trade, hotels and restaurants, apart from public administration. Another noticeable pattern was that there was significant employment growth for ST workers in agriculture and public administration, education and community services, while in these industries, non-ST workers experienced a negative employment growth.

## Unemployment in Arunachal Pradesh

Table 4.10 shows the unemployment rates for various categories of workers in Arunachal Pradesh from the two NSS rounds. It is found that unemployment rates are lower in Arunachal Pradesh than in all other north-eastern states. The share of unemployed persons,<sup>1</sup> both in population as well as in work force had declined in the State between 1993-94 and 1999-2000 but increased between 1999-2000 and 2004-05. Less than one per cent of the labour force was unemployed in the State as per NSS figures. The low level of unemployment has to be seen in the context of the level of development as well as the nature of the economy of the State. Apart from the low population density and labour shortage, manifested in the heavy in-migration of workers from outside the State, the low unemployment status might be a reflection of the

low level of commercialisation and development of the economy. It is well known that the poor people cannot afford to remain unemployed for long.<sup>2</sup> It is precisely the lack of development in the rural areas in general and within agriculture in particular, which explains the low levels of unemployment in the State. However, some other aspects of unemployment in Arunachal Pradesh come out from the data presented in Table 4.10.

Firstly, unemployment rates are higher in the urban area than in rural areas. In the urban areas, unemployment is significantly higher in the case of females than in the case of males, while in the rural areas, male unemployment is higher than female unemployment. Secondly, so far as unemployment in terms of social groups is concerned, it is found that unemployment is higher among the ST workers than the overall

TABLE 4.10  
Unemployment Rate (Arunachal Pradesh): 1993-94, 1999-2000 and 2004-05

		Proportion of Labour Force							
		R_M	R_F	R_P	U_M	U_F	U_P	T_M	T_P
1993-94	16.37	2.26	10.40	17.73	73.91	26.07	16.54	4.63	11.79
1999-2000	7.72	1.41	5.20	6.50	89.97	21.30	7.62	3.85	6.16
2004-05	11.14	5.74	8.85	10.64	24.27	13.54	11.08	6.61	9.27
ST									
1993-94	19.51	3.38	12.53	0.00	0.00	0.00	19.03	3.36	12.32
1999-2000	13.71	1.75	8.23	11.21	102.28	35.56	13.59	3.98	9.26
2004-05	11.27	6.67	9.17	15.91	32.67	22.10	11.50	7.59	9.73
Non-ST									
1993-94	15.74	2.02	9.96	18.27	76.25	26.87	16.10	4.90	11.69
1999-2000	2.20	0.89	1.76	4.57	78.11	14.42	2.45	3.64	2.82
2004-05	10.82	1.44	7.85	8.57	11.14	8.90	10.25	2.39	8.07
		Proportion of Population							
		R_M	R_F	R_P	U_M	U_F	U_P	T_M	T_P
1993-94	8.28	0.93	4.78	9.30	8.08	8.75	8.41	1.74	5.25
1999-2000	3.31	0.44	1.95	2.64	9.86	5.84	3.25	1.15	2.26
2004-05	5.63	2.37	4.09	4.96	3.68	4.37	5.54	2.52	4.12
ST									
1993-94	9.65	1.51	5.92	0.00	0.00	0.00	9.40	1.45	5.73
1999-2000	4.95	0.55	2.79	3.39	13.69	8.04	4.86	1.22	3.08
2004-05	5.48	2.92	4.24	6.11	6.83	6.48	5.52	3.19	4.39
Non-ST									
1993-94	8.00	0.81	4.56	9.62	8.51	9.12	8.22	1.79	5.17
1999-2000	1.14	0.28	0.75	2.16	7.29	4.41	1.26	1.04	1.16
2004-05	6.08	0.47	3.60	4.36	1.18	3.04	5.61	0.65	3.45

Note: R\_M= Rural Males, R\_F = Rural Females, R\_P= Rural Persons, U\_M= Urban Males, U\_F = Urban Females, U\_P = Urban Persons, T\_M= Total Males, T\_F= Total Females, T\_P = Total Persons.

Source: NSS 50th, 55th and 61st Rounds.

1. The unemployment rate increased from 1.9 per cent in 1993-94 to 2.2 per cent in 1999-2000 at the all-India level.
2. Vaidyanthan (1994:69), for example, has shown that there is a significant and positive correlation between unemployment rate and the incidence of wage labour and the degree of commercialisation at the State-level. Given the positive correlation between the latter two variables themselves, it is possible to argue that with commercialisation of agriculture, and the consequent rise in the incident of wage labour and casualisation of wage labour, the traditional mechanisms to take care of the 'surplus labour' also breaks down. Hence, the latent unemployment becomes more and more open.



unemployment rate of the State. However, unemployment has declined between the period under consideration, for male ST workers only.

### *Youth and Educated Unemployment*

Youth and educated unemployment is normally found to be higher than the general unemployment rate. At the all India level, for all groups except urban females, it has increased significantly over the 1990s (Planning Commission, 2002). In the case of Arunachal Pradesh, the problem of unemployment is generally considered to be a problem of the educated and the young age population. The data from employment exchange shows that the number of unemployed persons in the live register has crossed twenty six thousand (Table 4.11). The NSS data also shows a relatively higher level of unemployment among the relatively better educated. The rate of unemployment among those having a secondary or higher level of education was higher than that among the general population. Between 1993-94 and 2004-05, the level of unemployment among the relatively better educated has declined. However, an important change between these two years is that, while in 1993-94 unemployment among the educated in the ST group was virtually non-existent; it started showing some presence since 1999-2000.<sup>3</sup> Although, given the thin spread of the sample across all these categories, conclusions should be drawn rather cautiously. The available data suggests that, between 1993-94 and 2004-05, the decline in the unemployment rates among the relatively better educated groups, was accompanied by a rise in unemployment among the relatively better educated ST youths in the rural areas.

Among the different age groups, the unemployment rate was highest in the age group of 20-24 years followed by the category 25-29 years in 2004-05. The unemployment rate

was particularly high among the urban youth in the State. Urban females belonging to the age group of 15-24 have a high level of unemployment in the State (Annexure Tables A-4.9-A-4.11). Another important aspect of the unemployment scenario in the State is that the extent of youth unemployment among the population is higher among the ST population than the general levels of youth unemployment in the State. Between 1993-94 and 2004-05 there has been an increase in the extent of youth unemployment among the ST population.

The problem of unemployment among the youth and the educated in Arunachal Pradesh, though considerably lower than many other parts of the country, basically exemplifies the mismatch between the available jobs and the skills, expectations and aspirations of young job seekers. Given the negligible presence of the organised manufacturing in the State, and the dominance of public administration as a source of employment, so far, the major source of employment creation has been through expansion of employment in the government sector. There are, however, obvious limits to the possibility of expanding employment opportunities in the government sector, particularly in the context of increasing emphasis on fiscal responsibilities of the government at various levels. The analysis of sectoral issues in employment generation brings out these problems and inadequacies in a clearer manner.

### *Growth Rate of Labour Force and Unemployment*

Between 1999-2000 and 2004-05, the labour force in Arunachal Pradesh increased at the rate of 5.9 per cent, while unemployment increased at the rate of 13.1 per cent for all categories of workers. Unemployment has decreased in urban areas but it has increased in the rural areas of the State. For the ST workers, overall

TABLE 4.11  
Registered Unemployed in Arunachal Pradesh

Year	No. of Employment Exchanges	No. of Job Seekers Registered during the Year			No. of Job Seekers Sponsored during the Year			No. of Job Seekers on Live Register		
		Male	Female	Total	Male	Female	Total	Male	Female	Total
2001-02	11	3852	2207	6059	347	132	479	15400	7116	22516
2002-03	12	2586	1432	4018	609	181	790	16255	7697	23952
2003-04	13	11	16	27	502	206	708	7487	8507	15994

Source: Director, Employment and Training, Naharlagun, Itanagar.

3. In the 2004-05, for example, unemployment among the ST population with an education level of higher secondary but less than graduation was nearly 3.75 per cent of the labour force, while that among those having graduation or higher level of education in the ST group was 6.49 per cent.

unemployment has increased, but mainly due to increase in rural unemployment (Table 4.12).

TABLE 4.12

**Growth Rates of Labour Force and Unemployment:  
1993-94 to 1999-2000 and 1993-94 to 2004-05**

Category	UPSS Growth Rates (%)—1993-94 to 1999-2000					
	Labour Force			Unemployment		
	Rural	Urban	Total	Rural	Urban	Total
ST	19.56	37.61	19.99	11.47		15.37
Non-ST	-9.92	-12.90	-10.20	-32.51	-16.94	-27.14
All	-0.96	-7.49	-1.46	-11.78	-5.77	-10.43
	UPSS Growth Rates (%)—1993-94 to 2004-05					
	Rural	Urban	Total	Rural	Urban	Total
ST	13.1	16.1	13.2	15.6	-0.5	13.2
Non-ST	-8.2	13.3	-5.4	23.7	-3.8	12.8
All	5.2	14.2	5.9	17.0	-2.0	13.1

### Strategy for Employment Generation: Sectoral Issues

Employment generation strategy of any State is not independent of the overall strategy for economic development adopted at the national level. However, given the specificities in the State the conventional employment generation strategies conceived at the level of Central government and other agencies are quite often inadequate and inappropriate for the State. Thus, there is an urgent need for a serious revaluation of the employment generation strategy in the State, keeping in mind the local specificities. For a number of reasons, the standard model of employment generation is less likely to be effective in Arunachal Pradesh.<sup>4</sup> Given the fact that most of the poor in the State are self-employed in agriculture, it is quite natural that the standard programmes that attempt to tackle poverty by providing more employment opportunity through labour-intensive casual work would not be successful in Arunachal Pradesh.<sup>5</sup> In fact, given the labour market characteristics of the State, such programmes have

helped the non-poor (*viz.*, contractors) more than the really poor.

There is a need to integrate the problems of unemployment and poverty simultaneously. As in the case of many other underdeveloped regions of India, poverty doesn't necessarily reflect itself through unemployment, as the poor are too poor to be unemployed. So far as the problems of the self-employed poor, who are mainly cultivators in rural areas, are concerned there are only two viable policy options: a) to increase productivity and profitability of agriculture; and b) to provide alternative sources of earnings and employment in non-agricultural occupations.<sup>6</sup> In this context the increasing participation of women in a number of micro-enterprises provides an alternative strategy to address the problems of the poor. Many of these women are found in retail trade and seasonal enterprises, but some of them are also involved in the traditional manufacturing (Upadhyay, 2005). Given the ecological preconditions and spatial dispersion of settlements of the State, these enterprises cater to a locally differentiated market.<sup>7</sup>

### Employment in the Urban Informal Sector

The important role, played by informal sector activities, in providing earnings and livelihood to a growing number of workers in future is gradually being recognised at various levels (Planning Commission, 2002). The economic census data shows that informal enterprises in Arunachal Pradesh account for more than 90 per cent of establishments and their share in total employment was as high as 50 per cent. The result of the 5<sup>th</sup> Economic Census reveal that in 2005, there were 28,734 establishments in Arunachal Pradesh, of which 98.6 per cent were non-agricultural establishments. The compound annual growth rate of establishments during the period 1998-2005 was 4.8 per cent. The number of persons engaged in these establishments were 110,385 out of

- For example, in 1993-94, among the very poor category, more than 45 per cent were landless in states like Bihar, Assam, Andhra Pradesh and many others, but in the case of Arunachal Pradesh, only 6.7 per cent of the very poor were landless. Among the poor only 7.4 per cent were landless. However, 54 per cent among the very poor and 41 per cent among the poor were sub-marginal farmers. Around 90.2 per cent of the very poor were self-employed and only 3.7 per cent were wage earners in the state. In no other state of India such a high proportion of very poor people were self-employed (Chaudhuri, 2002).
- Between 1987-88 and 1993-94, as per estimates based on the NSS data, the percentage of poor in Arunachal Pradesh has increased from 29.76 per cent to 47.70 per cent (Srivastava and Dubey, 2004). In fact, among the North-eastern states, it is only in Arunachal Pradesh, where such a rise in the incidence of poverty has been noticed. Moreover, in terms of human development parameters, the progress of the State has been less than satisfactory (Upadhyay and Mishra, 2004).
- Although there is scope for increasing earnings within agriculture through crop diversification, technological change, value addition at local levels etc., but given the ecological constraints and weak market linkages there are limits to which agricultural growth could be projected as the sole hope for rural development. The alternative is to provide education and gradually shift labour from low productive to high productive occupations. This strategy has its own problems as well, mainly because of the dependence on government sector jobs. This strategy is wasteful, unproductive and unsustainable in the long-run, but more importantly, it would almost certainly by-pass the poor.
- There is a strong linkage with the household economy as well, with many of them selling output produced or collected by themselves and other family members (Upadhyay, 2005).

which 98 per cent were engaged in non-agricultural establishments. Employment grew at the rate of 4.61 per cent per annum during the period 1998-2005. The growth of employment was more in urban than in rural enterprises. These enterprises mainly consist of retail trading and social, personal and community services. A recent study on the micro-enterprises in Arunachal Pradesh reveals that a key aspect of micro-enterprises in the State, particularly those involved in manufacturing and processing activities, is the weak production linkages. Apart from the very low production base of the economy, high transportation costs, low levels of commercialisation and marketisation of output and unreliable and poor communication services have also contributed towards this (Upadhyay and Mishra, 2004). The contractual relations in the urban informal economy also need to be carefully understood to design effective policies for employment generation in the informal sector. Insights from a recently concluded study bring out the exploitative mechanisms that underlie the contractual relations in the urban informal sector (Upadhyay, 2006).

### Employment Prospects in the Rural Non-farm Sector

The share of non-farm employment in rural employment in the State has gone up from only 17.09 per cent in 1971 to 26.07 per cent in 1991. From the census data, it can be inferred that rural employment in non-household manufacturing, construction, trade and commerce, and transport, storage and communications expanded during 1971-1991, while the relative share of household manufacturing and other services has shown a decline. Employment in transport, storage and communications has recorded the highest growth rate during this period, followed by mining and quarrying and non-household manufacturing.

As per NSS data, the share of non-farm sector in total rural labour force in the State has gone up from 13.61 per cent in 1993-94 to 16.58 per cent in 1999-2000 as per UPSS status of employment. The share of RNF sector employment in the State continues to be lower than the

national average as well as that for the North-east region (Annexure Table A-4.16). Rural males in Arunachal Pradesh had higher access to non-farm employment than their female counterparts. Even in 1999-2000, the participation of woman in RNFE in Arunachal Pradesh was the lowest among all the north-eastern states.

So far as the composition of rural non-farm employment in Arunachal Pradesh is concerned, 'other services', which also includes those employed in public administration, continues to be the most important occupational category, although its share in RNFE has declined significantly from around 96 per cent in 1971 to around 56 per cent during 1991. The second most important source of employment in the rural non-farm sector comes from the construction sector. A substantial portion of employment opportunities in this sector also comes from the road construction activities of the government, including those by the defence organisations. Trade and commerce and non-household manufacturing have also expanded substantially in the rural areas (Annexure Table A-4.17). There is of course considerable inter-district variations in the share of RNFE (Annexure Table A-4.18).

The literature on determinants of RNFE has identified factors like agricultural growth, urbanisation, literacy, rural poverty and unemployment, infrastructural development and equity in the distribution of rural assets as major determinants of RNFE. Although some studies suggest the RNFE to be determined by agricultural growth<sup>8</sup>, given the low levels of commercialisation and productivity in agriculture, it is doubtful that the non-farm economy has been exclusively driven by the growth impetus in the farm economy. Inter-sectoral production linkages are remarkably low in the State. However, rising farm incomes might have resulted in greater demand for non-farm products and services in the rural areas through consumption linkages. Analysis of data from 2001 census shows that rural literacy rate is positively associated with the level of non-farm employment, while average size of operational holding has a negative relationship with it<sup>9</sup> (Mishra, 2006).

8. In 1991, food crops yield and main cereal crop yield per hectare are positively correlated with the share of rural non-farm employment. The correlation of RNFE with literacy and urbanisation, was, however, found to be weak (Mishra, 2006). The results indicate that RNFE growth in the State might have been driven by growth in agriculture. The fact that the correlation between agricultural growth and RNFE growth was weak in 1981, but significant in 1991 can be attributed to stronger inter-sectoral linkages in the rural areas as a result of rising productivity, increasing marketisation and commercialisation of the agro-economy (Panda, 1999).

9. A micro-level study on rural non-farm sector concludes that the probability of a household entering into any non-farm occupation is influenced significantly by the ST status, the education of the head of the household and size of operational holdings. While the ST status reduces the possibility of entering a non-farm occupation, the education of the head of the household is positively related with participation in non-farm occupation. Size of operational holding is negatively associated with participation in the non-farm sector. Participation in agricultural wage labour is negatively, but insignificantly associated with participation in non-farm activity, while the dummy capturing distance from the urban locality shows a significant relationship between nearness to urban locality and participation in non-farm occupation (Mishra, 2006).

## Conclusion and Policy Implications

Several policy implications could be noted on the basis of the existing employment situation in Arunachal Pradesh.

- Till now the major chunk of employment generated outside agriculture sector has been either in public administration or sectors like construction, which has strong linkages with government spending. The inadequate expansion of employment opportunities in the manufacturing sector has to be addressed in a forward looking perspective, giving due emphasis to the relative advantages and disadvantages of the State in specific sectors.
- The crux of the problem is however, to create enough employment opportunities outside the government sector. Given the low level of development of the State as well as the strong presence of the State in various sectors of the economy, it may be possible to expand employment in the government sector at least for some more years. But there are obvious limits to this and any forward-looking strategy has to take cognisance of this limitation.
- The problem of youth and educated unemployment, which exists along with shortages of skilled manpower in specific sectors and occupations, needs urgent attention, particularly because of its potential role as a source of social destabilisation. The policy options here range from harmonisation of skill requirements and skill creation on the one hand to create additional avenues of earnings for the youth, particularly for those living in the rural areas. Strengthening the system of vocational education will go a long way in addressing the skill deficit in the State. Lack of entrepreneurial ability has acted as a major constraint in making self-employment an attractive option for the youth and the unemployed.
- There is a tremendous scope for the expansion of the rural non-farm occupations in the State. There has been a great deal of spatial concentration in rural non-farm sector employment in the State. There is a clear need for a more dispersed rural non-farm sector growth.
- There is also an urgent need to identify and prioritise the rapidly growing rural non-farm occupations to dovetail their sector specific needs to a comprehensive strategy of employment generation in rural Arunachal Pradesh.
- Some sectors like rural manufacturing, and petty trading needs additional attention. Over the past decades, partly as a result of the growing demonstration effect of urban consumption patterns in the rural areas, there has been a phenomenal growth of these sectors in the rural areas. Women, particularly those belonging to the APST communities have already taken a lead in establishing small self-financed micro-enterprises in petty trading. In the urban areas of the State there has been a modest growth of traditional handicrafts manufacturing as well. All these activities should be made part of the strategy to generate more employment, particularly more self-employment in the rural areas. Among the basic needs of these enterprises is credit and marketing support. There is a scope for better horizontal as well as vertical coordination among various agencies working in these areas.
- Finally, given the overwhelming significance of education as a determinant for entry into more remunerative occupations, education has to be made more accessible to all sections of the population. There are significant rural-urban as well as gender divide in terms of access to education in the State.
- Apart from addressing these glaring inequalities, there is a clear case for special educational drives for specific marginalised groups such as those in inaccessible and border areas, traditionally marginalised ethnic groups, migrant casual labourers, tenants as well as those living in labour camps.



ANNEXURE TABLE A-4.1

## Age Group-wise Workforce Participation Rate in Arunachal Pradesh: 1993-94, 1999-2000 and 2004-05

Age Group	Work Force Participation Rate								
	R_M	R_F	R_P	U_M	U_F	U_P	T_M	T_F	T_P
1993-94									
5-9	0	2	1	0	0	0	0	2	1
10-14	43	31	37	0	0	0	37	26	32
15-19	364	401	380	81	53	66	330	344	336
20-24	632	609	618	628	116	314	631	540	578
25-29	831	701	758	911	308	662	842	669	748
30-34	932	749	856	1000	365	709	939	702	839
35-39	989	732	870	1000	160	643	991	648	834
40-44	961	754	870	1000	180	789	967	704	859
45-49	979	730	866	1000	289	753	982	690	853
50-54	969	770	874	1000	0	731	973	730	861
55-59	955	662	799	1000	0	485	960	589	763
60 and Above	668	391	540	569	0	261	662	360	520
All Age Groups	497	409	455	515	101	326	499	374	440
1999-2000									
5-9	19	10	15	4	10	6	17	10	14
10-14	38	51	44	0	0	0	34	47	40
15-19	293	320	307	90	17	59	272	299	286
20-24	473	552	510	345	212	280	467	534	498
25-29	742	478	607	802	266	513	745	467	602
30-34	789	474	662	854	114	339	793	408	626
35-39	833	484	668	903	189	593	844	443	657
40-44	792	542	678	834	190	650	798	517	675
45-49	791	615	700	990	202	713	810	594	701
50-54	683	563	642	968	708	931	698	566	654
55-59	780	732	759	1000	149	444	783	714	753
60 and Above	684	438	559	0	0	0	666	432	548
All Age Groups	422	310	369	399	100	267	420	294	360
2004-05									
5-9	0	3	1	36	0	20	5	2	4
10-14	25	49	36	16	39	26	24	48	34
15-19	283	329	304	78	84	81	255	286	270
20-24	698	608	653	310	192	255	648	562	605
25-29	921	628	766	900	263	544	918	578	737
30-34	942	710	823	886	199	510	934	636	780
35-39	918	744	831	978	327	634	927	674	799
40-44	961	754	871	988	167	772	965	699	857
45-49	965	805	896	1000	235	739	969	760	881
50-54	957	765	870	904	384	737	951	739	857
55-59	895	685	824	982	31	637	900	645	814
60 and Above	709	562	639	357	0	193	691	536	617
All Age Groups	500	410	458	461	148	319	495	379	441

Note: R\_M= Rural Males, R\_F = Rural Females, R\_P= Rural Persons, U\_M= Urban Males, U\_F = Urban Females, U\_P = Urban Persons, T\_M= Total Males, T\_F= Total Females, T\_P = Total Persons.

Source: NSS 50th, 55th and 61st Rounds.



ANNEXURE TABLE A-4.2

## Age Group-wise Labour Force Participation Rate in Arunachal Pradesh: 1993-94, 1999-2000 and 2004-05

Age Group	Labour Force Participation Rate								
	R_M	R_F	R_P	U_M	U_F	U_P	T_M	T_F	T_P
1993-94									
5-9	0	2	1	38	0	22	6	2	4
10-14	54	31	44	0	16	8	47	28	38
15-19	380	401	389	91	71	81	346	347	347
20-24	680	620	645	678	147	352	680	554	607
25-29	855	701	768	911	308	662	863	669	757
30-34	940	749	861	1000	365	709	947	702	844
35-39	989	732	870	1000	160	643	991	648	834
40-44	961	754	870	1000	180	789	967	704	859
45-49	979	730	866	1000	289	753	982	690	853
50-54	969	770	874	1000	0	731	973	730	861
55-59	955	662	799	1000	0	485	960	589	763
60 and Above	668	391	540	569	0	261	662	360	520
All Age Groups	506	410	460	525	109	335	508	375	445
1999-2000									
5-9	19	10	15	4	10	6	17	10	14
10-14	38	51	44	0	0	0	34	47	40
15-19	304	320	312	90	37	68	283	301	292
20-24	494	557	523	401	310	357	489	544	515
25-29	747	478	610	880	273	552	754	467	607
30-34	790	474	663	854	114	339	794	408	626
35-39	833	484	668	903	203	599	844	445	658
40-44	792	542	678	834	190	650	798	517	675
45-49	791	615	700	990	202	713	810	594	701
50-54	683	563	642	968	708	931	698	566	654
55-59	780	732	759	1000	149	444	783	714	753
60 and Above	684	438	559	0	0	0	666	432	548
All Age Groups	425	310	371	406	110	275	424	295	363
2004-05									
5-9	1	3	2	36	0	20	6	2	4
10-14	25	49	36	16	39	26	24	48	34
15-19	290	331	309	85	90	88	262	289	275
20-24	724	616	669	347	216	286	675	572	623
25-29	951	645	789	921	273	559	947	594	759
30-34	952	710	829	886	199	510	944	636	785
35-39	921	744	832	978	327	634	930	674	800
40-44	961	754	871	988	167	772	965	699	857
45-49	965	805	896	1000	235	739	969	760	881
50-54	957	765	870	904	384	737	951	739	857
55-59	895	685	824	982	31	637	900	645	814
60 and Above	709	562	639	357	0	193	691	536	617
All Age Groups	505	413	462	466	151	323	500	382	445

Note: R\_M= Rural Males, R\_F = Rural Females, R\_P= Rural Persons, U\_M= Urban Males, U\_F = Urban Females, U\_P = Urban Persons, T\_M= Total Males, T\_F= Total Females, T\_P = Total Persons.

Source: NSS 50th, 55th and 61st Rounds.

### Unemployment Rate by Educational Standards in Arunachal Pradesh (as a Proportion of Labour Force): 1993-94

[illegible]

ANNEXURE TABLE A-4.4

Unemployment Rate by Educational Standards in Arunachal Pradesh (as a Proportion of Labour Force): 1999-2000

Education Level	Proportion of Labour Force								
	R_M	R_F	R_P	U_M	U_F	U_P	T_M	T_F	T_P
All Social Groups									
Illiterate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Below Primary	5.85	0.00	4.00	0.00	0.00	0.00	5.31	0.00	3.71
Primary	37.26	0.00	25.05	38.46	0.00	32.48	37.32	0.00	25.37
Middle	17.35	0.00	13.44	0.00	0.00	0.00	15.67	0.00	12.34
Secondary	2.53	42.82	6.92	16.67	149.81	43.99	5.33	79.50	14.98
Higher Secondary	2.16	0.00	2.07	0.00	220.31	36.31	1.72	118.89	9.80
Graduate and Above	7.36	661.06	30.84	0.00	31.97	4.90	4.42	180.75	19.67
All	7.72	1.41	5.20	6.50	89.97	21.30	7.62	3.85	6.16
ST Social Group									
Illiterate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Below Primary	16.02	0.00	10.45	0.00	0.00	0.00	14.02	0.00	9.40
Primary	91.05	0.00	54.98	0.00	0.00	0.00	87.52	0.00	53.13
Middle	37.13	0.00	26.39	0.00	0.00	0.00	34.82	0.00	24.93
Secondary	2.08	46.57	9.02	47.94	0.00	42.70	7.76	42.58	13.00
Higher Secondary	0.00	0.00	0.00	0.00	540.26	141.05	0.00	203.19	45.61
Graduate and Above	8.02	800.61	38.67	0.00	0.00	0.00	5.56	233.06	25.45
All	13.71	1.75	8.23	11.21	102.28	35.56	13.59	3.98	9.26
Non-ST Social Group									
Illiterate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Below Primary	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Primary	9.20	0.00	6.57	50.86	0.00	46.10	11.74	0.00	8.50
Middle	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
Secondary	3.23	0.00	3.15	0.00	179.48	44.56	2.29	151.48	17.60
Higher Secondary	2.48	0.00	2.45	0.00	0.00	0.00	2.02	0.00	1.95
Graduate and Above	6.80	524.05	24.16	0.00	51.05	7.17	3.67	145.52	15.85
All	2.20	0.89	1.76	4.57	78.11	14.42	2.45	3.64	2.82

Note: R\_M= Rural Males, R\_F = Rural Females, R\_P= Rural Persons, U\_M= Urban Males, U\_F = Urban Females, U\_P = Urban Persons, T\_M= Total Males, T\_F= Total Females, T\_P = Total Persons.

Source: NSS 55th Round.

ANNEXURE TABLE A-4.5

## Unemployment Rate by Educational Standards in Arunachal Pradesh (as a Proportion of Labour Force): 2004-05

Education Level	Proportion of Labour Force								
	R_M	R_F	R_P	U_M	U_F	U_P	T_M	T_F	T_P
<b>All Social Groups</b>									
Illiterate	0.0	0.0	0.0	27.8	0.0	20.3	0.8	0.0	0.4
Below Primary	8.6	10.1	9.1	38.3	6.1	23.3	10.7	9.7	10.4
Primary	17.7	15.8	17.0	0.0	14.8	1.9	15.2	15.7	15.4
Middle	14.1	20.6	16.3	0.0	35.9	7.8	12.1	21.9	15.2
Secondary	8.5	7.7	8.3	0.0	0.0	0.0	7.1	6.2	6.9
Higher Secondary	33.2	46.8	35.8	6.0	47.9	11.3	23.1	47.0	27.2
Graduate and Above	61.4	70.6	62.1	18.0	135.5	29.4	48.5	93.7	52.2
All	11.1	5.8	8.9	10.6	24.3	13.5	11.1	6.6	9.3
<b>ST Social Group</b>									
Illiterate	0.0	0.0	0.0	165.9	0.0	74.2	1.0	0.0	0.5
Below Primary	3.4	12.9	6.9	0.0	0.0	0.0	3.3	12.0	6.5
Primary	22.2	19.7	21.3	0.0	26.3	10.7	21.6	19.9	21.0
Middle	21.8	23.5	22.5	0.0	39.7	19.5	20.4	24.9	22.3
Secondary	14.4	8.8	12.6	0.0	0.0	0.0	13.4	7.3	11.3
Higher Secondary	44.3	51.2	46.1	0.0	72.7	13.6	31.7	55.7	37.5
Graduate and Above	68.4	52.7	67.0	32.1	286.9	57.7	60.2	111.2	64.9
All	11.3	6.7	9.2	15.9	32.7	22.1	11.5	7.6	9.7
<b>Non-ST Social Group</b>									
Illiterate	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Below Primary	21.2	0.0	15.4	59.0	11.1	38.7	26.8	2.8	19.5
Primary	5.3	0.0	3.8	0.0	0.0	0.0	3.4	0.0	2.7
Middle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Secondary	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Higher Secondary	15.1	0.0	14.3	10.3	0.0	9.5	12.8	0.0	12.0
Graduate and Above	54.7	95.2	57.3	11.0	54.5	15.1	39.2	76.5	42.0
All	10.8	1.4	7.9	8.6	11.1	8.9	10.3	2.4	8.1

Note: R\_M= Rural Males, R\_F = Rural Females, R\_P= Rural Persons, U\_M= Urban Males, U\_F = Urban Females, U\_P = Urban Persons, T\_M= Total Males, T\_F= Total Females, T\_P = Total Persons.

Source: NSS 61st Round.

ANNEXURE TABLE A-4.6

## Unemployment Rate by Educational Standards in Arunachal Pradesh (as a Proportion of Population): 1993-94

Education Level	Proportion of Population								
	R_M	R_F	R_P	U_M	U_F	U_P	T_M	T_F	T_P
<b>All Social Groups</b>									
Illiterate	8.29	0.32	4.10	0.00	0.00	0.00	7.83	0.30	3.86
Below Primary	0.00	0.00	0.00	31.62	17.03	26.04	4.80	2.39	3.83
Primary	2.02	0.00	1.29	0.00	0.00	0.00	1.68	0.00	1.04
Middle	6.79	0.00	4.25	15.27	0.00	8.97	8.87	0.00	5.46
Secondary	44.73	4.64	33.79	0.00	29.58	12.33	30.78	16.19	26.04
Higher Secondary	3.42	54.65	15.13	22.37	64.30	39.57	9.03	59.44	23.80
Graduate and Above	84.51	60.99	76.96	0.00	0.00	0.00	41.92	38.64	41.03
All	8.28	0.93	4.78	9.30	8.08	8.75	8.41	1.74	5.25
<b>ST Social Group</b>									
Illiterate	14.54	2.03	8.00	0.00	0.00	0.00	14.19	1.96	7.77
Below Primary	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Primary	7.78	0.00	5.36	0.00	0.00	0.00	7.73	0.00	5.24
Middle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Secondary	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
Higher Secondary	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Graduate and Above	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
All	9.65	1.51	5.92	0.00	0.00	0.00	9.40	1.45	5.73
<b>Non-ST Social Group</b>									
Illiterate	7.10	0.00	3.37	0.00	0.00	0.00	6.66	0.00	3.15
Below Primary	0.00	0.00	0.00	32.14	17.58	26.63	5.71	2.89	4.59
Primary	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Middle	8.53	0.00	5.08	15.84	0.00	9.23	10.60	0.00	6.27
Secondary	47.02	4.83	35.43	0.00	29.58	12.46	32.04	16.54	26.94
Higher Secondary	3.85	61.08	17.02	23.40	74.42	43.08	9.95	67.59	26.46
Graduate and Above	99.42	101.77	100.01	0.00	0.00	0.00	45.47	51.78	46.92
All	8.00	0.81	4.56	9.62	8.51	9.12	8.22	1.79	5.17

*Note:* R\_M= Rural Males, R\_F = Rural Females, R\_P= Rural Persons, U\_M= Urban Males, U\_F = Urban Females, U\_P = Urban Persons, T\_M= Total Males, T\_F= Total Females, T\_P = Total Persons.

*Source:* NSS 50th Round.

ANNEXURE TABLE A-4.7

## Unemployment Rate by Educational Standards in Arunachal Pradesh (as a Proportion of Population): 1999-2000

Education Level	Proportion of Population								
	R_M	R_F	R_P	U_M	U_F	U_P	T_M	T_F	T_P
All Social Groups									
Illiterate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Below Primary	1.42	0.00	0.70	0.00	0.00	0.00	1.30	0.00	0.65
Primary	14.40	0.00	8.05	9.32	0.00	4.70	13.98	0.00	7.74
Middle	7.34	0.00	4.48	0.00	0.00	0.00	6.50	0.00	3.94
Secondary	1.32	4.64	2.55	9.19	28.85	17.54	2.82	10.13	5.61
Higher Secondary	1.62	0.00	1.36	0.00	75.50	22.45	1.28	27.43	6.34
Graduate and Above	6.48	473.83	26.94	0.00	13.38	3.84	3.98	83.87	16.37
All	3.31	0.44	1.95	2.64	9.86	5.84	3.25	1.15	2.26
ST Social Group									
Illiterate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Below Primary	2.46	0.00	1.21	0.00	0.00	0.00	2.27	0.00	1.13
Primary	21.88	0.00	11.75	0.00	0.00	0.00	20.29	0.00	10.90
Middle	15.50	0.00	9.42	0.00	0.00	0.00	14.02	0.00	8.55
Secondary	1.12	8.46	3.72	30.04	0.00	16.47	4.26	7.15	5.32
Higher Secondary	0.00	0.00	0.00	0.00	283.81	75.90	0.00	66.93	17.26
Graduate and Above	6.68	667.51	32.19	0.00	0.00	0.00	4.88	220.27	22.47
All	4.95	0.55	2.79	3.39	13.69	8.04	4.86	1.22	3.08
Non-ST Social Group									
Illiterate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Below Primary	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Primary	5.21	0.00	3.06	17.83	0.00	8.58	6.41	0.00	3.69
Middle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Secondary	1.61	0.00	0.98	0.00	43.78	18.05	1.15	13.13	5.93
Higher Secondary	2.23	0.00	1.97	0.00	0.00	0.00	1.79	0.00	1.49
Graduate and Above	6.30	330.15	22.03	0.00	15.85	5.10	3.36	50.28	12.70
All	1.14	0.28	0.75	2.16	7.29	4.41	1.26	1.04	1.16

Note: R\_M= Rural Males, R\_F = Rural Females, R\_P= Rural Persons, U\_M= Urban Males, U\_F = Urban Females, U\_P = Urban Persons, T\_M= Total Males, T\_F= Total Females, T\_P = Total Persons.

Source: NSS 55th Round.



ANNEXURE TABLE A-4.8

## Unemployment Rate by Educational Standards in Arunachal Pradesh (as a Proportion of Population): 2004-05

Education Level	Proportion of Population								
	R_M	R_F	R_P	U_M	U_F	U_P	T_M	T_F	T_P
All Social Groups									
Illiterate	0.0	0.0	0.0	8.8	0.0	4.4	0.4	0.0	0.2
Below Primary	3.5	2.8	3.2	9.1	1.2	5.2	4.1	2.6	3.4
Primary	7.0	4.3	5.8	0.0	0.9	0.5	6.1	3.7	5.1
Middle	7.3	6.5	7.0	0.0	5.1	2.3	6.0	6.3	6.1
Secondary	4.6	2.0	3.5	0.0	0.0	0.0	3.8	1.5	2.8
Higher Secondary	20.2	13.7	18.0	4.0	10.2	5.9	14.5	12.5	13.9
Graduate and Above	57.6	20.0	49.6	14.8	46.0	21.2	43.6	28.2	40.4
All	5.6	2.4	4.1	5.0	3.7	4.4	5.5	2.5	4.1
ST Social Group									
Illiterate	0.0	0.0	0.0	41.8	0.0	16.6	0.5	0.0	0.3
Below Primary	1.3	3.8	2.4	0.0	0.0	0.0	1.2	3.5	2.2
Primary	8.7	5.9	7.5	0.0	2.0	1.3	8.3	5.5	7.0
Middle	10.3	8.6	9.5	0.0	8.2	4.9	9.4	8.6	9.0
Secondary	6.9	2.6	5.0	0.0	0.0	0.0	6.2	2.1	4.3
Higher Secondary	23.8	17.1	21.4	0.0	24.9	7.0	17.4	18.7	17.8
Graduate and Above	62.6	19.0	54.0	20.8	131.7	35.9	50.5	42.4	49.0
All	5.5	2.9	4.2	6.1	6.8	6.5	5.5	3.2	4.4
Non-ST Social Group									
Illiterate	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Below Primary	9.4	0.0	5.3	13.9	1.9	8.0	10.5	0.6	6.0
Primary	2.2	0.0	1.2	0.0	0.0	0.0	1.5	0.0	0.8
Middle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Secondary	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Higher Secondary	11.6	0.0	8.8	7.8	0.0	5.1	9.8	0.0	6.9
Graduate and Above	52.6	20.9	45.3	10.3	16.2	11.8	37.4	19.1	33.1
All	6.1	0.5	3.6	4.4	1.2	3.0	5.6	0.7	3.5

Note: R\_M= Rural Males, R\_F = Rural Females, R\_P= Rural Persons, U\_M= Urban Males, U\_F = Urban Females, U\_P = Urban Persons, T\_M= Total Males, T\_F= Total Females, T\_P = Total Persons.

Source: NSS 61st Round.

ANNEXURE TABLE A-4.9

## Unemployment Rate by Age Group in Arunachal Pradesh (as a Proportion of Labour Force): 1993-94

(Per Thousand Population)

Age Group	Proportion of Labour Force								
	R_M	R_F	R_P	U_M	U_F	U_P	T_M	T_F	T_P
All Social Groups									
10-14	209.28	0.00	142.73		1000.00	1000.00	209.28	84.36	167.13
15-19	44.33	1.61	25.27	110.86	254.56	177.72	46.40	10.11	30.19
20-24	71.38	18.13	41.92	74.51	207.82	108.67	71.76	25.15	47.04
25-29	27.79	0.00	13.51	0.00	0.00	0.00	23.67	0.00	12.23
30-34	8.52	0.00	5.43	0.00	0.00	0.00	7.58	0.00	4.92
35-39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40-44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45-49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50-54	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
55-59	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
60 and Above	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
All Age Groups	16	2	10	18	74	26	17	5	12
ST Social Group									
10-14	0.00		0.00				0.00		0.00
15-19	140.63	0.00	72.35				140.63	0.00	72.35
20-24	23.86	52.01	32.72	0.00	0.00	0.00	23.35	47.63	31.34
25-29	38.73	0.00	19.31	0.00		0.00	37.72	0.00	19.06
30-34	25.01	0.00	8.89				25.01	0.00	8.89
35-39	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
40-44	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
45-49	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
50-54	0.00	0.00	0.00				0.00	0.00	0.00
55-59	0.00	0.00	0.00				0.00	0.00	0.00
60 and Above	0.00	0.00	0.00				0.00	0.00	0.00
All Age Groups	19.51	3.38	12.53	0.00	0.00	0.00	19.03	3.36	12.32
Non-ST Social Group									
10-14	214.92	0.00	145.33		1000.00	1000.00	214.92	84.36	170.09
15-19	28.47	1.93	16.82	110.86	254.56	177.72	31.45	12.04	22.91
20-24	88.66	14.42	43.86	77.80	272.19	119.68	87.00	22.55	50.20
25-29	25.82	0.00	12.49	0.00	0.00	0.00	21.50	0.00	11.15
30-34	7.50	0.00	5.02	0.00	0.00	0.00	6.62	0.00	4.50
35-39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40-44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45-49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50-54	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
55-59	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
60 and Above	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
All Age Groups	15.74	2.02	9.96	18.27	76.25	26.87	16.10	4.90	11.69

Note: R\_M= Rural Males, R\_F = Rural Females, R\_P= Rural Persons, U\_M= Urban Males, U\_F = Urban Females, U\_P = Urban Persons, T\_M= Total Males, T\_F= Total Females, T\_P = Total Persons.

Source: NSS 50th Round.

ANNEXURE TABLE A-4.10

## Unemployment Rate by Age Group in Arunachal Pradesh (as Proportion of Labour Force): 1999-2000

(Per Thousand Population)

Age Group	Proportion of Labour Force								
	R_M	R_F	R_P	U_M	U_F	U_P	T_M	T_F	T_P
All Social Groups									
10-14	0.00	0.00	0.00				0.00	0.00	0.00
15-19	37.04	0.00	17.11	0.00	533.09	123.10	35.86	4.49	19.16
20-24	41.05	9.96	25.55	141.16	317.38	216.11	45.11	19.33	32.32
25-29	7.56	0.00	4.54	87.84	24.45	70.89	11.92	0.74	7.52
30-34	1.18	0.00	0.84	0.00	0.00	0.00	1.10	0.00	0.79
35-39	0.00	0.00	0.00	0.00	71.21	10.47	0.00	4.55	1.43
40-44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45-49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50-54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55-59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60 and Above	0.00	0.00	0.00				0.00	0.00	0.00
All Age Groups	7.71	1.41	5.20	16.40	88.38	29.13	8.42	3.84	6.65
ST Social Group									
10-14	0.00	0.00	0.00				0.00	0.00	23.71
15-19	61.22	0.00	24.07	0.00	0.00	0.00	59.59	0.00	64.16
20-24	102.41	14.53	53.07	215.24	338.28	298.81	106.18	32.04	11.46
25-29	15.55	0.00	8.37	150.96	0.00	98.43	21.14	0.00	0.74
30-34	1.18	0.00	0.77	0.00	0.00	0.00	1.12	0.00	0.00
35-39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40-44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45-49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50-54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55-59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60 and Above	0.00	0.00	0.00				0.00	0.00	9.73
All Age Groups	13.71	1.75	8.23	28.34	101.41	47.72	14.46	3.98	23.71
Non-ST Social Group									
10-14	0.00	0.00	0.00				0.00	0.00	0.00
15-19	21.00	0.00	10.97	0.00	1000.00	193.49	20.26	9.50	15.19
20-24	0.00	5.08	2.26	105.02	0.00	98.33	4.75	5.06	4.88
25-29	2.50	0.00	1.62	61.94	42.56	57.52	6.20	1.48	4.57
30-34	1.18	0.00	0.93	0.00	0.00	0.00	1.08	0.00	0.85
35-39	0.00	0.00	0.00	0.00	117.33	14.99	0.00	13.16	2.78
40-44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45-49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50-54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55-59	0.00	0.00	0.00				0.00	0.00	0.00
60 and Above	0.00	0.00	0.00				0.00	0.00	0.00
All Age Groups	2.19	0.89	1.76	11.53	76.06	20.22	3.20	3.63	3.34

Note: R\_M= Rural Males, R\_F = Rural Females, R\_P= Rural Persons, U\_M= Urban Males, U\_F = Urban Females, U\_P = Urban Persons, T\_M= Total Males, T\_F= Total Females, T\_P = Total Persons.

Source: NSS 55th Round.

ANNEXURE TABLE A-4.11

## Unemployment Rate by Age Group in Arunachal Pradesh (as Proportion of Labour Force): 2004-05

(Per Thousand Population)

Age Group	Proportion of Labour Force								
	R_M	R_F	R_P	U_M	U_F	U_P	T_M	T_F	T_P
<b>All Social Groups</b>									
10-14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19	20.8	7.9	14.4	92.3	66.0	77.8	24.0	11.1	17.6
20-24	35.6	13.0	25.1	107.6	110.2	108.5	40.3	17.0	29.6
25-29	31.1	25.6	28.7	23.0	36.4	26.7	30.1	26.2	28.5
30-34	10.9	0.0	6.1	0.0	0.0	0.0	9.6	0.0	5.6
35-39	3.9	0.0	2.1	0.0	0.0	0.0	3.2	0.0	1.9
40-44	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45-49	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50-54	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55-59	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60 and Above	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
All Age Groups	11.1	5.7	8.9	10.6	24.3	13.5	11.1	6.6	9.3
<b>ST Social Group</b>									
10-14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19	5.1	11.4	8.4	0.0	80.1	69.0	5.0	15.8	10.9
20-24	44.9	16.6	31.2	240.8	142.5	186.0	48.7	19.8	34.7
25-29	26.0	30.1	27.8	34.5	44.0	38.7	26.6	31.1	28.6
30-34	15.2	0.0	8.0	0.0	0.0	0.0	14.6	0.0	7.7
35-39	6.2	0.0	3.0	0.0	0.0	0.0	5.9	0.0	2.8
40-44	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45-49	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50-54	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55-59	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
60 and Above	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
All Age Groups	11.3	6.7	9.2	15.9	32.7	22.1	11.5	7.6	9.7
<b>Non-ST Social Group</b>									
10-14	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
15-19	44.4	0.0	25.3	110.3	0.0	87.7	50.3	0.0	29.4
20-24	10.7	0.0	6.4	73.9	80.7	75.7	21.6	7.6	16.2
25-29	46.5	8.5	31.6	15.5	0.0	13.9	38.8	8.0	28.4
30-34	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35-39	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40-44	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45-49	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50-54	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
55-59	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60 and Above	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
All Age Groups	10.8	1.4	7.8	8.6	11.1	8.9	10.2	2.4	8.1

Note: R\_M= Rural Males, R\_F = Rural Females, R\_P= Rural Persons, U\_M= Urban Males, U\_F = Urban Females, U\_P = Urban Persons, T\_M= Total Males, T\_F= Total Females, T\_P = Total Persons.

Source: NSS 61st Round.

ANNEXURE TABLE A-4.12

## Unemployment Rate by Age Group in Arunachal Pradesh (as a Proportion of Population): 1993-94

(Per Thousand Population)

Age Group	Proportion of Population								
	R_M	R_F	R_P	U_M	U_F	U_P	T_M	T_F	T_P
<b>All Social Groups</b>									
10-14	11.38	0.00	6.22	0.00	15.64	7.54	9.80	2.39	6.41
15-19	16.86	0.65	9.84	10.11	18.09	14.32	16.07	3.51	10.46
20-24	48.54	11.24	27.06	50.54	30.53	38.25	48.79	13.93	28.54
25-29	23.76	0.00	10.38	0.00	0.00	0.00	20.42	0.00	9.25
30-34	8.02	0.00	4.67	0.00	0.00	0.00	7.17	0.00	4.15
35-39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40-44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45-49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50-54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55-59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60 and Above	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Age Groups	8.28	0.93	4.78	9.30	8.05	8.73	8.40	1.74	5.25
<b>ST Social Group</b>									
10-14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-19	32.54	0.00	20.22	0.00	0.00	0.00	31.82	0.00	19.90
20-24	14.77	27.14	19.13	0.00	0.00	0.00	14.58	24.31	18.22
25-29	28.25	0.00	13.54	0.00	0.00	0.00	27.71	0.00	13.38
30-34	23.67	0.00	7.63		0.00	0.00	23.67	0.00	7.52
35-39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40-44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45-49	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00
50-54	0.00	0.00	0.00				0.00	0.00	0.00
55-59	0.00	0.00	0.00				0.00	0.00	0.00
60 and Above	0.00	0.00	0.00				0.00	0.00	0.00
All Age Groups	9.62	1.51	5.91	0.00	0.00	0.00	9.37	1.45	5.72
<b>Non-ST Social Group</b>									
10-14	12.92	0.00	7.25	0.00	16.04	7.70	10.96	2.80	7.33
15-19	12.12	0.79	7.05	10.52	18.19	14.63	11.89	4.16	8.31
20-24	62.54	9.13	28.94	52.03	33.34	40.82	60.86	12.61	30.72
25-29	22.78	0.00	9.76	0.00	0.00	0.00	19.06	0.00	8.54
30-34	7.05	0.00	4.33	0.00	0.00	0.00	6.27	0.00	3.80
35-39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40-44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45-49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50-54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55-59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60 and Above	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Age Groups	7.99	0.81	4.56	9.62	8.47	9.10	8.22	1.79	5.16

Note: R\_M= Rural Males, R\_F = Rural Females, R\_P= Rural Persons, U\_M= Urban Males, U\_F = Urban Females, U\_P = Urban Persons, T\_M= Total Males, T\_F= Total Females, T\_P = Total Persons.

Source: NSS 50th Round.

ANNEXURE TABLE A-4.13

## Unemployment Rate by Age Group in Arunachal Pradesh (as a Proportion of Population): 1999-2000

(Per Thousand Population)

Age Group	Proportion of Population								
	R_M	R_F	R_P	U_M	U_F	U_P	T_M	T_F	T_P
All Social Groups									
10-14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-19	11.26	0.00	5.34	0.00	19.84	8.34	10.13	1.35	5.59
20-24	20.26	5.55	13.37	56.66	98.37	77.07	22.06	10.51	16.64
25-29	5.65	0.00	2.77	77.28	6.68	39.12	8.98	0.35	4.56
30-34	0.93	0.00	0.56	0.00	0.00	0.00	0.87	0.00	0.49
35-39	0.00	0.00	0.00	0.00	14.47	6.28	0.00	2.02	0.94
40-44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45-49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50-54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55-59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60 and Above	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Age Groups	3.28	0.44	1.93	6.66	9.69	8.00	3.57	1.13	2.41
ST Social Group									
10-14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-19	14.52	0.00	6.08	0.00	0.00	0.00	13.77	0.00	5.81
20-24	34.46	7.62	22.36	64.08	228.38	143.42	35.57	17.01	27.18
25-29	8.97	0.00	4.07	116.04	0.00	54.12	12.32	0.00	5.60
30-34	0.84	0.00	0.51	0.00	0.00	0.00	0.81	0.00	0.46
35-39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
40-44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45-49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50-54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55-59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
60 and Above	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Age Groups	4.88	0.55	2.76	8.64	13.61	10.88	5.10	1.21	3.20
Non-ST Social Group									
10-14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15-19	7.85	0.00	4.33	0.00	31.17	11.86	6.70	3.57	5.33
20-24	0.00	3.03	1.49	50.78	0.00	25.67	3.34	2.83	3.09
25-29	2.30	0.00	1.22	57.93	9.88	31.80	5.71	0.80	3.39
30-34	1.04	0.00	0.62	0.00	0.00	0.00	0.94	0.00	0.53
35-39	0.00	0.00	0.00	0.00	23.57	9.94	0.00	4.23	1.84
40-44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
45-49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50-54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
55-59	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
60 and Above	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
All Age Groups	1.14	0.27	0.74	5.41	7.11	6.16	1.64	1.03	1.36

Note: R\_M= Rural Males, R\_F = Rural Females, R\_P= Rural Persons, U\_M= Urban Males, U\_F = Urban Females, U\_P = Urban Persons, T\_M= Total Males, T\_F= Total Females, T\_P = Total Persons.

Source: NSS 55th Round.



ANNEXURE TABLE A-4.14

## Unemployment Rate by Age Group in Arunachal Pradesh (as a Proportion of Population): 2004-05

(Per Thousand Population)

Age Group	Proportion of Population								
	R_M	R_F	R_P	U_M	U_F	U_P	T_M	T_F	T_P
<b>All Social Groups</b>									
10-14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19	6.0	2.6	4.4	7.9	6.0	6.9	6.3	3.2	4.8
20-24	25.7	8.0	16.8	37.3	23.8	31.1	27.2	9.7	18.5
25-29	29.6	16.5	22.6	21.2	9.9	14.9	28.5	15.6	21.6
30-34	10.4	0.0	5.1	0.0	0.0	0.0	9.0	0.0	4.4
35-39	3.6	0.0	1.8	0.0	0.0	0.0	3.0	0.0	1.5
40-44	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45-49	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50-54	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55-59	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60 and Above	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All Age Groups	5.6	2.4	4.1	5.0	3.7	4.4	5.5	2.5	4.1
<b>ST Social Group</b>									
10-14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19	1.1	3.3	2.1	0.0	9.4	6.0	1.0	4.1	2.6
20-24	31.1	10.3	20.5	33.8	37.3	35.2	31.3	11.9	21.6
25-29	24.5	22.2	23.3	31.7	18.1	23.1	25.0	21.8	23.3
30-34	14.2	0.0	6.9	0.0	0.0	0.0	13.4	0.0	6.4
35-39	5.5	0.0	2.5	0.0	0.0	0.0	5.3	0.0	2.4
40-44	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45-49	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50-54	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55-59	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60 and Above	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All Age Groups	5.5	2.9	4.2	6.1	6.8	6.5	5.5	3.2	4.4
<b>Non-ST Social Group</b>									
10-14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-19	22.4	0.0	12.8	13.9	0.0	7.9	20.0	0.0	11.5
20-24	8.9	0.0	4.6	40.8	15.0	27.7	16.5	3.8	10.2
25-29	45.6	3.8	21.0	14.2	0.0	7.3	37.4	3.1	18.0
30-34	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35-39	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40-44	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45-49	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50-54	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55-59	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60 and Above	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
All Age Groups	6.1	0.5	3.6	4.4	1.2	3.0	5.6	0.7	3.5

Note: R\_M= Rural Males, R\_F = Rural Females, R\_P= Rural Persons, U\_M= Urban Males, U\_F = Urban Females, U\_P = Urban Persons, T\_M= Total Males, T\_F= Total Females, T\_P = Total Persons.

Source: NSS 61st Round.

ANNEXURE TABLE A-4.15

## Percentage Share of Informal Sector Enterprises and Employment in Arunachal Pradesh: 1990-1998

Categories	Rural		Urban		Combined	
	Numbers	Employment	Numbers	Employment	Numbers	Employment
<b>1990 Agriculture</b>						
OAE	58.59	30.89	57.94	35.38	58.52	31.38
Informal Enterprise	94.16	66.82	99.21	95.61	94.77	70.44
<b>Non-Agriculture</b>						
OAE	45.56	16.20	36.40	8.31	43.36	13.48
Informal Enterprise	93.36	47.86	88.11	34.27	92.10	43.18
<b>Total</b>						
OAE	46.31	16.87	36.96	8.60	44.12	14.08
Informal Enterprise	93.40	48.72	88.39	34.93	92.23	44.09
<b>1998 Agriculture</b>						
OAE	58.01	34.05	20.00	8.64	54.23	31.24
Informal Enterprise	93.92	63.80	90.00	60.49	93.53	63.44
<b>Non-Agriculture</b>						
OAE	48.55	19.34	50.50	15.25	49.12	17.89
Informal Enterprise	93.24	51.91	92.63	43.79	93.06	49.02
<b>Total</b>						
OAE	48.66	19.52	50.40	15.23	49.18	18.01
Informal Enterprise	93.25	52.06	92.62	43.84	93.06	49.14

Source: Report on Economic Census, 1990 and 1998, Arunachal Pradesh.

ANNEXURE TABLE A-4.16

## Rural Non-farm Labour Force in North-east India

State	1993-94			1999-2000			2004-05		
	R_M	R_F	R_P	R_M	R_F	R_P	R_M	R_F	R_P
Arunachal Pradesh	20.93	3.84	13.61	24.38	4.89	16.58	26.0	7.3	18.1
Assam	22.36	17.65	21.41	35.35	20.6	32.32	30.4	11.7	25.7
Manipur	33.49	39.56	35.88	22.05	30.43	24.7	30.6	30.9	30.7
Meghalaya	17.46	9.48	14.01	14.03	12.72	13.45	20.7	15.2	18.3
Mizoram	13.65	6.73	11.22	15.99	12.53	14.49	15.1	8.9	12.6
Nagaland	32.13	10.81	25.55	29.47	8.07	20.34	30.4	9.6	20.7
Sikkim	43.02	32.97	40.86	43.16	29.93	39.25	45.3	28.1	39.5
Tripura	51.56	45.48	50.52	54.72	50.93	54.29	57.6	51.4	56.8
All North East	25.32	18.82	23.76	34.86	19.97	31.34	32.2	14.9	27.4
All India	25.90	13.80	21.60	28.60	13.70	23.70			

Note: R\_M= Rural Males, R\_F = Rural Females, R\_P= Rural Persons.

Source: NSS 50<sup>th</sup>, 55<sup>th</sup> and 61<sup>st</sup> Rounds, extracted from household level data on CD-ROM.

ANNEXURE TABLE A-4.17

## Changing Composition of RNFE in Arunachal Pradesh: 1971-1991

Industry Category	Percentage Share of RNFE		Annual Growth
	1971	1991	1971-1991
Mining and Quarrying	0.01	0.77	28.06
Manufacturing [a+b]	1.65	8.97	12.81
a. Household Manufacturing	1.53	0.63	-0.48
b. Non-household Manufacturing	0.12	8.29	28.17
Construction	0.48	19.79	24.90
Trade and Commerce	1.93	8.87	11.87
Transport, Storage and Communication	0.02	3.10	32.63
Other Services	95.91	58.50	1.14
Total RNFE	100.00	100.00	3.67

Note: Growth Rate is simple annual average growth.

Source: Census of India, various years.

ANNEXURE TABLE A-4.18

## Inter-district Variations in the Share of Rural Non-farm Employment in Arunachal Pradesh: 2001

(Main+Marginal Workers)

Districts	Share of Rural Non-farm Employment		
	Persons	Males	Females
Tawang	51.15	67.11	23.52
West Kameng	57.83	69.93	26.55
East Kameng	15.39	23.76	6.97
Papum Pare	47.18	59.39	27.33
Lower Subansiri	18.5	29.42	7.43
Upper Subansiri	14.92	23.94	5.57
West Siang	22.72	31.1	12.42
East Siang	28.84	35.08	20.78
Upper Siang	32.53	45.82	12.2
Dibang Valley	29.81	39.61	14.09
Lohit	26.91	34.98	13.33
Changlang	18.97	25.61	10.56
Tirap	14.66	23.79	4.75
Arunachal Pradesh	27.47	38.31	12.65

Source: Census of India, 2001.f

## Chapter 5

# Poverty

### Introduction

This chapter assesses poverty incidence in Arunachal Pradesh. It specially investigates the inter-district variation in the incidence of poverty.

The differences in the level of living, and consequently on incidence of poverty and inequality could arise due to variations in land use pattern across the states, the settlement of population, composition of population in different ethnic groups, temporal change and spatial variation in education and literacy rates and so on. Given that poverty is multidimensional; these characteristics would have significant influence on outcomes like poverty and consumption.

The data used here to investigate these issues have been obtained from the National Sample Survey Organisation (NSSO), Census of India, Ministry of Rural Development, Government of India and benchmarking survey of the households conducted by the Institute of Applied Manpower Research, New Delhi. The temporal change and spatial variation in the incidence of poverty and inequality have been investigated using household level data collected during two recent rounds of surveys conducted by the NSSO during the 50th (1993-94) and 61st Rounds (2004-05). In this study, we have used the unit record data, rather than the published tables brought out by the NSSO.

### Poverty and Undernutrition

In this section, we look at incidence of poverty in Arunachal Pradesh. The issues surrounding poverty measurement have been thoroughly debated.<sup>1</sup> Standard of

living or welfare is measured using consumption expenditure of the households. The reasonable minimum standard of living or poverty norm is taken from GoI (1993, 1997, 2007). It is to be noted that for the states located in the north-eastern region (NER), the state-specific price indices are available only for Assam. Consequently, the official poverty ratios are reported separately for Assam only from among the states in the NER (GoI, 1993, 1997, 2001). For the remaining six states in the region, the poverty ratios of Assam have been assigned. In this chapter, we have used expenditure distribution of Arunachal Pradesh and poverty line of Assam to calculate incidence of poverty in Arunachal Pradesh (as well as other states in NER) along with estimates of poverty incidence among districts in Arunachal Pradesh.

The poverty incidence in Arunachal Pradesh and NER as captured by the HCR is reported in Table 5.1. We observe from the table that the poverty incidence in the NER *vis-à-vis* the all India level was marginally lower in 1993-94, whereas in 2004-05, the all India figure (27.47 per cent) is over nine percentage points higher than the NER (18.17 per cent). While poverty incidence at the all-India level has recorded a steady and continuous fall during 1980s and 1990s, the NER has shown an uneven variation over time. Using the same methodology of poverty calculation among the states in the NER, we find that for the region as a whole, incidence of poverty in the NER declined sharply.

The estimates of poverty for 2004-05 released by the Planning Commission, Government of India have two different set of figures, mean per capita expenditure

1. For a survey of the literature on issues surrounding poverty measurement, see Dubey and Gangopadhyay (1998) and , Pradhan and Saluja (1998). For recent developments, see Dubey and Palmer-Jones (2005, 2005a, 2005b).

TABLE 5.1

## Poverty Incidence in Arunachal Pradesh and Other States in NER (1993-94 and 2004-05)

State	50th Round			61st Round		
	Rural	Urban	Total	Rural	Urban	Total
<b>Arunachal Pradesh</b>	<b>41.20</b>	<b>6.02</b>	<b>37.00</b>	<b>10.85</b>	<b>2.58</b>	<b>9.90</b>
Assam	45.20	7.92	41.40	22.09	3.64	20.38
Manipur	18.86	6.83	15.54	4.22	0.67	3.35
Meghalaya	24.37	1.82	21.29	3.57	0.06	3.11
Mizoram	6.24	0.00	4.26	2.80	0.00	1.69
Nagaland	2.29	0.00	1.68	0.00	0.00	0.00
Tripura	23.63	5.97	21.29	34.59	5.57	30.52
All India	36.85	32.86	35.86	28.04	25.81	27.47

Source: Dubey and Pala (2008).

(MPCE) based on uniform recall period (URP) and mixed recall period (MRP).<sup>2</sup> The difference in the estimates of poverty between URP and MRP measures of MPCE arises due to difference in the concept of mean per capita expenditure. It is to be noted that the numbers reported under columns 2004-05 in Table 5.1 are based on URP method which is comparable with the calculations of poverty in 1993-94. The HCR based on URP is higher by about six percentage points compared to HCR based on MRP measure of MPCE. We find a similar difference between the two measures for NER though the gap is marginally lower in case of NER compared to national figure.<sup>3</sup>

The state-wise break-up of poverty incidence in the NER highlights the intra-state variation. In 2004-05, Arunachal Pradesh has about 10 per cent of its population below the official poverty line. This is a steep decline from over 37 per cent in 1993-94. In fact, this is one of the fastest decline in poverty, especially among the smaller states.

Table 5.1 also highlights the break-up of poverty incidences into rural and urban sectors. While strict comparisons in rural poverty for Arunachal Pradesh, and Nagaland is not possible (because of limited survey of rural areas in Nagaland), the general trend is that poverty incidence has been on the decline in all the states except Tripura from 1993-94 to 2004-05.

Sectoral break-up of poverty incidence suggests that in Arunachal Pradesh, like other states in the region, poverty is mainly a rural phenomenon though it has declined

TABLE 5.1A

## HCR for NER States in 2004-05: URP and MRP

States	URP			MRP		
	Rural	Urban	All	Rural	Urban	All
<b>Arunachal Pradesh</b>	<b>10.85</b>	<b>2.58</b>	<b>9.90</b>	<b>10.09</b>	<b>1.76</b>	<b>9.13</b>
Assam	22.09	3.64	20.38	16.84	2.15	15.48
Manipur	4.22	0.67	3.35	2.43	0.26	1.90
Meghalaya	3.57	0.06	3.11	1.10	0.00	0.96
Mizoram	2.80	0.00	1.69	1.68	0.00	1.02
Nagaland	0.00	0.00	0.00	0.00	0.00	0.00
Tripura	34.59	5.57	30.52	28.68	2.72	25.04
All India	28.0	25.8	27.5	21.73	21.86	21.76

Source: Dubey and Pala (2008).

significantly (by about 31 percentage points). In fact, one of the highest reductions in rural poverty among the Indian states is recorded in Arunachal Pradesh. The urban population in Arunachal Pradesh, as well as among other states is less vulnerable. Given that nearly two-thirds of Arunachal Pradesh is inhabited by indigenous population, we have also calculated poverty ratios for these groups separately (not reported in this chapter). The STs in Arunachal Pradesh do not fare worse than other population groups. In sum, unlike other predominantly tribal states in the region (Meghalaya, Mizoram and Nagaland), households living in rural areas of Arunachal Pradesh are more vulnerable to poverty which could be due to relatively low productive *jhum* cultivation, absence of labour, product and credit market, and poor transport network (compared to other smaller states in the region).

While the debate on poverty in India goes back several decades, it has focused almost exclusively on changes in the 'headcount' ratio of consumption poverty—viz., the proportion of the population having monthly per capita consumption expenditure that is lower than the poverty line. In this chapter, we have also measured hunger-poverty, as measured by calorie deficiency—the inability to consume the energy (calories) required by the body. As pointed out earlier, we have used NSS consumption survey data from the 50th and 61st Rounds to calculate mean daily calorie intake per person, using food-to-calorie conversion factors obtained from Gopalan *et al.* (1993) and NSSO (1996, 2007). The normative calorie requirements for the population in Arunachal Pradesh were calculated using age-sex-activity structure for the rural and urban sectors separately.

2. See GoI (2007) for details on the concepts of URP and MRP.

3. Table 5.1a has HCR figures by type of recall period (URP and MRP) for NER and states in the NER.

From Table 5.2 it can be seen that among the states in the NER (except Meghalaya and Mizoram), as well as compared to all India level, Arunachal Pradesh has higher average normative calorie requirement in 1993-94 in the rural sector and continues to be at that level in 2004-05. This reflects the activity structure and demographic profile of the population of Arunachal Pradesh. As borne by the distribution of work force in Arunachal Pradesh, majority of working population is engaged in “heavy work” thereby increasing the normative requirements.<sup>4</sup>

TABLE 5.2

**State-wise Average Normative Calorie Requirement:  
Based on National Classification of Occupation  
Code and Declining Requirement with Age**

State	50th Round (1993-94)		61st Round (2004-05)	
	Rural	Urban	Rural	Urban
<b>Arunachal Pradesh</b>	<b>2243</b>	<b>2084</b>	<b>2398</b>	<b>2076</b>
Assam	2175	2068	2271	2041
Manipur	2149	2064	2318	2032
Meghalaya	2380	2019	2458	2024
Mizoram	2309	2153	2466	2041
Nagaland	2215	2065	2376	2052
Tripura	2126	2058	2237	2021
All India	2177	2050	2275	2062

Source: Dubey and Pala (2008).

The consequences of the higher average calorie requirement are reflected in the incidence of calorie deficiency reported in Table 5.3 where Arunachal Pradesh is one of states with marginally higher proportion of calorie deficient households compared to India but has higher incidence only compared to Nagaland and Manipur in the region in 1993-94. However, there is significant deterioration in the incidence of calorie deficiency, in 2004-05 in the country as a whole as well as states in the NER. In Arunachal Pradesh the calorie deficiency has increased sharply in the urban sector in 2004-05 compared to 1993-94, whereas the proportion of calorie deficient households in the rural sector has increased marginally from 64.08 per cent to 64.78 per cent.

This presents a paradoxical situation where incidence of poverty as measured by head count index has declined sharply in Arunachal Pradesh but the incidence of calorie deficiency has increased. This apparent disconnect between HCR and calorie deficiency has raised several

uncomfortable questions about the efficacy of methodology of poverty measurement in India in general and for smaller states in particular.

TABLE 5.3

**State-wise Proportion of Calorie Deficient Households**

State	50th Round (1993-94)			61st Round (2004-05)		
	Rural	Urban	Total	Rural	Urban	Total
<b>Arunachal Pradesh</b>	<b>64.08</b>	<b>26.75</b>	<b>58.69</b>	<b>64.78</b>	<b>47.50</b>	<b>62.30</b>
Assam	74.64	44.04	71.01	72.99	41.16	69.17
Manipur	60.40	49.65	57.36	75.08	27.69	63.02
Meghalaya	83.94	37.30	76.90	93.50	62.22	88.90
Mizoram	74.32	37.86	62.12	73.81	46.82	62.84
Nagaland	52.86	35.02	47.88	82.82	39.26	69.09
Tripura	71.88	51.93	69.16	86.50	44.70	80.04
All India	61.32	41.45	56.23	68.34	52.60	64.01

Source: Dubey and Pala (2008).

This clearly reflects the ad hoc procedure that has been adopted in the measurement of poverty among smaller states in general and in Arunachal Pradesh in particular. This clearly calls for making a fresh attempt at working out separate poverty line for Arunachal Pradesh and also for other states in the region.

### Poverty and Incidence of Hunger among Districts in Arunachal Pradesh

In the last section we have noted that at less than 10 per cent, incidence of poverty in Arunachal Pradesh is lower than many states in the Indian union. While one might like to argue that this figure may not be plausible, the available data do throw up these numbers which requires a careful examination which is beyond the scope of this chapter. However, the level of development is not uniform within the state, so it might have some influence on incidence of poverty among different districts.

Table 5.4 reports the proportion of population below the poverty line among 13 districts in Arunachal Pradesh in 1993-94 and 2004-05. It is to be noted that because of smaller sample at district level, contiguous districts were merged together to get poverty ratio only for three regions within the State.<sup>5</sup> The observed differences in the level of development (as could be seen from different infrastructure related developments) suggest that the most backward districts in the State are Changlang and

4. With only about 20 per cent population living in the urban areas, most of the population is dependent on subsistence agriculture.

5. The unit record data provided by the NSSO has only 13 districts codes. The two new districts created at later date are therefore not covered in this chapter.



Tirap. Our calculations also show these differences as the poverty incidence at 20 per cent is highest among these two districts. Similarly, if we do not go by the absolute numbers, these differences conform to our understanding of level of development among different districts in Arunachal Pradesh.

Table 5.4 also reports the incidence of hunger among districts in Arunachal Pradesh. The incidence of hunger is calculated from NSSO data on consumption expenditure. In the 61st Round of consumption expenditure survey, respondents were asked if all the members in the household get two square meals every day. The response from households in Arunachal Pradesh has been that almost all the households answered this question. Among the districts, Lower Subansiri and Upper Subansiri reporting over 24 per cent of the households not having two square meals round the year is alarming. In fact four districts have severe food insufficiency among households in Arunachal Pradesh.

TABLE 5.4

## Poverty in the Districts in Arunachal Pradesh

District	1993-94		2004-05	
	% of Population Below the Poverty Line	% of Households going Hungry	% of Population Below the Poverty Line	% of Households going Hungry
Changlang	38.3	25.3	20.0	23.5
Dibang Valley	16.4	0.0	10.3	0.0
East Kameng	24.9	17.3	11.2	10.1
East Siang	16.4	2.1	6.4	5.1
Lohit	38.3	6.0	10.3	0.0
Lower Subansiri	24.9	31.2	3.0	24.2
Papum Pare	24.9	31.2	1.6	2.8
Tawang	24.9	2.7	11.2	10.1
Tirap	38.3	43.4	20.0	23.5
Upper Siang	16.4	2.1	6.4	5.1
Upper Subansiri	24.9	47.3	3.0	24.2
West Kameng	24.9	32.2	11.2	10.1
West Siang	16.4	6.3	6.4	5.1

Source: Dubey and Pala (2008).

TABLE 5.5

## District Level Poverty in Arunachal Pradesh

Districts	50th Round (1993-94)				
	Districts Merged with the District in Column 1	Sample Size	Estimated Population	Estimated Number of Poor	HCR
01 Tawang	02 West Kameng, 03 East Kameng, 04 Lower Subansari, 05 Upper Subansari	524	287969	99581	34.6
06 West Siang	07 East Siang, 08 Dibang Valley	321	187675	63201	33.7
09 Lohit	11 Changlang, 10 Tirap	460	213673	93759	43.9
	61st Round (2004-05)				
	Districts Merged with the District in Column 1	Sample Size	Estimated Population	Estimated Number of Poor	HCR
01 Tawang	02 West Kameng, 03 East Kameng, 04 Papum Pare, 05 Lower Subansari, 06 Upper Subansari	827	318635	19281	6.1
07 West Siang	08 East Siang, 10 Dibang Valley, 09 Upper Siang	600	285528	17346	6.1
11 Lohit	12 Changlang, 13 Tirap	616	267164	49630	18.6

Note: Poverty calculations at the district level is possible for only three groups of districts. The name of the district is reported in column 1. Other contiguous districts have been merged (reported in column 2) with the districts in column 1. This has been done to maintain comparability with the 50<sup>th</sup> Round.

Source: Dubey and Pala (2008).

TABLE 5.6

## District Level Poverty in Arunachal Pradesh in 2004-05

Dist	Combined with	Sample	HCR
Tawang	West Kameng, East Kameng	279	11.2
Papum Pare	None	280	1.6
Lower Subansiri	Upper Subansiri	268	3.0
West Siang	East Siang, Upper Siang	480	6.4
Lohit	Dibang Valley	336	10.3
Changlang	Tirap	400	20.0
<b>Arunachal Pradesh</b>		<b>2043</b>	<b>9.9</b>

Note: In 61<sup>st</sup> Round, district poverty can be calculated for six districts if we consider sample size for 61<sup>st</sup> Round only.

Source: Dubey and Pala (2008).

**TABLE 5.7**  
**District Level Poverty and Hunger Incidence**  
**in Arunachal Pradesh**

<i>District</i>	<i>Districts Merged with</i>	<i>HCR</i>	<i>Incidence of Hunger</i>
Tawang	West Kameng, East Kameng	11.2	10.1
Papum Pare	None	1.6	2.8
Lower Subansiri	Upper Subansiri	3.0	24.2
West Siang	East Siang, Upper Siang	6.4	5.1
Lohit	Dibang Valley	10.3	0.0
Changlang	Tirap	20.0	23.5

*Source:* Dubey and Pala (2008).

## Conclusions and Policy Issues

In this chapter, we looked at the most important consequence of underdevelopment—the existence of poverty and malnutrition in Arunachal Pradesh along with states in the NER as well as all India. In Arunachal Pradesh, poverty incidence as measured by the Head Count Index is less than all India average but higher compared to smaller states in NER in 2004-05. Arunachal Pradesh is also one of the states where poverty incidence declined significantly. The intra-state incidence of poverty is also reported where we observe that highest poverty

levels are recorded in the most backward districts in the State.

An important finding of this chapter is the higher normative calorie requirement as well as higher incidence of calorie deficiency in Arunachal Pradesh. This highlights the issue that was raised in the GoI (1979). The Task Force had suggested that the poverty norm at the all India level is not a true reflection of normative calorie requirement of the population living in the hilly areas. This finding also suggests that the consumption pattern, especially consumption of food items, of the rural population in Arunachal Pradesh is not being captured adequately in the NSSO surveys.

The issues of immediate concern are calculation of separate poverty norm and creation of price indexes that could capture the living standard and cost of living adequately for Arunachal Pradesh. In addition, the exercise carried out in this chapter is based on data available from the Central Sample of the NSSO surveys. For smaller states like Arunachal Pradesh, there is urgent need to increase the sample size (number of the households surveyed) for getting a more reliable estimate of poverty at the State as well as districts within Arunachal Pradesh.

## Chapter 6

# Human Development

### Introduction

The increasing visibility and growing popularity of the concept of ‘human development’, has created an entirely new paradigm of public policymaking, particularly in developing economies. Human development is not just another dimension of development; it is altogether a new perspective, ‘a revolutionary way to recast our conventional approach to development’. What is ‘new’ in this approach to development is that the focus is on ‘human beings’ and not just on the economy. Further, it is not just about plan-targets and growth rates; it is more concerned about the impact of growth on human beings. And last but not least, human development is a broader and holistic concept which encompasses developments in the economy, polity and society. In its essence, human development is about expansion of human freedoms. This conceptual watershed in the history of development studies clearly recognises the values of freedom to choose—not only between commodities, but also among technologies, political parties, ideologies and institutions. Thus, human development is not just limited to the material aspects of well-being it goes beyond that. There is a greater recognition of the intrinsic value of human well-being and education in this framework. At the same time, human development is not only important in itself, but also has important linkages with the growth process.

### Human Development in Arunachal Pradesh and its Districts

The human development index (HDI) is basically a composite index based on three dimensions of human development—income, health and education. In

conventional analysis a country is called rich or poor mainly on the basis of a single indicator—the per capita income. The HDI, on the other hand, puts equal emphasis on all the three dimensions of development. Thus, different indicators of development like per capita income, life expectancy, adult literacy and enrolment ratio are used to construct a single index—the human development index.

In terms of HDI the position of Arunachal Pradesh is dismal, ranking 14<sup>th</sup> among the 16 major states of India.<sup>1</sup> At a disaggregated level, in Arunachal Pradesh, the district East Siang with an HDI of 0.660 ranks first among the 13 districts, followed by Dibang Valley with an HDI of 0.659. The district of Papum Pare in which the capital complex, Itanagar is situated ranks third with an HDI of 0.573. Further it has been observed that the hilly districts have a lower HDI compared to that of the plain districts (Table 6.1).

The spatially uneven process of development in the State has created new challenges and constraints. Usually, the districts or areas bordering Assam, and within the district areas near the urban, administrative centres have better infrastructural facilities than the interiors. Arunachal Pradesh has been the home of a number of tribes and sub-tribes, and many of them have limited mobility beyond their well-defined local boundaries. Inter-regional disparities in the State, therefore, have an additional implication—as in many cases, it may reflect inter-tribal disparities to a certain extent. Though the state has been relatively free from secessionist violence and insurgency, its development performance, particularly in terms of the human development indicators, has not been satisfactory. Among the eight north-eastern states,

1. Annexure Table A-6.1 clearly reflects that Kerala with an HDI of 0.721 occupies the highest rank and Bihar occupies the lowest position with an HDI of 0.446. Whereas on per capita basis, the rank of Arunachal Pradesh is 10<sup>th</sup>—only six states namely Assam, Bihar, Madhya Pradesh, Orissa, Rajasthan and Uttar Pradesh are ranked lower than that of Arunachal Pradesh. Further, in the field of education the rank of Arunachal Pradesh is 12<sup>th</sup>. However, in terms of health status, the position of Arunachal Pradesh is the worst among all the 16 states (GoAP, 2006).

TABLE 6.1  
HDI of Districts of Arunachal Pradesh: 2001

Districts	Health		Education		Income		HDI	Rank
	Index	Rank	Index	Rank	Index	Rank		
Tawang	0.413	11	0.472	12	0.780	2	0.555	6
West Kameng	0.473	7	0.566	6	0.680	4	0.573	4
East Kameng	0.306	13	0.489	10	0.291	12	0.362	13
Papum Pare	0.613	1	0.729	1	0.376	9	0.573	3
Lower Subansiri	0.457	10	0.626	4	0.191	13	0.425	11
Upper Subansiri	0.356	12	0.552	7	0.408	8	0.438	10
West Siang	0.506	5	0.701	2	0.467	7	0.558	5
East Siang	0.585	2	0.666	3	0.729	3	0.660	1
Upper Siang	0.484	6	0.532	8	0.557	5	0.524	7
Dibang Valley	0.465	8	0.572	5	0.942	1	0.659	2
Lohit	0.522	3	0.503	9	0.530	6	0.518	8
Changlang	0.512	4	0.473	11	0.371	10	0.452	9
Tirap	0.461	9	0.428	13	0.301	11	0.397	12
<b>Arunachal Pradesh</b>	<b>0.484</b>		<b>0.566</b>		<b>0.495</b>		<b>0.515</b>	

Source: Government of Arunachal Pradesh, 2006.

Arunachal Pradesh occupies the fourth position in terms of per capita NSDP, but according to the National Human Development Report 2001, it was at the bottom in terms of HDI (Annexure Table A-6.1). In terms of the Human Poverty Index, barring Mizoram, its position is the worst in the region. In 2001, Arunachal Pradesh had the lowest literacy rate among all the north-eastern states, as well as the highest urban-rural gap and the highest gender gap in literacy. Although enrolment in schools has been improving in terms of dropout rates and school availability, the State's performance, in a comparative perspective, has hardly been satisfactory (Annexure Table A-6.2). In terms of health status of the population, Arunachal Pradesh has the second highest Under Five Mortality rate and the second highest IMR among the north-eastern states (Annexure Table A-6.3). While it is always possible to explain this relative under-performance of Arunachal Pradesh by citing many historical, geographical and economic constraints, any forward-looking strategy of development for the State has to address these issues in their entirety as well as local specificities.

## Health

The right to lead a long, healthy and productive life is one of the fundamental prerequisite for human development. In fact, it is one of the essential indicators of peoples' well-being and quality of life. Apart from the low levels of food and nutrition security, access to health care, education and income, critically conditions the survival and well-being of individuals.

Due to the non-availability of reliable time-series data on many important aspects of health and demographic indicators, it is difficult to arrive at any conclusions regarding the changes in the health status of the population in the State. The following analysis is largely based on the data generated by the survey conducted for the preparation of the State's Human Development Report,<sup>2</sup> although data from other secondary sources have also been used.

### Life Expectancy

The life expectancy at birth in Arunachal Pradesh is estimated to be 54.05 years, which is less than the national average of 63.30 years. Although, the health conditions in Arunachal Pradesh, by and large, have improved in the post-Independence decades, yet there are no reliable estimates of the changes in the health condition of people in the State.<sup>3</sup>

As shown by the data in Annexure Table A-6.5, the difference in life expectancy between Kerala, the state having the highest life expectancy in the country and Arunachal Pradesh is as high as 22.18 years. Even among the north-eastern states, the state of Assam is ahead of Arunachal Pradesh by 4.56 years. Papum Pare is the district with the highest life expectancy at birth indicating the best of health status of the people among all the 15 districts of the State, followed by East Siang. At the other extreme is Kurung Kumey, which has a life expectancy of only 42.50 years. Dibang Valley (new) and East Kameng are close to Kurung Kumey with life expectancy of 43.20 years and 43.36 years, respectively (Table 6.2). There are five districts with life expectancy below 50 years. It has been found that the districts situated in the upper ranges of the hills have a lower life expectancy than the districts

2. The primary survey was conducted in all the districts of Arunachal Pradesh covering 5257 households with 30,762 individuals. Much of the analysis in this chapter draws on the Arunachal Pradesh Human Development Report, 2005.

3. This can be ascertained by the changes in the growth rates of the tribal population, in the absence of mortality data. Since 1961, the tribal population has been growing in the State. Given the declining fertility rate of the tribal population this is indicative of their improved health conditions and higher longevity. By all circumstantial evidence one can safely conclude that the health status of the people of Arunachal Pradesh has improved but the rate of improvement has been less than satisfactory.

with a larger share of plain areas and plateaus. The two districts of Lower Dibang Valley and Lohit, with extensive plain areas, for example, have better health conditions than Dibang Valley (new).

TABLE 6.2  
Life Expectancy at Birth in Districts of  
Arunachal Pradesh: 2000-01

Districts	Life Expectancy			Life Expectancy Index		
	Male	Female	Total	Male	Female	Total
Tawang	49.75	50.01	49.79	0.454	0.375	0.413
West Kameng	53.04	53.51	53.35	0.509	0.434	0.473
East Kameng	43.86	42.47	43.36	0.356	0.250	0.306
Papum Pare	60.92	62.45	61.80	0.640	0.583	0.613
Kurung Kumey	42.83	42.30	42.50	0.339	0.247	0.292
Lower Subansiri	54.91	56.33	55.65	0.540	0.481	0.511
Upper Subansiri	45.50	47.22	46.34	0.383	0.329	0.356
West Siang	56.30	54.36	55.37	0.563	0.448	0.506
East Siang	59.06	61.43	60.08	0.609	0.566	0.585
Upper Siang	55.59	52.50	54.02	0.552	0.417	0.484
Lower Dibang Valley	56.95	59.05	58.56	0.574	0.526	0.559
Dibang Valley (new)	43.55	42.46	43.20	0.351	0.249	0.303
Lohit	55.51	57.67	56.30	0.550	0.503	0.522
Changlang	54.72	56.62	55.70	0.537	0.485	0.512
Tirap	54.36	50.51	52.66	0.531	0.384	0.461
<b>Arunachal Pradesh</b>	<b>53.66</b>	<b>54.51</b>	<b>54.05</b>	<b>0.519</b>	<b>0.450</b>	<b>0.484</b>

Source: GoAP, 2006, HDR of Arunachal Pradesh 2005.

Female life expectancy at birth in Arunachal Pradesh has been estimated to be 54.51, which is marginally higher than the male life expectancy in the State, 53.66. While Papum Pare, the most urbanised district, has the highest female life expectancy at birth, Kurung Kumey has the lowest life expectancy followed by Dibang Valley (new) and East Kameng. It is important to note that female life expectancy in the State is not only lower than the current national average of 64.84, but also lower than the country's average in 1981-1985. So far as the determinants of inter-district variations in life expectancy are concerned, it is found that the percentage of rural population not connected by road,<sup>4</sup> is positively correlated with life expectancy, while literacy is positively correlated

with the life expectancy.<sup>5</sup> However, it is important to note that variables capturing the availability of health services, such as hospital beds per ten thousand population in the districts are not very strongly related to their life expectancy. In spite of relatively low IMR in Arunachal Pradesh the expectation of life, which captures the overall mortality condition of the population is one of the lowest in the country. This is mainly because of comparatively high mortality rate among the people aged 40 years and above, a situation, which is reflective of poor health services, and high illiteracy among the older generation in Arunachal Pradesh.

### Infant and Child Mortality

Infant mortality rate measures the health conditions in infancy and it is intricately enmeshed with the low economic conditions of the population. In general, a high IMR in a high fertility society is associated with illiteracy, low level of technology in production and poverty. As per the HDR survey, Arunachal Pradesh has a high IMR of 77.<sup>6</sup> The IMR in Arunachal Pradesh varies from 113 in Kurung Kumey to 53 in Lower Dibang Valley, the inter-district variation being quite large. In Arunachal Pradesh there are six districts with IMR higher than 90. There are five districts in Arunachal Pradesh with IMR higher than that of Orissa', the state having the largest IMR (Table 6.3).

Although female infant mortality rate was estimated to be 76 for the State as a whole, considerable inter-district variation in IMR has also been noticed. Among the 15 districts, it is found that Kurung Kumey has the highest infant mortality rate for females, while Lower Dibang Valley has the lowest. It is important to note that, of the 13 districts, female IMR was found to be higher than male IMR in as many as five districts.<sup>7</sup>

As per the HDR survey, the female under-five mortality rate was estimated to be 137 for the State as a whole. Among the districts it varied between 94 in East Siang to 246 in Kurung Kumey. The female under-five mortality rate was found to be higher than the male under-five mortality rate in 9 out of the 13 old districts as well as for the State as a whole.

4. The correlation coefficient of percentage of rural population not connected by road with the life expectancy was found to be -0.84, which is statistically significant at 0.10 per cent level. The explanatory variables are available for the old 13 districts and so the analysis is carried out for them only.
5. The correlation coefficient between life expectancy and literacy was found to be 0.74 that is significant at 0.40 per cent level.
6. According to the Registrar General of India, during 2004-2006, the IMR of the State was 38 for males, 43 for females and 40 for all persons (Economic Survey, 2007-08). In 2000-01, the period for which the HDR survey estimated IMR, among the 15 big states, Orissas IMR of 95 is the highest and Kerala's lowest at 14 in the country.
7. Alternative estimates from 1991 census also show higher female IMR in 4 districts among the 11 districts for which data was available (Rajan and Mohanachandran, 1998). Among the scheduled tribe population in the State, IMR and Under Five Mortality Rate were found to be higher for males than for females in 1991, both in urban as well as rural areas (Rajan and Mohanachandran, 2001).



TABLE 6.3

**Infant Mortality Rate in the Districts of Arunachal Pradesh**

Sl.No.	Districts	IMR	Rank
1	Tawang	98	13
2	West Kameng	88	9
3	East Kameng	97	12
4	Papum Pare	67	5
5	Kurung Kumey	113	15
6	Lower Subansiri	59	3
7	Upper Subansiri	97	11
8	West Siang	85	7
9	East Siang	57	2
10	Upper Siang	87	8
11	Lower Dibang Valley	53	1
12	Dibang Valley (new)	98	14
13	Lohit	72	6
14	Changlang	62	4
15	Tirap	92	10
	Arunachal Pradesh	77	

Source: HDR of Arunachal Pradesh 2005.

IMR in Arunachal Pradesh varies significantly with the accessibility. It is excessively high in the remote and relatively inaccessible areas and relatively low in accessible areas. By and large, the districts in the upper region have a higher IMR than the districts in the lower regions of the State. Both female IMR and female under-five mortality rate are found to be negatively correlated with female adult literacy rates. In spite of the fact that gender discrimination is generally believed to be less severe in predominantly tribal societies, excess female mortality in Arunachal Pradesh puts a question mark on the prevailing social attitudes towards girl child. Improvement in female literacy to some extent might have contributed in eliminating gender bias in childcare that results in excess female mortality among children.

### Immunisation

The universal immunisation programme (UIP) was introduced by the Government of India in 1985-86 with the objective of covering at least 85 per cent of infants against six vaccine-preventable diseases by 1990. Subsequently, the programme was expanded to cover all the districts of the country and the target now is to achieve 100 per cent immunisation coverage. In spite of the programme being universal, a number of states in the country including Arunachal Pradesh have failed to really 'universalise' it. As per the HDR survey, the overall achievement in immunisation against polio and DPT is only 68.09 per cent in the State, a level that is

significantly below the national average. Some districts have achieved a better coverage with Papum Pare being at the top. National Family Health Survey (NFHS-3) in Arunachal Pradesh found that 28.4 per cent of the children were vaccinated fully against BCG, polio, DPT and measles during 2005-06. Apart from Nagaland, in all other states of the north-eastern region a higher percentage of children have received all the basic vaccination. There is an urgent need to expand the reach of the programme in the State, particularly to the remote and hilly areas.

### Health Services

The availability and effective utilisation of health services are necessary preconditions for improvements of the health status of the population. The tribes of Arunachal Pradesh had a rich knowledge about medicinal plants, and in some areas (for example in the Buddhist belts) traditional medicines were being used more systematically. The growth of modern health services, however, is a comparatively recent phenomenon. As reflected by Annexure Table A-6.6, hospital beds per thousand population, increased from 11.0 in 1960-61 to 26.4 in 1990-91. In the post-reform decade of the 1990s, however, this has declined to 20.1. Doctors per thousand population, similarly increased from 1.6 in 1950-51 to 4.3 in 2000-01. In comparison to all India averages, the level of health facilities might seem somewhat satisfactory, but the conventional indicators based on availability of health services per thousand population have limited significance in a hilly state like Arunachal Pradesh because of the scatteredness of settlements and difficulties in utilising health facilities in high altitude areas.

An important aspect of the availability of health infrastructure in the State, as in many other parts of the country, is the rural-urban disparity. As shown in Annexure Table A-6.7, of all the allopathic medical institutions in the State, 85.71 per cent are located in the urban areas. Only 29.63 per cent of community health centres (CHCs) and 37.31 per cent of primary health centres (PHCs) are located in the rural areas of the State. Providing basic health care to scattered human habitations is a tough and challenging task in Arunachal Pradesh.

### Educational Attainments

Access to education plays a significant role in expanding opportunities for individuals, households and communities. Given the positive externalities of education in general, it is hardly surprising that expansion of educational opportunities has been regarded as one of the fundamental means for social transformation. In

Arunachal Pradesh access to formal education has been one of the most important means for achieving a better quality of life in the context of the rapid transformation and modernisation of the economy, the society and the polity.

### Literacy Rates

The literacy rate for Arunachal Pradesh, according to 2001 census, is only 54.34 per cent, much lower than the national average of 64.80 per cent. Nevertheless, the State has made some progress in raising the literacy rate—from only 25.55 per cent in 1981 to 54.34 per cent in 2001. However, literacy rate in rural areas is as low as 47.8 per cent, and the rural-urban gap in literacy continues to be very high. Among the ST population literacy has gone up from 14.04 per cent in 1981 to 34.45 per cent in 1991 and further to 49.62 per cent in 2001. Adult literacy rate went up from 23.77 per cent in 1981 to 37.53 per cent in 1991, but in rural Arunachal Pradesh literacy was only 32.61 per cent, which was much below the other north-eastern states (Table 6.4 and Annexure Table A-6.8). Female literacy rate for Arunachal Pradesh was only 43.53 per cent, much lower than the national average of 53.70 per cent in 2001. However the State has made rapid progress in raising the female literacy—from only 14.02 per cent in 1981 to 43.53 per cent in 2001. In rural areas

female literacy rate is as low as 36.9 per cent, and its rural-urban gap continues to be very high. Among the ST population female literacy has gone up from 7.31 per cent in 1981 to 24.94 per cent in 1991 and 39.86 in 2001. Adult literacy rate for females has gone up from 11.01 per cent in 1981 to 23.59 per cent in 1991, but in rural Arunachal Pradesh female literacy was only 19.13 per cent, in 1991, which was much below the other north-eastern States. Further it is found that the male literacy rate for Arunachal Pradesh is 63.83 per cent, which is lower than the national average of 75.20 per cent, according to census 2001. Nevertheless, the State has made substantial progress in raising the male literacy—from only 35.12 per cent in 1981 to 63.83 per cent in 2001. In rural areas though the male literacy rate is 57.7 per cent, yet the rural-urban gap continues to be very high. Among the ST population male literacy has gone up from 20.79 per cent in 1981 to 44.00 per cent in 1991 and further to 58.77 per cent in 2001. Adult literacy rate for males has gone up from 34.02 per cent in 1981 to 48.69 per cent in 1991, but in rural Arunachal Pradesh male literacy was only 43.80 per cent, which was much below compared to other north-eastern states.

Although the State has made significant progress in the past, its performance in comparative terms has not

TABLE 6.4  
Literacy Rate in Districts of Arunachal Pradesh: 2001 (All Areas) (Percentage)

Districts	All Areas			Rural			Urban		
	M	F	All	M	F	All	M	F	All
Tawang	51.05	30.87	41.14	45.66	25.89	35.83	83.60	67.37	76.31
West Kameng	71.02	48.56	61.67	69.65	45.84	59.83	85.47	72.47	79.55
East Kameng	52.66	28.86	40.89	42.28	20.98	31.5	79.99	53.48	67.72
Papum Pare	79.00	61.72	70.89	70.11	49.66	60.35	87.03	73.35	80.72
Kurung Kumey	32.74	15.94	24.31	32.74	15.94	24.31	-	-	-
Lower Subansiri	53.68	36.19	45.09	48.79	31.16	40.01	85.86	71.76	79.10
Upper Subansiri	58.81	42.74	50.89	49.69	34.84	42.27	80.90	63.94	72.86
West Siang	66.72	53.24	60.31	60.92	48.58	54.9	87.01	74.10	81.5
East Siang	69.02	52.87	61.22	64.13	48.12	56.3	82.43	67.24	75.38
Upper Siang	58.64	39.09	49.8	58.64	39.09	49.8	-	-	-
Dibang Valley	69.21	49.73	60.34	63.26	42.79	53.74	89.97	78.39	85.05
Dibang Valley (N)	60.55	43.15	53.36	60.55	43.15	53.36	-	-	-
Lohit	65.68	44.59	56.05	61.2	38.80	50.89	83.83	69.68	77.56
Changlang	62.83	39.85	51.98	59.34	36.00	48.2	90.11	76.46	84.26
Tirap	53.76	29.00	42.01	46.56	21.24	34.36	88.50	73.69	82.02
Arunachal Pradesh	64.07	44.24	54.74	58.09	37.56	48.34	85.61	70.60	78.82

Source: Censuses of India 2001, Series 13-Arunachal Pradesh, Provisional Population Totals, Paper - of 2001, Directorate of Censuses Operations, Arunachal Pradesh.

been very impressive. Considerable inter-district variations exist in literacy rates from 69.32 per cent in Papum Pare to 25.74 per cent in Kurung Kumey, 40.64 per cent in East Kameng, and 41.73 per cent in Tirap. Substantial gap exists between urban and rural literacy levels in many of the districts as well. The gap was found to be the highest in Tawang followed by Tirap, Lower Subansiri, East Kameng and Changlang, respectively. The urban-rural gap in literacy was lowest in East Siang and West Kameng districts. Given the inaccessibility and inadequacy in provision of social infrastructure, there is a huge gap in the opportunities before the rural masses and their urban counterparts. Between 1981-1991 there has been a decline in urban-rural gap in literacy both for male and female literacy rates, but it was found that the decline in urban-rural gap in case of male literacy was sharper than that of the females. However, during the 1990s the urban-rural gap in female literacy has come down very sharply.

**TABLE 6.5**  
**Female Literacy Rate: Arunachal Pradesh 2001**

District	Female Literacy Rate			Urban-Rural Gap
	Total	Rural	Urban	
Tawang	30.0	25.0	66.6	41.6
West Kameng	47.5	44.8	71.3	26.5
East Kameng	28.6	20.8	52.7	31.9
Papum Pare	60.4	49.0	71.3	22.3
Lower Subansiri	36.0	31.3	69.8	38.5
Upper Subansiri	40.7	32.5	63.0	30.5
West Siang	51.6	46.7	73.0	26.3
East Siang	52.4	47.5	67.2	19.7
Upper Siang	38.8	38.8	-	-
Dibang Valley	48.7	42.5	78.1	35.6
Lohit	44.5	38.8	69.3	30.5
Changlang	39.2	35.0	75.4	40.5
Tirap	28.8	21.2	73.1	51.9
Arunachal Pradesh	43.5	36.9	69.5	32.6

*Note:* Upper Siang district does not have any urban area.

*Source:* Census of India 2001, Series-13, Arunachal Pradesh, Final Population Totals, Paper-2 of 2001.

### Gender Gap in Literacy

The gender gap in literacy in Arunachal Pradesh as per 2001 census is 20.30 per cent points which is lower than the national average of 21.5 percentage points. The gap

between male and female literacy rates in the State declined very slowly during 1981 to 2001. In rural areas, gender gap in literacy is sharper than that in urban areas. Although the gender gap in literacy has been narrowing down in the urban areas; it has remained at around 20 per cent points during the past two decades in rural areas—a fact that needs to be addressed in all future initiatives. In comparative terms, gender gap in literacy in Arunachal Pradesh is highest among all the states in north-east India both for total as well as for rural population (Annexure Table A-6.9). At a disaggregated level, gender gap in literacy is highest in Tawang district and lowest in West Siang.<sup>8</sup> The districts having higher gender gap in literacy than the State average include the western districts of Tawang, West Kameng and East Kameng on one end, and the eastern districts of Tirap, Changlang and Lohit on the other. Such patterned concentration of districts having high gender gap in literacy rates may imply the importance of shared social attitudes in determining gender difference in access to education, an issue that needs further scrutiny. Another disturbing fact is that in West Kameng and East Kameng, gender gap increased between 1991 and 2001, while in Lower Subansiri, Tirap and East Siang the decline was marginal, although the disparity index in literacy has shown a decline in all the districts (Table 6.6). Gender gap in literacy among the ST population in the State, although lower than that among the total population, is quite high. Despite the rise in female literacy rate among the ST population, the gender gap increased substantially from 13.48 percentage points in 1981 to 19.06 percentage points in 1991 and has marginally reduced to 18.92 points in 2001. This implies that the expansion of educational opportunities has not been gender-neutral: females within the ST population are lagging behind their male counterparts.

Notwithstanding the importance of literacy rate as a basic measure of educational attainment, the relative access to secondary, higher and technical education has to be taken into account to get a complete picture of gender disparities in educational attainments. Among the literate females in Arunachal Pradesh, substantial proportions have studied only up to below primary levels.<sup>9</sup> National Family Health Survey data for 1998-99 shows that the median years of schooling among males in Arunachal Pradesh was 4.4, while that for females was only 2.1. It is important to mention that the survey found median years

8. The gender gap in adult literacy is higher than that of the overall literacy rate in 2001. Changlang has the highest gender gap in adult literacy, followed by Tirap, West Kameng, Tawang, Lohit and Upper Siang, all of which show higher gender gaps than the state average (GoAP, 2006).

9. In 1991, of the total female literates in Arunachal Pradesh 36.4 per cent had studied up to below primary levels, while in rural areas 40.9 per cent of literate females had studied up to that level. In some districts like East Kameng, 48 per cent of female literates had not studied beyond primary levels. On the other hand, 6.1 per cent of literate males had studied up to graduation and beyond in the State, but only 3.6 per cent of women could reach that stage in 1991.

of schooling for females in the State to be the lowest among all north-eastern states (IIPS, 2002:25-29). In 2005-2006, as per the NFHS-III data, only 9.6 per cent of women in the age group 15-49 have completed 12 or more years of schooling, which is the lowest among the north-eastern states, except Tripura (IIPS, 2007: 62).

**TABLE 6.6**  
**Gender Gap in Literacy in Districts of**  
**Arunachal Pradesh: 1991-2001**

<i>Districts</i>	<i>Gender Gap in Literacy Rate</i>		<i>Disparity Index in Literacy</i>	
	1991	2001	1991	2001
Tawang	35.82	30.28	0.440	0.388
West Kameng	19.81	22.83	0.252	0.241
East Kameng	23.67	23.77	0.489	0.328
Papum Pare	22.47	16.92	0.251	0.163
Lower Subansiri	17.55	17.36	0.295	0.220
Upper Subansiri	20.34	18.85	0.297	0.219
West Siang	18.01	15.07	0.227	0.157
East Siang	16.74	16.00	0.233	0.166
Upper Siang	21.97	19.92	0.348	0.237
Dibang Valley	22.64	18.55	0.300	0.196
Lohit	22.81	21.20	0.277	0.233
Changlang	24.80	22.90	0.332	0.267
Tirap	24.92	24.52	0.434	0.336
<b>Arunachal Pradesh</b>	<b>21.76</b>	<b>20.30</b>	<b>0.298</b>	<b>0.227</b>

*Note:* (i) Literacy rate is the percentage of literates to total population aged 7 years and above.

(ii) Disparity Index is the modified Sopher's index.

*Source:* Census of India, 2001 Final Population Totals, Paper-2 of 2001.

The gender bias in educational attainment results from a variety of discriminatory attitudes towards females and their education. All available studies show that societies and families benefit immensely from female education. The benefits of female education are societal—a more productive workforce, lower fertility, lower infant mortality—whereas the costs are private (King and Hill, 1999). Apart from the tangible costs such as tuition fees, uniforms and school supplies, etc., an important component of cost of education of the girl child is the opportunity cost in the shape of foregone child labour (McDougall, 2000).

According to the NFHS-III, the percentage of children attending schools in the age group 6-17 was 68.5 per cent in the State in the year 2005-06. While among the boys 72.2 per cent were attending school, among the girls their percentage was 64.3. In rural areas of the State, 72.1 per cent of boys were attending schools while 63.9 per cent of

girls were in schools. In urban areas 72.5 per cent of boys and 66.4 per cent of girls were attending schools (IIPS, 2007:33).

### BOX 6.1

#### Sarva Shiksha Abhiyan in Arunachal Pradesh

The Sarva Shiksha Abhiyan (SSA) was initiated by the Government of India in the year 2000-01 with the objective to attain universalisation of elementary education in the country as a whole. Their main aim was to achieve universal education for all children within the age group of 6-14 years by the year 2003. They also intended that by the year 2010 all the children should complete eight years of schooling along with quality improvement in elementary education. Further they aimed at bringing down the dropout rate to zero in primary education and bridging all gaps in gender and social category in the elementary stage of education.

In Arunachal Pradesh the SSA was first implemented in the three districts of Tawang, East Kameng and Tirap in 2001-02. The following year the other districts of the State were also covered and finally in the year 2007-08, the SSA was also implemented in the newly formed district of Anjaw. This scheme is funded by the Government of India (75 per cent), the state government (10 per cent) and the DONER ministry (15 per cent) presently.

The SSA provides a host of facilities in the field of education by creating jobs for new teachers and building infrastructure in the primary as well as upper primary level. In order to encourage the girl child and SC and ST students the scheme provided free text books to them. Further to provide quality education they initiated teacher's training and training of community leaders. The SSA also introduced innovative activity for out of school children like vocational education for girls, computer aided learning, early childcare education, inter-village residential school and education on wheels.

The Sarva Shiksha Abhiyan has been quite successful in the state of Arunachal Pradesh. Out of the total grant approved by 2006-07 the achievement has been nearly 100 per cent for most of the schemes apart from a few like teachers training, electrification, school grant, teacher's grant and repair and maintenance of the schools. Initial assessments suggests that on the whole the SSA has gone a long way in achieving its goal that universal education should reach the interior most areas of the State also. A review of SSA conducted in four districts of the State in 2007 has observed that by and large grants have been utilised for the purpose for which it was granted, improvements in enrolment and attendance as well as in teacher recruitment and training has been noticed. The study has pointed out that midday meals, scheme in the schools, however needs to be improved (Kapoor and Lhungdim, 2007).

*Source:* With inputs from Prof. K.C. Kapoor, Department of Education, Rajiv Gandhi University, Itanagar.



## Enrolment

In Arunachal Pradesh, the educational infrastructure continues to be inadequate, but its expansion over the past three decades or so has been impressive. Children, as a result, have better access to schooling today in comparison with the past. Enrolment ratio in the age group 6-11 has gone up from 31.9 to 38.1 per cent, while in 11-14 age group it improved from 42.8 to 61.5 per cent during 1981 to 1991 (Planning Commission, 2002). There is, however, a considerable inter-district variation in the GER in the State (Annexure Table A-6.10). Efforts have been made to strengthen the educational set-up particularly at the pre-primary and primary levels. The educational institutions now accommodate nearly two lakh students out of which 73.60 per cent are tribal. It was found that initially the sex-ratio among students first increased from 787 girls per 1000 boys at pre-primary level to 830 girls at primary and 903 girls at middle school levels and then declined fast at secondary and tertiary levels dropping to only 222 girls per 1000 boys at university level. Arunachal Pradesh has a higher gender disparity index<sup>10</sup> at all levels of schooling than that of most of the north-eastern states. This disparity is even more pronounced in higher education. At this stage, with the sole exception of Tripura, Arunachal Pradesh has a higher gender disparity index than all other states of the region. Thus, as pointed out earlier, greater emphasis has to be given to expand access of the girls to higher education.

## Dropout Rates

Improvements in enrolment, however, do not guarantee access to adequate levels of education. The dropout rates in relatively underdeveloped regions are very high. Dropout rates in classes I-V for children in Arunachal Pradesh have come down substantially from 73.9 per cent in 1981-82 to 46.85 per cent in 2004-05 (Annexure Table A-6.11). It is still higher than the national average, but there seems to be very little improvement in reducing dropout rate at this stage in the past few years. The dropout rate at this stage had already reduced to 46.89 per cent in 1998-99. The dropout rate in classes I-VIII for children, similarly, was reduced from 84.20 per cent in 1981-82 to 63.63 per cent in 2004-05. Similarly the dropout rate for children in classes I-X has been reduced from 90.70 per cent in 1981-82 to 70.79 per cent in 2004-05. In this case, in classes I-X, girls in the state have a higher dropout rate than boys. The dropout

rates for scheduled tribe students are higher than that of all categories of students.

### BOX 6.2

#### Infrastructure and Human Development

The crucial role of infrastructure in fostering economic growth and enhancing public welfare has been widely acknowledged by economists and planners. Adequate development of infrastructure is considered to be a vital prerequisite to accelerate the pace of development, which in turn has its impact on human development. Infrastructure services are typically characterised by high upfront costs and long pay back periods and the lumpiness of investment. The existence of externalities makes it difficult for investors to recover investment and operational costs. All these factors along with the relatively weak private sector had created a consensus on the necessity of heavy public investment in infrastructure as a necessary ingredient of planned economic development. Experiences in a number of developing countries, however, show that there are limits to infrastructure development through public investment and a range of policy changes, broadly aiming at encouraging private investment in the infrastructure sector are being given increasing importance in recent policy measures.

In spite of the fact that significant development of infrastructural facilities has taken place over the past decades in Arunachal Pradesh, the State still lags behind the national average in various components of infrastructure. Wide rural-urban as well as inter-district disparities exist in case of infrastructural facilities in Arunachal Pradesh. The urban centres as well as the administrative centres are much more developed compared to other areas. Social infrastructure facilities in the relatively remote districts are in a very dismal state. Low population density and scatteredness of the villages makes the cost of providing basic infrastructure facilities too high.

While the levels of infrastructure development and the divergence in the growth of different components of infrastructure have important implications for development of a State, the regional or spatial distribution of infrastructure services also affects the prospects for development. The regional disparities in the provision of infrastructure development in Arunachal Pradesh have accentuated regional disparities in socio-economic development. Studies show that there exists considerable inter-district disparity in infrastructural facilities in Arunachal Pradesh. Hence, given the low level of development in Arunachal Pradesh, there is an urgent need to focus on development of infrastructural facilities, particularly in the rural and remote areas, as part of an overall strategy for fostering human development in the state.

10. Gender parity index (GPI) is girls 'GER divided by boys' GER at a given level of education. GPI=1 indicates that there is no gender disparity at that level.

## Educational Infrastructure

Availability of educational infrastructure is an important prerequisite for enhancing the scope of education. There has been a steady expansion of educational institutions in Arunachal Pradesh over the past four decades at all levels. The schools at primary and middle levels have increased more than 11 times and 23 times respectively, during the last 40 years but this increase is sharper in case of secondary and higher secondary schools. However, the number of pre-primary and primary schools declined in 2000-01 as compared with 1990-91, primarily because a number of primary schools have been converted to middle schools. In 2004-2005, there were one university, 11 colleges, 78 higher secondary, 138 secondary, 495 middle, 1371 primary and 22 pre-primary schools in Arunachal Pradesh. An independent survey by NGOs, called the Annual Status of Education Report, 2007, has pointed out the need to focus on the quality of education in the schools. Nearly 52 per cent of primary schools do not have access to potable water, while 73 per cent of primary schools do not have usable toilets. The survey points out that though the State's learning levels are above the national average, there is a need to focus on school infrastructure as well as learning outcomes at the primary level. The poor learning skills among the children who are attending schools need to be tackled seriously.<sup>11</sup> The share of trained teachers in Arunachal Pradesh, was 22 per cent at the primary level, 29 per cent at the middle school level, 49 per cent at the high school and 66 per cent at the higher secondary level in 2004-05. There has been significant growth of educational opportunities in Arunachal Pradesh in the post-Independence period, particularly since the 1980s, but crucial gaps in institutional needs and availability still remains. Closing of this gap demands a high priority.

## Social Development

The role of the State in ensuring equality of opportunity and dignity to all individuals has been widely accepted. As a result of the struggle for greater overall justice at various levels, social development concerns are being increasingly made an integral part of various state-sponsored development and welfare programmes. The

objectives of creating a just, democratic and prosperous society will remain unfulfilled without ensuring equality of opportunities for all the marginalised groups in the society. However, there is a growing concern regarding the systematic exclusion of certain sections of population on grounds of ethnicity, caste, gender, religion, location and affordability.<sup>12</sup> Such exclusionary processes of development may have grave consequences for the economy and the society, not only through its impact on equity and social justice, but also in terms of its impact on the growth process as well. In the case of Arunachal Pradesh, the implications are all the more severe, because there has been an alarming rise in inequality in the past few decades. In addition to that, there is the formidable challenge of overcoming well entrenched traditional social hierarchies.

The relative performance of Arunachal Pradesh, on various dimensions of social development has not been satisfactory, as pointed out in the discussions on the previous section. Government expenditure on social sector has remained at around 30 per cent of total government spending for most of the years in the past decade (Annexure Table A-6.4). In comparison with other small states of India in general and north-eastern states in particular, the social development scenario in Arunachal Pradesh was, in fact, one of the worst (Annexure Table A-6.13), although there has been some progress during 1991-2001 (Annexure Table A-6.14). According to a recently released report, among the nine relatively small states of India, Arunachal Pradesh, barring Meghalaya, was at the bottom in terms of its performance on social development (CSD, 2006).

As it has already been mentioned, people in Arunachal Pradesh face additional constraints because of the relative backwardness of the State itself. However, various schemes initiated by the Government of India for helping the disadvantaged group as well as women's empowerment are being employed by various departments and agencies in the state (Box 6.3). There is a need for greater accountability and transparency in implementation of these programmes.<sup>13</sup> The role of civil society institutions and community-based organisations in making these programmes responsive to the local needs can hardly be overstressed.

11. The Annual Status of Primary Education (ASER) 2007, for example, points out that only 47 per cent of standard III children can read a standard II level text. This ability increases with standard but only 52.5 per cent of standard V children can read standard II level text.

12. As the Indian economy is gradually moving towards market, there is an apprehension that those who cannot pay the right price for certain essential goods and services, like quality health care and education, for example, would be excluded from having access to them.

13. Ineffective governance not only reduces the efficiency of development intervention, more importantly, it creates and sustains a set of institutions or institutional constraints that prohibits the scope of democratic and inclusive growth. Mishra and Upadhyay (2007) note that governance failures have specific adverse outcomes for the marginalised, including the poor.



## BOX 6.3

**Schemes for the Welfare of Women and Children**

Various schemes have been launched by the Government of Arunachal Pradesh, with assistance from the Government of India for the welfare of women and children. The outlines of some of these schemes are as below.<sup>14</sup>

*Reservation for Women in Panchayat Bodies*

In order to ensure participation of women in the political process, 33 per cent seats in the three tier Panchayat Raj System has been reserved for women in the state. The *Panchayat* elections held in April 2003, has opened up a new chapter in the political history of the State. In total 3,183 ST women have been elected to different *Panchayat* bodies. Their exposure at the grassroots level is expected to encourage women to participate more actively in the political arena in the State.

*Integrated Women's Empowerment Programme (IWEP)*

The vision of the IWEP, which was created by recasting the Indira Mahila Yojana (IMY), was basically meant to develop empowered women who would demand their rights from family, community and government; have greater access and control over material, social and political resources; as well as enhance awareness and improved skills and raise issues of common concerns through mobilisation and networking. The immediate objectives of the programme was to establish self-reliant women's Self Help Groups (SHGs) which would create confidence and awareness among members of SHGs regarding women's status, health, nutrition, education, sanitation and hygiene, legal rights, economic upliftment and other social, economic and political issues; and further help in strengthening and institutionalising the savings habit in rural women and their control over economic resources by improving access of women to microcredit and by involvement of women in local level planning.

*Swayamsidha*

Under the IMY only one ICDS project was launched in Tezu-Namsai in Lohit district in 1995-96 and 62 SHGs have been promoted. The following numbers of SHGs were formed during 2002-03 under Swayamsidha: Sagalee in Papum Pare district (76), Roing in Dibang Valley district (67), Buragaon in West Kameng district (53) and Tezu in Lohit district (62). In total 102 SHGs were operating in the State during 2001-02. From 1995-96 to 2002-03 the Government of India under this scheme released a total amount of Rs. 20,31,000. Out of the sanctioned amount only Rs. 6,11,56 has been spent so far. Thus, around 70 per cent of the fund released by the Central government has remained unspent.

*Kishori Shakti Yojana*

Kishori Shakti Yojana is part of ICDS programme with an intention to improve the condition of adolescent girls in the age group of 11-18 years in the field of health, nutrition, education, family welfare, self awareness, etc. So far two ICDS Projects in the State have been selected for implementation of this programme.

*Health Facilities for Women*

The Family Welfare Branch of the Directorate of Health Services, Government of Arunachal Pradesh is implementing the reproductive and child health programme (RCH), which is a 100 per cent centrally sponsored scheme. The major focus in this programme is delivery of need-based, client-centred, good quality, and comprehensive reproductive and child health services to all beneficiaries in an integrated manner. Although the Government of India formally launched the RCH programme in October 1997, its implementation in the State effectively began in 1999-2000. The major schemes under the RCH programme intended specifically for improving the health status of the women and children by Safe Motherhood Scheme, 24-Hour Delivery Services, RCH Camps and Out-Reach Services, Vande Mataram, National Maternity Benefit Scheme, and Pre-Natal Diagnostic Techniques Act.

*Beneficiaries of Rural Development Schemes*

The various rural development schemes undertaken by the Government of Arunachal Pradesh cover many women beneficiaries. All these schemes are exclusively for Arunachal Pradesh Scheduled Tribes (APST). However, the percentage of women beneficiaries of many of the programmes are far from satisfactory. For example, in 2001-02, only 25.1 per cent of the beneficiaries in Swarnjayanti Gram Swarozgar Yojana (SGSY) were women, whereas under the scheme 40 per cent should have been reserved for women. Under Sampoorna Gramin Rozgar Yojana (SGRY), out of the 18.39 lakh man-days claimed to be created in the year 2001-02, 29.20 per cent were for women. Similarly, of the 3118 houses constructed under the Indira Awas Yojana, 1340 were for women beneficiaries and 935 were jointly held in the name of both the spouses.

*Encouragement to Entrepreneurs*

In order to help entrepreneurs the following steps have been taken by the Government of Arunachal Pradesh under the Prime Minister's Rozgar Yojana (PMRY) scheme. People have been given assistance to start their own business. So far 390

contd...

...contd...

women have been assisted and provided self-employment during the past five years. In this scheme 25 per cent of the seats have been reserved for female candidates. The Department of Industries in collaboration with various other institutions has been organising Entrepreneurship Development Programmes and Industrial Management Trainings, in which women have been given preference for participation.

#### *Schemes for Education*

The government is attempting to increase the literacy rates through various measures including the Sarva Siksha Abhiyan (SSA). It is noteworthy, that at present girls are 44 per cent of the total enrolments in the State. Certain special incentives are provided to girl students like, free textbooks from class I to XII, stipend in lieu of ration for hostel boarders for ten and a half months in a year, special incentives of Rs. 5000 per girl to discourage early marriage till completion of class X, cooked mid-day meals for all children from class I to V and girl students who are one time repeater in a class are allowed hostel boarders stipend to avoid dropout and encourage them for continuation of their studies.

#### *Balika Samriddhi Yojana (BSY)*

The Balika Samriddhi Yojana (BSY) a 100 per cent centrally sponsored scheme is also being implemented in the State. The main objectives of the programme is to change negative family and community attitudes towards the girl child at birth and towards her mother, to improve enrolment and retention of girl child in schools, to raise the age of marriage for girls and to assist the girl to undertake income generating activities. In 2001-02, 1687 girls had been covered under the scheme. The BSY covers girl children in families below the poverty line, both in rural and urban areas.

Source: Upadhyay and Mishra, 2005.

## Conclusions

Human development requires interventions at multiple levels by a number of agencies, including the state, community and individuals. However, given the ground realities of Arunachal Pradesh, the State's commitment towards providing sustainable, affordable, reliable and equitable access to earnings, employment, education, health care and other social security, would be the most critical determinant of the human development scenario. Special needs programmes, like those for the women, children, aged, disabled and other marginalised groups, have to be made more responsive to the specific needs of the State. There is a need to specifically target the relatively backward districts and groups. Apart from expanding and consolidating the gains in healthcare services, there is a need to focus on the programmes targeted at improving maternal and child health, particularly in rural areas and relatively in accessible parts

of the State. In terms of educational opportunities, specific programmes to improve the retention rates of girls in higher school level and beyond, needs to be given emphasis. The gender gap in literacy in rural Arunachal Pradesh, which has remained stagnant, needs to be brought down. The other area of concern in the education field is quality of education. The greatest challenge in financing these programmes, notwithstanding the support of the Central government, would be to mobilise resources from within the State. The state government has to take pragmatic and effective steps to design local solutions, which could respond to the specificities of spatial and ecological variations across the State. At the same time, unless the civil society in general and the intelligentsia in particular, comes out in support of the need to view development of the State together with the human development in a holistic framework, it would be difficult to achieve the goals of a just and equitable social order.

ANNEXURE TABLE A-6.1

## Human Development Index (HDI) of States of India: 2000

State	Education		Life Expectancy		Income		HDI	Rank
	Index	Rank	Index	Rank	Index	Rank		
Andhra Pradesh	0.539	14	0.661	8	0.513	8	0.571	9
Assam	0.588	6	0.56	14	0.431	13	0.526	11
Arunachal Pradesh	0.566	12	0.484	16	0.493	10	0.514	13
Bihar	0.413	16	0.616	11	0.308	16	0.446	16
Gujarat	0.612	4	0.65	9	0.544	5	0.602	7
Haryana	0.57	10	0.692	4	0.579	3	0.614	5
Karnataka	0.607	5	0.676	6	0.531	7	0.605	6
Kerala	0.751	1	0.854	1	0.544	5	0.716	1
M.P.	0.569	11	0.537	15	0.447	12	0.518	12
Maharashtra	0.678	2	0.716	3	0.581	2	0.658	2
Orissa	0.56	13	0.569	13	0.403	15	0.511	14
Punjab	0.58	8	0.755	2	0.589	1	0.641	3
Rajasthan	0.578	9	0.617	10	0.466	11	0.554	10
Tamil Nadu	0.662	3	0.69	5	0.549	4	0.634	4
Uttar Pradesh	0.456	15	0.574	12	0.423	14	0.484	15
W.Bengal	0.588	7	0.668	7	0.511	9	0.589	8

*Note:* This table was not used in the final Arunachal Pradesh Human Development Report 2005. Now the table is used to have a better understanding of the all the states in Human Development, including Arunachal Pradesh.

*Source:* Prepared by the Technical Committee set up for the preparation of Arunachal Pradesh Human Development Report 2005.

ANNEXURE TABLE A-6.2

## Educational Attainments in Arunachal Pradesh and Other North-eastern States

States	Literacy Rate 2001	Urban-Rural Gap in Literacy 2001	Gender Gap in Literacy 2001	Gross Enrolment Ratio for Age Group 6 to below 11 Years 2004-05	Dropout Rates in Classes I-V 2004-05	No. of Primary School per Thousand Population 2004-05
<b>Arunachal Pradesh</b>	<b>54.74 (8)</b>	<b>30.48 (1)</b>	<b>19.83 (1)</b>	<b>123.12(6)</b>	<b>46.87(5)</b>	<b>9.14 (5)</b>
Assam	64.28 (6)	24.84 (3)	15.9 0(4)	105.20(7)	50.07(1)	9.01(6)
Manipur	68.87 (4)	14.71 (8)	18.17 (2)	151.69(1)	31.18(8)	11.10(4)
Meghalaya	63.31 (7)	30.12 (2)	5.73 (7)	147.62(2)	49.97(2)	18.46(1)
Mizoram	88.49 (1)	15.89 (7)	4.56 (8)	127.53(5)	49.84(3)	15.27(2)
Nagaland	67.11 (5)	22.96 (4)	9.85 (6)	87.94(8)	42.69(6)	5.96(7)
Sikkim	69.68 (3)	17.15 (6)	15.27 (5)	143.58(3)	49.44(4)	11.4(3)
Tripura	73.66 (2)	19.28 (5)	16.06 (3)	131.03(4)	43.20(7)	5.04(8)
All India	65.20	20.85	21.61	107.80	29.00	6.33

*Note:* Primary schools per thousand population refers to school per thousand population of 6-11 year age group.

*Source:* Planning Commission, 2002; Computed from Selected Educational Statistics (2004-05).

ANNEXURE TABLE A-6.3

## Health Status of the Population: Arunachal Pradesh and Other North-eastern States

States	Infant Mortality Rate		Under 5 Mortality Rate		Percentage of Women with Anaemia	
	1997-98	2004-05	1997-98	2004-05	1997-98	2004-05
<b>Arunachal Pradesh</b>	<b>63.1</b>	<b>60.7</b>	<b>98.1</b>	<b>87.7</b>	<b>62.5</b>	<b>50.6</b>
Assam	69.5	66.1	89.5	85.0	69.7	69.5
Manipur	37.0	29.7	56.1	41.9	28.9	35.7
Meghalaya	89.0	44.6	122.0	70.5	63.3	47.2
Mizoram	37.0	34.1	54.7	52.9	48.0	38.6
Nagaland	42.1	38.3	63.8	64.7	38.4	-
Sikkim	43.9	33.7	71.0	40.1	61.1	60.0
Tripura	-	51.5	-	59.2	59.4	65.1
All India	67.6	57.0	94.9	74.3	51.8	55.3

Source: National Family Health Survey-II and III.

ANNEXURE TABLE A-6.4

## Social Sector Expenditure as Percentage of Total Government Expenditure

State	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07 (RE)	2007-08 (BE)
<b>Arunachal Pradesh</b>	<b>32.1</b>	<b>31</b>	<b>34.1</b>	<b>34.4</b>	<b>31.5</b>	<b>32.8</b>	<b>35.6</b>	<b>34.3</b>	<b>33.1</b>	<b>33.9</b>	<b>26.9</b>	<b>32.5</b>	<b>30.9</b>	<b>28.3</b>	<b>31.0</b>	<b>30</b>	<b>31.4</b>	<b>19.0</b>
Assam	34.7	40.3	36.3	38.6	38.5	41.3	40	37.7	41.3	37.3	40.3	35.5	36.2	35.0	32.0	37	38.7	40.3
Manipur	33.4	34.6	23.8	32.9	35.6	37.9	37.9	36.7	35.1	34.0	32.5	26.0	26.0	26.0	34.0	34	30.5	27.5
Meghalaya	39.3	38.3	36.4	34.9	36.8	37.0	40.0	39.7	38.7	42.0	40.6	40.5	35.9	36.2	36.0	38	36.9	38.3
Mizoram	30.6	41.8	40.9	40.7	40.3	40.8	42.4	36.8	42.4	43.6	39.2	40.7	40.0	35.7	36.0	33	34.2	33.2
Nagaland	33.0	27.6	26.2	28.9	33	35	32.2	30.0	27.9	32.1	31.9	26.9	29.6	27.0	28.0	29	29.9	26.6
Sikkim	33.3	32.2	32.4	34.4	16.8	15.2	13.4	13.5	15.7	15.1	27.3	16.5	16.3	27.5	22.0	23	25.1	23.7
Tripura	43.1	42.3	39.8	41.2	43.5	43.4	43.8	44.0	43.9	43.8	42.0	39.3	38.4	34.8	38.0	34	37.9	33.5

Note: (i) RE : Revised Estimates; BE : Budget Estimates.

Source: Computed from data on State Government Finances as given in Reserve Bank of India Bulletin, (various issues).

ANNEXURE TABLE A-6.5

## Life Expectancy in Different States of India: 2000 (Adjusted)

State	Life Expectancy			Life Expectancy Index		
	Male	Female	Persons	Male	Female	Persons
Andhra Pradesh	62.58	66.53	64.66	0.668	0.650	0.661
Assam	57.74	59.77	58.61	0.587	0.538	0.560
<b>Arunachal Pradesh</b>	<b>53.66</b>	<b>54.51</b>	<b>54.05</b>	<b>0.519</b>	<b>0.450</b>	<b>0.484</b>
Bihar	61.96	61.46	61.94	0.658	0.566	0.616
Gujarat	62.27	66.00	64.03	0.663	0.642	0.650
Haryana	65.26	67.90	66.53	0.713	0.673	0.692
Karnataka	62.89	68.11	65.59	0.673	0.677	0.676
Kerala	72.26	80.05	76.23	0.829	0.876	0.854
Madhya Pradesh	56.71	57.76	57.25	0.570	0.504	0.537
Maharashtra	65.67	69.91	67.99	0.719	0.707	0.716
Orissa	58.57	59.77	59.17	0.601	0.538	0.569
Punjab	68.34	72.44	70.29	0.764	0.749	0.755
Rajasthan	60.32	62.94	62.05	0.630	0.591	0.617
Tamil Nadu	64.64	68.43	66.43	0.702	0.682	0.690
Uttar Pradesh	59.39	59.56	59.47	0.615	0.534	0.574
West Bengal	63.61	66.64	65.07	0.685	0.652	0.668
All India	61.86	64.84	63.30	0.656	0.622	0.638

Source: Data of life expectancy of all the states except Arunachal Pradesh relating to the period 1992-1996 are taken from National Human Development Report 2001 and adjusted for the year 2000. Arunachal Pradesh's expectancy of life is taken from Human Development Report of Arunachal Pradesh 2005.

ANNEXURE TABLE A-6.6

## Growth of Health Services in Arunachal Pradesh and in the Country

Year	Hospital Beds per 10,000 Population		Doctors per 10,000 Population	
	Arunachal Pradesh	India	Arunachal Pradesh	India
1950-51	-	3.2	1.6	1.7
1960-61	11.0	5.7	2.1	1.9
1970-71	25.4	6.4	3.3	2.8
1980-81	23.3	8.3	4.1	3.9
1990-91	26.4	9.5	3.1	4.7
1991-92	25.5	9.7	3.1	4.8
1995-96	-	9.4*	-	5.1p
1997-98	-	9.3*	-	5.3p
2000-01	20.3	-	4.3	-

Note: Dash means data not available. \* means the figure is provisional.

Source: Economic Survey, 2002-03, Government of India. Statistical Abstracts of Arunachal Pradesh, Government of Arunachal Pradesh.

ANNEXURE TABLE A-6.7

## Rural Urban Distribution of Allopathic Medical Institutions in Arunachal Pradesh, 2001

No. of Medical Institutions	Rural	Urban	Total
General Hospital	—	3 (100)	3
District Hospital	2 (15.38)	11 (84.62)	13
Dispensaries	—	18 (100)	18
Community Health Centre (CHC)	8 (29.63)	19 (70.37)	27
Primary Health Centre (PHC)	25 (37.31)	42 (62.69)	67
Health Sub Centre	350 (100.00)	—	350
Others	48 (85.71)	8 (14.29)	56

Note: Figures in the parentheses indicate percentage to total.

Source: Statistical Abstract of Arunachal Pradesh, 2001.

ANNEXURE TABLE A-6.8

## Literacy Rate in Districts of Arunachal Pradesh: 1991

(Percentage)

Districts	All Areas			Rural			Urban		
	M	F	All	M	F	All	M	F	All
Tawang	40.41	16.83	29.80	40.41	16.83	29.80	-	-	-
West Kameng	55.03	35.22	46.31	52.43	32.42	43.56	76.10	60.79	69.75
East Kameng	37.69	14.02	26.20	37.69	14.02	26.20	-	-	-
Lower Subansiri	51.10	30.70	41.57	41.40	21.68	31.95	77.02	59.74	69.54
Upper Subansiri	47.58	27.24	38.31	47.58	27.24	38.31	-	-	-
West Siang	53.86	35.85	45.64	47.83	31.50	40.14	81.78	65.63	75.70
East Siang	52.49	34.43	44.30	48.72	30.56	40.35	71.71	58.49	66.26
Dibang Valley	56.94	33.27	46.88	51.79	27.06	41.10	80.31	66.71	75.00
Lohit	59.02	36.21	49.21	53.33	29.96	42.98	77.10	61.42	71.06
Changlang	54.44	29.64	43.20	54.44	29.64	43.20	-	-	-
Tirap	43.44	18.52	32.06	38.15	13.59	26.76	89.83	78.40	85.43
<b>Arunachal Pradesh</b>	<b>51.45</b>	<b>29.69</b>	<b>41.59</b>	<b>47.00</b>	<b>25.31</b>	<b>37.02</b>	<b>77.99</b>	<b>62.23</b>	<b>71.59</b>

Source: Censuses of India, Arunachal Pradesh, 1981 and 1991, Age, Sex and Level of Education, Table C-2, Directorate of Censuses Operations, Arunachal Pradesh.

ANNEXURE TABLE A-6.9

## Gender Gap in Literacy: Arunachal Pradesh and North-eastern States 1981-2001

States	1981			1991			2001		
	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban
<b>Arunachal Pradesh</b>	<b>21.1</b>	<b>20.23</b>	<b>18.48</b>	<b>18.73</b>	<b>21.69</b>	<b>15.76</b>	<b>20.30</b>	<b>20.80</b>	<b>15.70</b>
Assam	-	-	-	18.84	19.47	11.17	15.19	16.77	8.85
Manipur	29.48	29.33	29.07	24.03	24.38	23.44	18.17	18.62	17.31
Meghalaya	9.48	8.59	10.81	8.27	7.71	8.40	5.73	5.88	5.60
Mizoram	10.75	11.97	6.4	7.01	10.33	3.54	4.56	8.21	1.28
Nagaland	18.20	18.20	9.7	12.87	13.06	6.84	9.85	9.86	6.92
Sikkim	25.62	26.49	15.37	19.05	19.51	10.25	15.27	16.06	8.42
Tripura	23.48	24.74	14.32	20.93	22.74	12.07	16.06	17.84	8.15
All India	26.62	27.89	-	24.84	27.25	-	21.50	24.60	13.43

Note: (i) Census not held in Assam in 1981.

(ii) Literacy rate is defined as the proportion of literates to the population in the age group 7+.

(iii) Gender gap in literacy is defined as male literacy rate minus female literacy rate.

Source: 1981- Census of India, Social and Cultural Tables; 1991- Paper 2 of 1991, Series I, Census of India 1991; 2001—Primary Census 2001 estimates. Calculations based on NHDR, 2001; Tables 4.1-4.3.



**ANNEXURE TABLE A-6.10**  
**Gross Enrolment Ratio (2000-01)**

<i>Districts</i>	<i>Primary</i>	<i>Rank</i>	<i>Upper Primary</i>	<i>Rank</i>
Tawang	98.50	8	54.38	11
West Kameng	92.62	9	46.14	13
East Kameng	110.58	6	81.64	6
Papum Pare	123.07	4	100.01	3
Lower Subansiri	180.11	1	95.48	4
Upper Subansiri	131.53	3	73.20	8
West Siang	141.67	2	143.85	1
East Siang	120.64	5	120.54	2
Upper Siang	109.13	7	82.07	5
Dibang Valley	80.72	10	78.15	7
Lohit	62.41	13	53.62	12
Changlang	64.88	12	54.92	10
Tirap	74.47	11	66.50	9
<b>Arunachal Pradesh</b>	<b>104.66</b>		<b>79.05</b>	
All India	95.66		58.64	

*Note:* For Arunachal Pradesh ratios are estimated.

*Source:* GoAP, 2006.

**ANNEXURE TABLE A-6.11**  
**Dropout Rates in Arunachal Pradesh and India: 2004-05**

<i>State</i>	<i>Category</i>	<i>Class I-V</i>			<i>Class I-VIII</i>			<i>Class I-X</i>		
		<i>Boys</i>	<i>Girls</i>	<i>Total</i>	<i>Boys</i>	<i>Girls</i>	<i>Total</i>	<i>Boys</i>	<i>Girls</i>	<i>Total</i>
<b>Arunachal Pradesh</b>	<b>All</b>	<b>45.86</b>	<b>48.01</b>	<b>46.85</b>	<b>63.23</b>	<b>61.90</b>	<b>62.63</b>	<b>69.59</b>	<b>72.30</b>	<b>70.79</b>
	<b>ST</b>	<b>47.91</b>	<b>47.74</b>	<b>47.83</b>	<b>68.03</b>	<b>66.58</b>	<b>67.37</b>	<b>73.38</b>	<b>74.89</b>	<b>74.05</b>
India	All	31.81	25.42	29.00	50.49	51.28	50.84	60.41	63.88	61.92
	ST	42.55	42.04	42.32	64.97	67.09	65.87	77.75	80.66	78.89

*Source:* Selected Educational Statistics 2004-05, Ministry of Human Resource Development, Government of India.

**ANNEXURE TABLE A-6.12**  
**Gender Parity Index in Enrolment: 2004-05**

States	Category	Gender Parity Index					
		Class I-V	Class VI-VIII	Class I-VIII	Class IX-XII	Class I-XII	Higher Education
Arunachal Pradesh	All	0.89	0.85	0.88	0.82	0.87	0.63
	ST	0.89	0.87	0.88	0.87	0.87	0.58
Assam	All	0.99	0.93	0.98	0.79	0.95	0.70
	ST	1.05	0.91	1.00	0.68	0.93	0.74
Manipur	All	0.96	0.94	0.96	0.93	0.95	0.79
	ST	0.92	0.92	0.92	0.87	0.91	0.78
Meghalaya	All	1.03	1.12	1.05	1.04	1.05	0.83
	ST	1.03	1.16	1.06	0.98	1.05	0.92
Mizoram	All	0.93	0.99	0.95	1.02	0.96	0.61
	ST	0.93	0.99	0.95	1.02	0.96	0.85
Nagaland	All	0.98	1.00	0.99	0.98	0.99	0.89
	ST	0.98	0.99	0.98	0.97	0.98	0.80
Sikkim	All	0.99	1.17	1.04	1.01	1.03	0.75
	ST	1.00	1.21	1.05	1.14	1.06	1.11
Tripura	All	0.96	0.94	0.95	0.88	0.94	0.72
	ST	0.90	0.85	0.89	0.76	0.88	0.47
India	All	0.95	0.88	0.93	0.79	0.91	0.71
	ST	0.90	0.81	0.88	0.67	0.86	0.55

*Note:* Gender Parity Index (GPI) is girls' GER divided by boys' GER at a given level of education. GPI=1 indicates that there is no gender disparity at that level.

*Source:* Selected Educational Statistics 2004-05, Ministry of Human Resource Development, Government of India.

**ANNEXURE TABLE A-6.13**  
**Index of Social Development among Small States: 1991**

States	Demography	Health Care	Basic Amenities	Education	Unemployment and Poverty	Social Deprivation	Aggregate Index of Social Development	Ranking
Arunachal Pradesh	12.48	24.16	35.43	1.51	20.23	55.91	24.97	9
Delhi	37.75	35.45	93.02	66.29	43.95	28.80	50.88	3
Goa	66.81	76.76	53.69	68.66	39.37	32.45	56.29	2
Manipur	40.00	52.69	24.45	60.18	45.13	49.59	45.35	5
Meghalaya	11.50	19.53	8.73	12.08	40.54	57.67	25.01	8
Mizoram	50.07	76.55	42.79	74.27	71.50	59.03	62.37	1
Nagaland	41.52	47.54	28.87	61.11	38.79	65.18	47.17	4
Sikkim	27.41	34.68	41.24	63.17	39.80	39.95	41.04	6
Tripura	50.65	15.28	33.35	37.22	15.31	34.00	30.97	7

*Note:* For details of methodology see CSD, 2006.

*Source:* Council for Social Development, 2006.

ANNEXURE TABLE A-6.14

## Index of Social Development among Small States: 2001

<i>States</i>	<i>Demography</i>	<i>Health Care</i>	<i>Basic Amenities</i>	<i>Education</i>	<i>Unemployment and Poverty</i>	<i>Social Deprivation</i>	<i>Aggregate Index of Social Development</i>	<i>Ranking</i>
<b>Arunachal Pradesh</b>	<b>36.26</b>	<b>47.39</b>	<b>30.24</b>	<b>4.81</b>	<b>37.62</b>	<b>58.79</b>	<b>35.85</b>	<b>8</b>
Delhi	66.88	40.52	92.35	59.37	24.63	32.58	52.72	3
Goa	85.02	72.92	62.38	87.37	41.81	44.25	65.63	1
Manipur	55.56	39.94	29.58	61.13	32.48	46.89	44.26	5
Meghalaya	0.0	9.11	5.78	11.03	65.25	53.67	24.14	9
Mizoram	74.25	54.15	51.77	79.21	38.20	54.65	58.71	2
Nagaland	22.12	35.94	29.95	49.68	41.37	56.04	39.18	7
Sikkim	46.00	62.33	48.39	64.39	25.33	45.56	48.66	4
Tripura	66.51	21.03	27.19	52.92	32.79	56.89	42.89	6

*Note:* For details of methodology see CSD, 2006.

*Source:* Council for Social Development, 2006.

## Chapter 7

# Natural Resources and Sustainable Development

### Mineral Resources

Arunachal Pradesh has a large number of metallic and non-metallic mineral occurrences, most of which are not being exploited at present, either because of lack of detailed information, or not being economically viable for extraction. The available information regarding mineral resources in the State has been summarised in Table 7.1.

Various minerals which can be exploited are as follows:

- (i) *Coal*: It occurs at two stratigraphic levels under different tectonic setting, one is tertiary in age and the other is Gondwana. Unlike the Peninsular counterpart, the resources of coal in Arunachal Pradesh are insignificant in the Gondwana Formations whereas sizeable resources occur in the tertiary coal measure of Tirap district.

The bulk of coal is located in the Namchik-Namphuk area in Changlang district spread over an area of 35.5 sq km, which is supposed to be the eastern extension of the adjacent Makum coalfield. MECL (1984), CMPDIL (1991) and Laskar (1983) show that the coal seams here extend over a strike length of 11 km along the northern flanks of Kuwenbum hill. The exploration drilling in Namchik-Namphuk area has proved the occurrence of 8 persistent coal seams varying in thickness from 1 to 17.4 m. These seams frequently thicken and thin out both along the dip and strike. Of these seams, Seam No. 3 is the most persistent in thickness varying from 2.4 to 17.4 m with average thickness being in the order of about 13 m, and Seam No. 4 ranges in thickness from 1.6 to 3.9 m. The Geological Survey of India estimates a proven reserve of 91

million tonnes. The estimated reserve, however, as per CMPDIL (1991) is 84.23 million tonnes.

The chemical analysis by the Central Fuel Research Institute shows that the moisture content in coal varies from 1.7 to 3.6 per cent and the ash content from 4 to 16 per cent. The volatile content is usually between 40 to 45 per cent. The coal is medium to strongly coking in nature; coking indices range from 17 to 29. The sulphur content varies widely from seam to seam and ranges from 1 to 6 per cent.

In addition, tertiary coal is also available in the form of lenses, peats and lignites all along the foothills belt in Siwalik belt. This Siwalik coal varies between lignite to high volatile bituminous rank and shows high reflectance values near the tectonic features such as thrusts/faults (Prakash and Singh, 2000).

The Gondwana coal is available at certain places only and can be utilised locally for domestic purposes. Such Gondwana coal is available in West Kameng, East Kameng, Lower Subansiri, West Siang and a few other places.

However, the major workable coal resource is confined to Namchik-Namphuk only. Lack of good communication and the remoteness of this place from the nearest rail are the major constraints to the development of this coalfield. However, the development of this coalfield should be viewed in supplement of the Makum coalfield, where its reserves are steadily decreasing. The coal of Namchik-Namphuk is suitable for manufacture of synthetic petroleum, and can be used in low temperature carbonisation plants and power generation.

- (ii) *Oil and Natural Gas*: It is available in Changlang district, particularly in Kumchai, Diyun and Kharsang area. Of these, the Kharsang oilfield is supposed to be the continuation of the Digboi oilfield.

Oil was discovered in 1976 at Kharsang. The estimated reserve is about 12.14 million tonnes with an estimated recoverable reserve of about 1.82 million tonnes. More than 13 exploratory wells have been completed and exploratory works have also been started in Monabum and Kumchai oilfields.

- (iii) *Limestone and Dolomite*: Limestone and dolomite are found in Lohit, Dibang Valley, East Siang, Upper Subansiri, and West Kameng. Estimated reserves are 140.0 million tonnes in Lohit, 13.35 million tonnes in Dibang Valley, 225.0 million tonnes in East Siang, 0.70 million tonnes in Upper Subansiri and 11.13 million tonnes in West Kameng. The chemical composition of the limestone and dolomite at these places is given in Table 7.2.

- (iv) *Graphite*: It is associated with the mica schist and sericite quartzite, and occurs in the form of thin bands and lensoid bodies particularly in the rocks of Bomdila and Se La groups. About 50 m thick band of graphite is located near Did village on Joram-Palin road and near Bopi on Tamen-Raga-Daporijo road in Lower Subansiri district. Other than these, some scanty deposits have also been observed near Abdullah Nala on Kimin-Ziro road, and a 70 m thick band of graphite schist containing flaky graphite has been located near Taliha in Upper Subansiri; and on Roing-Hunli road in Dibang Valley, and near Lalpani-Tidding in

Lohit district. Graphite reserve has been estimated to 2.46 million tonnes at Bopi, 0.50 million tonnes in Khetabari, 0.30 million tonnes near Taliha and 71.0 million tonnes in Lalpani.

- (v) *Lead and Zinc*: Some lead and zinc occurrences are reported from Shergaon area in West Kameng. The reserves are yet to be estimated in the area, however, a 20 m thick zone having 3-5 per cent lead and zinc content has been inferred by the GSI near Amritganga (vide Chaudhari, 2002).
- (vi) *Ferro-silicon Minerals*: The ferro-silicon grade quartzite deposit is located in Kalaktang area of West Kameng district with an estimated reserve of 1.13 million tonnes with 98.26 per cent of  $\text{SiO}_2$ ; and 1.12 million tonnes with 97.15 per cent of  $\text{SiO}_2$ .
- (vii) *Clay*: Small pockets of clay having moderate to good plasticity are associated with Siwalik sandstone, exposed in the foothill belt bordering the Brahmaputra flood plain. A small reserve of 80,000 tonnes has been estimated in East Kameng. The economic viability of the clay is yet to be ascertained, however, it may be suitable for use as pozzolanic material.
- (viii) *Other Economic Minerals*: In addition, a number of other economic minerals such as gold, cobalt, nickel, copper, magnetite-hematite (iron ore) and other platinoid group of metals, occur in the State. Although some scanty reports are available, a thorough investigation is necessary for their economic viability. Other potential resources in Arunachal Pradesh include mineral water and hot sulphurous springs.

TABLE 7.1  
Minerals and their Locations in the State

Minerals	Geographical Location		Est. Reserve (million tonne)	Quality Parameters	Associated Industry Activity
	District	Location			
Coal	West Kameng	Elephant Flat	NA	Gondwana Coal	Mining and Trading, Coal Bracket, Thermal Power Generation.
	East Kameng	Khuppi	NA	-do-	
	Lower Subansiri	Lichi	NA	-do-	
	West Siang	Garu-Gensi-Siberette belt	NA	-do-	
	Changlang	Namchik-Nampuk	84.23 (90.23 as per GSI)	Tertiary Coal of Lignite Bituminous rank. Low Ash contents (4-16%), High Sulphur (1-6%), High Volatile (30-49%)	
Crude Oil and Natural Gas	Changlang	Kunchai	NA		Mining and Trading, Refinery and associated Chemicals.
		Diyun	NA		
		Kharsang	NA		

contd...

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Minerals	Geographical Location		Est. Reserve (million tonne)	Quality Parameters	Associated Industry Activity
	District	Location			
Dolomite	West Kameng	Rupa	143.0 (243 as per GSI)	CaO – (30.06-39.32%) MgO (13.30-28.41%)	Mining and Trading. Also utilised in Blast Furnace, refractory Steel making Paper, and Chemical Industry.
		Jamiri (Dedza)	11.13	High grade quality with CaO – 31.75%; MgO – 18.24%	
Limestone	Upper Subansiri	Taliha	NA	NA	Mining and Trading. Cement and Chemicals industries as Flux Material.
		Menga	0.70	CaO – 29.63%; MgO – 19.42%	
		Yazuli	NA	NA	
	West Siang	Dali	NA	NA	
	East Siang	Pangin	225.0	CaO – 46.32%; MgO – 2.42%	
	Lohit	Tidding	140.0	CaO – 50.68%; MgO – 0.53%	
	Dibang Valley	Hunli	13.35	CaO – 50.5%; MgO – 1.5%	
Graphite	Lower Subansiri	Khetabari	0.50		Mining and Trading, Pencil making, Industrial use.
	Upper Subansiri	Did and Bopi	2.46		
		Laa and Lamdak			
		Taliha	0.30		
	West Siang	Tai			
	Dibang Valley	Hunli			
	Lohit	Lalpani			
Lead and Zinc	West Kameng	Shergaon	NA	5 km of strike length and average 70 m thick.	
		Amritganga	NA	20 m thick zone.	
Ferro-silicon	West Kameng	Kalaktang	1.25	Three Quartzite bands. High silica (95.5-98.3 %) and low Alumina (<0.9 - <2.2 %).	Best utilised as Refractory Material.
Gold	Lower Subansiri	In river sand at the rivers mouth	NA	50 ppb to 2.6 ppm	
Base Metal Sulphides	Lower Subansiri	Potin-Yazuli	NA	Cobalt – 2.2%, nickel – 0.11-0.51%, Copper – 0.33%.	
	Upper Subansiri	Near Taliha	NA	NA	
Platinoid group of Metals	Lohit	Tidding	NA	Pt 6-28 ppb, Pd 6-14 ppb, Rh <2-10 ppb, and Ir 2-14 ppb.	
Mineral Water/ Hot Springs	West Kameng	Dirang, Bishum and Balu	NA	41-42° C	
	Upper Subansiri	Kamla Valley and Takshing, Maja, Chetu and Tige	NA	30-49° C. Characterised by high Li/Na, B/Cl and low Ca/Na ratio. Temp. at Takshing, Chetu and Maja is 51.7°C, 37.8°C, and 37.8°C, respectively	
	Lohit	Parusram Kund	NA		

Source: Chaudhari (2002), De (2002), Kumar and Singh (1996), and Directorate of Geology and Mining, Government of Arunachal Pradesh.

TABLE 7.2

## Chemical Composition of the Limestone at Different Places

Contents	Tidding	Hunli	Pangin	Menga	Jamiri	Rupa
CaO	50.68	50.5	46.32	29.63	32.67	31.75
MgO	0.53	1.5	2.422	19.42	18.76	18.24
SiO <sub>2</sub>	5.48	1.15	2.42		1.14	1.09
Al <sub>2</sub> O <sub>3</sub>	1.98	1.70	2.45		0.34	0.58
Fe <sub>2</sub> O <sub>3</sub>	0.64	0.44	1.59			0.62
LOI	40.32	44.20	39.12		45.95	44.52
Volatile matter			0.626			

Source: Chaudhari (2002).

## Building Material

In addition to the above stated economic minerals, the State has plenty of marble, granite, volcanic, quartzite, slate, etc., that may be utilised for making tiles and mosaic chips.

- Sand, Concrete, Boulders, etc.:* The State has sand, concrete, gravel, etc., in vast quantity. The stone crushing industry may be established to utilise these resources.
- Brick Making:* Two types of bricks may be made (a) hollow brick through concrete, sand, cement, etc.,



and (b) earthen brick through kiln process. There is a great demand of both types of bricks in Arunachal Pradesh. The hollow concrete brick can be made cheaply in the State. It is durable and can be used in constructing environmentally friendly houses.

(iii) *Tiles and Mosaic chips*: These are much in demand in the State, which are being brought to the State from the rest of the country. Various rocks used in tiles and mosaic chips are available in good quantity in the State, as given below:

(a) **Marble**: Thin bands of marble are found at different stratigraphic levels along Bomdila-Se La-Tawang road section in West Kameng and Tawang districts, Ziro-Daporijo-Taliha road section in Lower and Upper Subansiri districts, Along-Pangin-Tuting road section in West and Upper Siang districts, Myodia Pass-Hunli-Angolin-Annini road section in Dibang Valley district, and Tezu-Tidding-Hayuliang-Walong road section in Lohit district. Of these deposits the estimated reserves are: 2.34 million tonnes near Hunli, 0.18 million tonnes at Ryalli, 30.30 million tonnes at Tezu and 43.30 million tonnes at Dora.

(b) **Quartzite**: Significant deposits of quartzite are also found at several stratigraphic horizons almost in all the main road sections of Arunachal Pradesh. Of these exposures, which need attention for exploitation, are between Ziro-Tamen, Daporijo-Taliha, Dali-Basar, Bame-Along, Bame-Daporijo, Kaying-Tato, Pangin-Boleng, Roing-Myodia Pass and Tezu-Tidding.

(c) **Granite/Granite Gneiss**: It is available in different stratigraphic levels in almost all the districts, except Changlang and Tirap. However, potential deposits viable for such purposes are exposed along Tenga-Bomdila, Dirang-Se La, around Tamen and Daporijo.

(d) **Volcanics/Meta-volcanics**: Significant deposits of volcanics are exposed in West Siang, particularly around Rotung, between Boleng to Dite Dame, and at a few patches on Bodak-Dumro along the Yamne Valley. The meta-volcanics, such as grano-diorite, etc., that forms a part of the Lohit Plutonic Complex are exposed between Hayuliang-Walong along the Lohit River. These rocks are also exposed in Dibang Valley, but at present this area lacks infrastructural facilities.

## Hydro Resources

The only known and apparent resource which is not hidden is the enormous water wealth of Arunachal Pradesh, which is available in the form of surface and groundwater. This vast resource can effectively be converted into hydro-power, besides drinking and irrigation purposes.

(i) *Surface Water*: The major rivers in the State form what is termed as Upper Brahmaputra River System, details of which appear in Table 7.3. The data reveals the presence of six river basins of high order (Kameng, Subansiri, Siang, Dibang, Lohit and Tirap-Dihing) and four of low order (Tawang, Dikrong, Sessri and Tiso). In addition, there are also 36 sub-basin, 46 total catchments/watershed areas and 420 streams of 1<sup>st</sup> order.

The data also shows that the Siang and Lohit river basins have 9, Dibang has 8, and Subansiri has 7 sub-basins. Whereas, the streams of 1<sup>st</sup> order are maximum, i.e., 111 in Siang, 83 in Dibang, 80 in Lohit, 61 in Subansiri and 34 in Kameng river basins. The water volume is highest in the Siang, followed by Lohit, Dibang, and Subansiri river basins.

(ii) *Hydro-power Potential*: The large river system along with the structure of the landforms provides ideal conditions to generate huge amount of electricity. According to various estimates, the State has one-third of the country's total potentiality. However, the State has so far developed only 33,210 KW under the State Sector from 53 micro/mini/small hydro-electric projects (Table 7.4), which is not sufficient to meet the peak domestic demand of 90,000 KW. Thus, the deficiency is met out by the DG sets (about 20,000 KW) and about 25,000 KW is purchased from the Central Sector.

In the Central Sector, a major hydro-power project commissioned in the State is the Ranga Nadi Hydel Project by NEEPCO, which has a power generation capacity of 405 MW (3x135 MW). The State is getting only a meagre quantity from the Ranga Nadi Hydel Project for domestic utilisation. Two other central projects with an installed capacity of 600 MW in Kameng by NEEPCO and 2,000 MW in Lower Subansiri by NHPC are likely to be completed during the XI Plan period.

Further, under the State Sector 37 micro/mini/small projects have been taken up which are at various stages of construction with a target capacity of 58,990 KW during the 10<sup>th</sup>-11<sup>th</sup> Plan period (Table 7.5).

TABLE 7.3  
River Basins of Arunachal Pradesh

River Basin	Sub-basin	Area (Km <sup>2</sup> )	Slope (in %)	Drainage Density (m/km <sup>2</sup> )	Av. Rainfall (in cm)	Total Annual Volume of Available Rainwater (ha. m)	Available Water for Use Including Water Absorbed by Soil through Percolation	
							(in ha. m)	(in %)
I. Tawang	1. Nyamjong	580.6	21.05	112.82	75	43542	5146	11.82
	2. Tawang Chu	1536.1	23.15	90.75	75	115205	13515	11.75
II. Kameng	1. Tammaphu-	1689.4	15.20	154.91	98	584603	195469	33.44
	2. Bichom	4297.5	16.33	40.79				
	3. Upper Kameng	3855.7	18.96	92.33	115	443408	193173	43.57
	4. Pakke	2980.1	5.95	122.04	173	515580	322172	62.49
III. Dikrang	1. Dikrang	1614.6	11.05	198.38	215	347135	121414	34.98
IV. Subansiri	1. Ranga	2733.3	13.35	90.88	203	553473	171374	30.96
	2. Khru	3467.2	17.08	86.87	155	537410	137642	25.61
	3. Kamla	3578.1	21.40	89.94	123	438305	71911	16.41
	4. Tsari	3251.4	23.75	96.67	168	1186853	408843	34.45
	5. Syee	1162.6	11.73	120.76				
	6. Middle Subansiri	2671.7	20.25	88.71				
	7. Subansiri interfluves	2334.9	3.85	106.17	278	647938	408849	63.10
V. Siang	1. Lower Siyom	2249.6	9.58	176.03	213	478035	231029	48.33
	2. Shimang	613.5	13.45	135.78	283	173318	85772	49.49
	3. Upper Siyom	2490.1	16.70	100.00	153	379738	706325	28.00
	4. Sike	871.9	19.60	107.24	181	156943	32523	20.72
	5. Siyong	2122.8	20.75	137.04	150	318420	85336	26.80
	6. Yangsang	1739.6	15.63	183.89	218	378360	130119	34.39
	7. Yamne	1379.1	77.45	161.92	340	468908	272110	58.03
	8. Upper Siang	1655.7	16.63	134.69	344	994530	582041	58.52
	9. Lower Siang	1234.9	3.80	116.77				
VI. Sessri	1. Sessri	411.4	14.80	149.00	388	159415	120455	75.56
	2. Sessri interfluves	640.1	6.03	86.71	495	316853	256235	80.87
VII. Dibang	1. Ahi	569.9	14.35	122.65	325	185218	131248	70.86
	2. Emra	1459.8	10.25	181.12	260	379550	241307	63.58
	3. Matun	2488.2	13.65	164.13	188	466540	230908	49.49
	4. Dri	1661.3	17.20	121.17	180	299033	141708	47.39
	5. Tangon	2393.5	21.50	145.81	198	472718	246054	52.05
	6. Ethun	1256.6	16.98	61.99	358	449235	330235	73.51
	7. Upper Dibang	468.2	20.50	108.71	184	231038	155597	48.47
	8. Lower Dibang	1278.8	6.35	134.58				
VIII. Lohit	1. Digaru	987.9	4.58	148.09	385	380343	266438	70.05
	2. Tidding	681.0	12.23	166.59	283	192385	113866	59.15
	3. Delei	1764.1	18.90	92.91	245	432203	228802	52.94
	4. Middle Lohit	1543.8	20.40	88.29	245	378230	200230	52.94
	5. Upper Lohit	2995.3	19.85	134.51	210	629013	283655	45.10
	6. Beiang	1109.9	7.95	135.42	273	302448	174477	57.69
	7. Bara Tanga	248.5	6.15	466.00	300	74548	45896	61.57
	8. Lohit	1314.7	8.25	41.38	320	913030	584056	63.97
	9. Tellu	1538.5	1.65	256.09				
IX. Tirap-Dihing	1. Neo Dihing	3775.0	6.08	118.65	245	924875	417893	45.18
	2. Tirap	2573.4	9.53	166.01	258	662650	317042	47.84
X. Tiso	1. Upper Tiso	1789.4	8.95	99.08	275	492085	251769	51.16
	2. Lower Tiso	2021.1	1.90	100.69	300	606328	334894	55.23
Ten Basins	46 Sub-basins					17799444	8647523	48.58

Source: Singh (1999).

TABLE 7.4

## Small Hydro-power Stations Under Operation

S.No.	Name of Station	Unit in KW	Installed Capacity in KW	Year of Commission
1.	Tawang District			
	1 Kitpi Ph-I	3 × 500	1,500	1977-78
	2 BTK camp	1 × 10	10	1995-96
	3 Thongleng	1 × 10	10	1995-96
	4 Nuranang	3 × 2000	6,000	1996-97
	5 T. Gompa	1 × 50	50	2001-02
	6 Dudunghar	1 × 30	30	2004-05
	Total of the District		7,600	
2.	West Kameng District			
	7 Rahung	3 × 250	750	1972-73
	8 Dirang	4 × 500	2,000	1977-78
	9 Sessa	3 × 500	1,500	1992-93
	10 Khelong	1 × 10	10	1995-96
	11 Rupa	2 × 100	200	1997-98
	12 Dokumpani	1 × 30	30	2000-01
	Total of the District		4,490	
3.	East Kameng District			
	13 Seppa	3 × 100	300	1980-81
	14 18 <sup>th</sup> mile	1 × 10	10	1995-96
	15 Pakke Kessang	1 × 30	30	2001-02
	Total of the District		340	
4.	Papum Pare District			
	16 Senkhi	3 × 250	750	1979-80
	17 Hostalam	1 × 5	5	1995-96
	Total of the District		755	
5.	Kurung Kumey District			
	18 Koloriang	1 × 10	10	1995-96
	Total of the District		10	
6.	Lower Subansiri District			
	19 Mai PH-I	4 × 500	2,000	1977-78
	20 Mai PH-II	2 × 500	1,000	1982-83
	21 Tago	3 × 1500	4,500	1992-93
	Total of the District		7,500	
7.	Upper Subansiri District			
	22 Daporijo	4 × 100	400	1981-82
	23 Maro	1 × 30	30	2002-03
	Total of the District		430	
8.	West Siang District			
	24 Pagi (Basar)	2 × 50	100	1980-81
	25 Along	4 × 100	400	1984-85
	26 Ego-Echi	4 × 100	400	1992-93
	27 Mechuka	2 × 50	100	1994-85
	28 Yomcha	2 × 50	50	1994-95
	29 Tato	1 × 50	50	
	Total of the District		1,100	

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S.No.	Name of Station	Unit in KW	Installed Capacity in KW	Year of Commission
9.	Upper Siang District			
	30 Yingkiong Ph-I	3 × 50	150	1980-81
	31 Tuting	2 × 50	100	1984-85
	32 Yingkiong Ph-II	3 × 100	200	1992-93
	33 Silli	2 × 250	500	1994-95
	34 Pangkang	1 × 125	125	1995-96
	35 Sirnyuk	2 × 1000	2,000	1996-97
	Total of the District		3,075	
10.	East Siang District			
	36 Pasighat	2 × 100	200	1974-75
	37 Yembung	4 × 500	2,000	1994-95
	38 Sille	1 × 50	50	2001-02
	Total of the District		2,250	
11.	Lower Dibang Valley District			
	39 Deopani Ph-I	3 × 250	750	1986-87
	40 Sissri	3 × 250	500	1992-93
	41 Abhapani	(1 × 250) + (2 × 100)	450	1994-95
	42 Jambupani	1 × 30	30	2000-01
	43 Deopani Ph-II	2 × 250	500	2004-05
	Total of the District		2,230	
12.	Upper Dibang Valley District			
	44 Anini	3 × 50	150	1994-95
	45 Tah Ahfra	1 × 50	50	2001-02
	46 Chini Afra	1 × 250	250	2001-02
	Total of the District		450	
13.	Lohit District			
	47 Dura Nallah	4 × 100	400	1976-77
	48 Tafragram	1 × 250	250	1984-85
	Total of the District		650	
14.	Anjaw District			
	49 Ampani	2 × 250	500	1989-90
	50 Kebitho	1 × 30	30	2004-05
	Total of the District		530	
15.	Changlang District			
	51 Tissue	4 × 100	400	1986-87
	Total of the District		400	
16.	Tirap District			
	52 Thiraiju	4 × 250	1,000	1978-89
	53 Charju	2 × 200	400	1984-85
	Total of the District		1,400	
	<b>Total (in KW)</b>		<b>33,210</b>	

Source: Hydro Electric Power Policy Document of the Government of Arunachal Pradesh, 2005.

As stated above, the State has a large potentiality of hydro-power generation, which is estimated at 49,000 MW from the 89 major projects identified in

the State by the Central Electricity Authority (CEA) (Table 7.6).

In addition, the potential from micro/mini/small project is also estimated to be about 1,600 MW.

(iii) *Inland Water Transport*: Another dimension of the surface water resource is the development of Inland Water Transport System, subject to the development of the multi-purpose hydro-power projects. With the limitation of land development infrastructure and difficulties due to hilly terrain, inland water transport may stand the viable mode of cheap transportation, and can improve the overall transport communication in the State.

(iv) *Groundwater*: Groundwater potential in the State is equally impressive (Table 7.7). The quality of groundwater in the State is good for domestic as well as industrial and agricultural use. The water has pH value ranging from 6.5-8.5, and its electrical conductivity varies from 46 to 316 micro mhos/cm at 25° C. All other cations and anions are within the permissible limit.

The following suggestions are given by the CGWB to augment water resources:

- In valley area—to construct deep tubewells, and to construct bunds/check dams, etc., on perennial streams.
- In hilly areas—to develop perennial springs and to provide storage for better supply by applying scientific methods, such as arresting rain water for drinking and creating artificial recharge through construction of suitable roof top rain water harvesting structures.

### Problems in Utilisation of Mineral Resources

Arunachal Pradesh is thought to have a treasure of natural wealth including minerals. But as long as the net worth of natural wealth is not estimated it has no relevance for socio-economic development. Therefore, it is very important to update the information through surveys and remote sensing technology. Further, with respect to the known mineral deposits, attempts should be made to study the economic feasibility for their exploitation. Mineral exploitation involves the various steps:

- Detailed geological investigation
- Terrain consideration
- Quantity and quality assessment of the mineral deposits

**TABLE 7.5**  
**Ongoing Hydro Electric Projects under State Sector**

S.No.	Name of Project	Installed Capacity (in KW)
1.	Tawang District	
1	Kitpi MHS Ph-II	3,000
2	Mukto MHS	6,000
3	Khangtang MHS	7,500
	Total of District	16,500
2.	West Kameng District	
4.	Domkhong MHS	2,000
	Total of District	2,000
3.	East Kameng District	
5	Pacha MHS	3,000
	Total of District	3,000
4.	Kurung Kumey District	
6	Kush MHS	2,000
7	Payu MHS	1,000
8	Pate Nallah MHS	50
	Total of District	3,050
5.	Lower Subansiri District	
9	Augmentation of Mai Ph-I, Ph-II and Tago MHS by diverting Pange River to Mai (civil works only)	
6.	Upper Subansiri District	
10	Siyum MHS	30
	Total of District	30
7.	West Siang District	
11	Liromoba MHS	2,000
12	Tato MHS	50
13	Beye	50
	Total of District	2,100
8.	Upper Siang District	
14	Sidip KHS at Mariyang	3,000
15	Sipit MHS at Gette	2,000
16	Angong Nallah MHS	4,500
17	Singa MHS	30
18	Sillingiri MHS	50
19	Ramsing MHS	50
20	Gosang MHS	500
21	Kopu MHS	50
	Total of District	10,180
9.	East Siang District	
22	Subbung MHS near Supsing	3,000
23	Rina MHS over Simen river	2,000
	Total of District	5,000
10.	Lower Dibang Valley District	
24	Deopani MHS Ph-II	500
25	MHS over Eme River	1,500
	Total of District	2,000

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S.No.	Name of Project	Installed Capacity (in KW)
11.	Upper Dibang Valley District	
26	Echi Ahfra MHS	400
27	Aug. of Awapani MHS	500
28	Tah Ahfra Ph-II	50
	Total of District	950
12.	Lohit District	
29	Dus Nallah MHS	500
	Total of District	500
13.	Anjaw District	
30	Yapak Nallah MHS	200
31	Teepani MHS	400
32	Mati Nallah MHS	500
33	Langpani MHS	400
34	Halaipani HEP	12,000
35	MHS over Kebitho	30
	Total of District	13,530
14.	Changlang District	
36	MHS over Ngonalo at Vijay Nagar	100
	Total of District	100
15.	Tirap District	
37	Baraf Nallah at Lazu	50
	Total of District	50
	<b>Grand Total (in KW)</b>	<b>58,990</b>

Source: Hydro Electric Power Policy Document of the Government of Arunachal Pradesh, 2005.

- Method of exploitation
- Environment impact assessment of commercial exploitation
- Economic, commercial, and technical feasibility
- Policy and legal framework.

These steps are time consuming and involve heavy investment. Given the financial constraints of the State, the private sector may be involved.

The following industries may be set up in the State based on the mineral potential:

- Fertiliser plants, refractory units based on dolomite.
- Calcium carbide manufacturing units and cement plants based on limestone.
- Coking plants and gasification based on coal.
- Refractory, pencil, abrasive-manufacturing units based on graphite.
- Cutting and polishing units of decorative and building stones.

TABLE 7.6

### Identified Sites for Hydro Power Potential in Arunachal Pradesh

S.No.	Name of Schemes	River Basin	Latitude	Longitude	Probable Installed Capacity (in MW)	Grade
1.	Siang Lower	Dihang/Dibang	28° 10'	95° 13'	1,700	A
2.	Bhareli Lift Dam-II	Kameng	27° 01'	92° 37'	330	A
3.	Hegio	Subansiri	27° 46'	93° 47'	250	A
4.	Bhareli Lift Dam-I	Kameng	27° 08'	92° 37'	240	A
5.	Emini	Dihang/Dibang	28° 50'	95° 52'	295	A
6.	Amulin	Dihang/Dibang	28° 53'	95° 53'	235	A
7.	Agolin	Dihang/Dibang	28° 47'	95° 54'	235	A
8.	Kapak Leyak	Kameng	27° 32'	92° 48'	195	A
9.	Rigong	Dihang/Dibang	28° 55'	94° 50'	130	A
10.	Badao	Kameng	27° 43'	93° 01'	120	A
11.	Pakke	Kameng	27° 07'	93° 05'	120	A
12.	Kurung Dam-II	Subansiri	27° 48'	93° 37'	115	A
13.	Seba	Kameng	27° 05'	93° 02'	105	A
14.	Yepin	Dibang/Dibang	28° 15'	95° 12'	95	A
15.	Milli	Subansiri	27° 58'	93° 03'	75	A
16.	Chela	Subansiri	27° 57'	93° 17'	75	A
17.	Par	Subansiri	27° 13'	94° 37'	65	A
18.	Pongging	Dihang/Dibang	28° 13'	95° 12'	60	A
19.	Tago-I	Subansiri	27° 28'	93° 48'	55	A
20.	Para	Kameng	27° 43'	93° 07'	55	A
21.	Seppla	Kameng	27° 25'	91° 00'	46	A
22.	Lachung	Kameng	27° 33'	93° 07'	41	A
23.	Sape	Subansiri	27° 57'	93° 05'	38	A
24.	Ralgam	Lohit	28° 12'	96° 32'	32	A
25.	Nyapin	Subansiri	27° 44'	93° 28'	32	A
26.	Gimiliang	Lohit	28° 08'	96° 39'	31	A
27.	Rebby	Kameng	27° 43'	93° 08'	30	A
28.	Chanda	Kameng	27° 47'	92° 56'	110	A
29.	Tarang Warang	Kameng	27° 30'	93° 15'	65	A
30.	Hiya	Subansiri	27° 42'	93° 27'	41	A
31.	Tiding-I	Lohit	28° 05'	96° 17'	31	A
	<b>Sub total</b>				<b>5,047</b>	
32.	Kimi	Kameng	27° 17'	92° 42'	535	B
33.	Tato-II	Dihang/Dibang	28° 58'	94° 26'	360	B
34.	Phanchung	Kameng	27° 32'	93° 04'	90	B
35.	Dardu	Subansiri	27° 14'	93° 46'	60	B
36.	Hutong	Lohit	27° 56'	96° 47'	950	B
37.	Chomi	Subansiri	27° 58'	93° 11'	80	B

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S.No.	Name of Schemes	River Basin	Latitude	Longitude	Probable Installed Capacity (in MW)	Grade
38.	Oju-II	Subansiri	28° 18'	93° 25'	2,580	B
39.	Atunli	Dihang/ Dibang	28° 41'	96° 04'	175	B
40.	Naba	Subansiri	28° 17'	93° 35'	1,290	B
41.	Emra-II	Dihang/ Dibang	28° 38'	95° 42'	870	B
42.	Noa-Dehing	Lohit	27° 28'	96° 24'	75	B
43.	Tammu	Subansiri	27° 58'	94° 25'	55	B
44.	Etalin	Dihang/ Dibang	28° 39'	96° 00'	3,045	B
45.	Kalai	Lohit	27° 59'	96° 59'	2,550	B
46.	Naying	Dihang/ Dibang	28° 02'	94° 31'	495	B
47.	Kameng	Kameng	27° 06'	92° 54'	1,100	B
48.	Oju-I	Subansiri	28° 21'	93° 21'	1,925	B
49.	Niare	Subansiri	28° 17'	93° 29'	1,405	B
50.	Bichom-II	Kameng	27° 18'	92° 37'	205	B
51.	Passar	Kameng	27° 16'	93° 08'	32	B
52.	Siang Middle	Dihang/ Dibang	28° 30'	94° 40'	700	B
53.	Emra – I	Dihang/ Dibang	28° 43'	95° 37'	275	B
54.	Minnying	Dihang/ Dibang	28° 54'	94° 36'	195	B
55.	Elango	Dihang/ Dibang	28° 33'	95° 32'	180	B
56.	Doimukh Storage	Subansiri	27° 10'	93° 46'	170	B
57.	Mirak	Dihang/ Dibang	28° 52'	94° 40'	160	B
58.	Tato-I	Dihang/ Dibang	28° 32'	94° 24'	80	B
59.	Nazong	Kameng	27° 28'	92° 32'	65	B
60.	Pauk	Dihang/ Dibang	28° 33'	94° 16'	50	B
61.	Satuk	Kameng	27° 37'	92° 45'	47	B
62.	Gameng	Dihang/ Dibang	28° 38'	94° 39'	37	B
63.	Papu	Kameng	27° 16'	93° 02'	160	B
64.	Jaru	Dihang/ Dibang	28° 17'	95° 12'	60	B
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S.No.	Name of Schemes	River Basin	Latitude	Longitude	Probable Installed Capacity (in MW)	Grade
65.	Pichang	Kameng	27° 20'	92° 35'	31	B
66.	Ranga Nadi Stage-II	Subansiri	27° 23'	93° 46'	180	B
67.	Mathithing	Kameng	27° 20'	92° 30'	40	B
68.	Khultam	Kameng	27° 20'	92° 23'	29	B
69.	Talong	Kameng	27° 34'	93° 00'	150	B
70.	Utong	Kameng	27° 28'	92° 32'	110	B
71.	Dibbin	Kameng	27° 27'	92° 32'	95	B
72.	Jarong	Dihang/ Dibang	28° 43'	94° 18'	85	B
73.	But	Kameng	27° 19'	92° 27'	26	B
74.	Hirong	Dihang/ Dibang	28° 44'	94° 24'	180	B
75.	Malinya	Dihang/ Dibang	28° 43'	96° 11'	335	B
76.	Heo	Dihang/ Dibang	28° 31'	94° 19'	90	B
77.	Yangman Storage	U/ Brahmaputra	27° 18'	96° 12'	60	B
78.	Tenga	Kameng	27° 13'	92° 36'	275	B
79.	Mithundon	Dihang/ Dibang	28° 53'	95° 59'	145	B
80.	Dibang	Dihang/ Dibang	28° 20'	95° 47'	1,000	B
81.	Sissiri	Dihang/ Dibang	28° 17'	95° 33'	222	B
82.	Subansiri Middle	Subansiri	27° 45'	94° 04'	2,000	B
83.	Siang Upper	Dihang/ Dibang	28° 57'	94° 57'	11,000	B
84.	Bichom-I	Kameng	27° 20'	92° 30'	190	B
85.	Subansiri Upper	Subansiri	28° 05'	94° 10'	2,500	B
86.	Kurung Dam-I	Subansiri	27° 48'	93° 37'	200	B
<b>Sub total</b>					<b>38,999</b>	
87.	Subansiri lower	Subansiri	27° 33'	94° 15'	2,000	C
88.	Demwe	Lohit	27° 57'	96° 24'	3,000	C
89.	Tipang	U/ Brahmaputra	27° 15'	95° 54'	80	C
<b>Sub-Total</b>					<b>5,080</b>	
<b>Total</b>					<b>49,126</b>	
Source: Hydro Electric Power Policy Document of the Government of Arunachal Pradesh, 2005.						

## Policy Options

Arunachal Pradesh is rich in geo-resources, however, an integrated approach is necessary for long term sustainability, keeping in view the diverse needs of socio-economic activities and ecological and environmental preservation.

It is a well known fact that Arunachal Pradesh falls under high seismic zone. The frequency of tremors can be judged by the fact that in Subansiri alone, particularly in

Yazuli area, nearly 1,000 mild earthquakes were recorded in 10 months in 1990 (Kayal *et al.*, 1992). The seismic data for 1979-1990 indicates that seismicity in Arunachal Pradesh is mostly aligned along the Main Boundary Thrust (MBT), Main Central Thrust (MCT), Lohit and Mishmi thrusts (Verma *et al.*, 1993). Further, a total number of 17 tremors of magnitude 2.4 to 5.0 during November 1997 to December 1999 (Sitaram, 2003), and 18 tremors of magnitude varying from 1.6 to 4.8 in 2003 were recorded



TABLE 7.7

**District-wise Groundwater Resources Availability and Stage of Development in Arunachal Pradesh (in ham)**

S.No.	Districts	Annual Replenishable Gross Groundwater Resources	Natural Discharge during Non-Monsoon Season	Net Annual Groundwater Availability	Annual Groundwater Draft	Projected Demand for Domestic and Industrial uses up to 2025	Groundwater Availability for Future Irrigation	Stage of Groundwater Development (%)
1.	Changlang	23,559	2,356	21,203	0	96	21,107	0.00
2.	Dibang valley	68,107	6,811	61,296	12	47	61,237	0.02
3.	East Kameng	10,639	1,064	9,575	0	31	9,544	0.00
4.	East Siang	31,483	3,148	28,334	27	56	28,251	0.10
5.	Lohit	1,01,023	10,102	90,921	15	110	90,796	0.02
6.	Lower Subansiri	1,438	144	1,294	0	58	1,236	0.00
7.	Papum Pare	6,237	624	5,614	15	169	5,430	0.27
8.	Tawang	-	-	-	-	23	-	-
9.	Tirap	8,927	893	8,034	0	140	7,895	0.00
10.	Upper Siang	-	-	-	-	20	-	-
11.	Upper Subansiri	-	-	-	-	25	-	-
12.	West Kameng	1,195	120	1,075	12	59	1,005	1.12
13.	West Siang	3,114	311	2,802	0	59	2,744	0.00
	<b>State Total</b>	<b>2,55,721</b>	<b>25,572</b>	<b>2,30,149</b>	<b>81</b>	<b>892</b>	<b>2,29,244</b>	<b>0.04</b>

Source: Central Ground Water Board (CGWB), Naharlagun, Unpublished Report.

in Arunachal Pradesh (RRL, 2004). The data given here represents the seismic recording carried out from time to time in a limited network and, therefore, the actual figure may be much higher.

On the other hand, unplanned developmental activities are increasing day by day without assessing their vulnerability to the earthquakes and landslides. The capital and urban towns have reached beyond the critical level of their bearing capacity. Population pressure is forcing people to construct their houses on the hill slopes and along the natural drains. Singh (2005), and Singh and Tewari (2005) have shown that the point of concern is not just increasing population, but also urban characterisation in the delicate eco-system which is prone to natural hazards.

Under this situation, any developmental programme in the State must be taken after thorough geo-environmental and geotechnical studies. As also suggested by Valdiya (2002), the environmental security and hazard management programmes must form essential part of the development paradigm of this hilly State.

It may be noted that development of infrastructure, hydro-power projects, and urbanisation has adverse effects on the ecology and the environment. Hazards micro-zonation maps of the State must be prepared prioritising specific areas for development activities.

Thus, the following points should be incorporated in the policy:

- Building codes and bye-laws should strictly be enforced.
- Geotechnical studies of the urban towns should be carried out.
- Geotechnical studies must be carried out before initiating any major developmental project.
- The resources should be utilised with the appropriate intervention of science and technology to achieve socio-economic goals. It is possible only with the help and cooperation of local people indigenous socio-economic and political institutions, technical and professional experts and NGOs.
- In general, the topmost priority for any developmental policy is to ensure new avenues of income generation. So it is important to identify the priorities in terms of resource utilisation in the State.
- The growing demand for a better quality of life has put severe stress on management of the resources. There is a need to balance the demands against constraints of conservation to achieve sustainable growth. The local indigenous knowledge should be utilised to achieve this goal.

## Chapter 8

# Development of Forest Resources

### Introduction

Arunachal Pradesh has large forest cover with around 82 per cent of its area being under forests. There are over 20 forest types ranging from tropical to alpine situation (Baishya *et al.*, 2001, Hegde, 2000, Kaul and Haridasan, 1987).

The ecological and environmental factors have greatly influenced the life and lore of the indigenous people of the State. The influence of forests and variety of wildlife have found manifestations in the diverse art and culture, lifestyles, food habits, cultivation practices, crafts, customs, traditions and their enormous indigenous knowledge system (IKS).

### Biological Diversity

The State is home to myriad life forms coexisting in diverse ecological situations. Its forest and faunal diversity makes it one of the 25 “Biodiversity Hotspots” in the world (Hegde, 2000). The varying climatic conditions have favoured the luxuriant growth of various forest types.

### Flora

Floristically, there are about 4500 species of flowering plants, 605 species of orchids, 89 species of bamboos, 18 species of canes, 400 species of ferns, 34 species of gymnosperms, and equally high number of unexplored algae, fungi, lichen, bryophytes and micro-organisms inhabiting the State. It is significant to note that 76.93 per cent of plant families known in India are found in Arunachal Pradesh. Some of the dominant families represented in the State are: *Orchidaceae*, *Leguminosae*, *Asteraceae*, *Ericaceae*, *Poaceae*, *Urticaceae*, *Rosaceae*, *Cyperaceae* and *Euphorbiaceae*. *Orchidaceae* is most predominant with

more than 600 species and with about 30 endemic species that adore the forests of Arunachal Pradesh (Hegde, 2001). Thus, this eastern Himalayan State harbours more than 33 per cent of the total Indian flora with unique taxa and large number of genetic resources making it a “cradle of speciation”.

### Fauna

Faunistically, the State is also rich in having more than 213 mammals, 872 birds, 113 reptiles, 130 fishes, 7 non-human primates and innumerable species of insects, micro-organisms and other life forms. Major animals found in the State are: elephant, *gaur*, *sambhar*, *mithun*, wild buffaloes, four major cats—tiger, spotted/clouded/snow leopards—rare feline species like the golden cats and the marbled cats, hog deer, barking deer, musk deer, black bear, three goat antelopes, *goral*, *serow*, *takin*, red panda, hispid hare, pheasants, Bengal pelican, migratory birds, etc. Hoolock gibbon found here is the only ape in India. *Takin* and Chinese *goral* are two rare animals found in the higher elevations. Similarly, *mithun* is a semi-domesticated animal (*bos frontalis*) having religious significance in Arunachal Pradesh.

### Forest Resources and Forestry

The forests of Arunachal Pradesh are the rich source of various timber and non-timber products including bamboo, cane, medicinal plants, orchids, thatch and broom grass, resin, etc. These resources are found throughout the State in various forest types. According to the classification of Champion and Seth (1968) there are 19 different and divergent forest types which can broadly be grouped under six general forest types in different altitudinal and climatic zones as in Table 8.1.

TABLE 8.1

## Various Forest Types with Important Plant Species

Forest Type	Altitudinal Range (in m)	Important Species
Alpine	Above 3500	<i>Rhododendron</i> spp., <i>Arenaria</i> , <i>Saxifraga</i> , <i>Saussurea</i> , <i>Rheum</i> , etc.
Temperate	1800-3500	<i>Acer</i> , <i>Castanopsis</i> , <i>Populus</i> , <i>Tsuga</i> , <i>Abies</i> , <i>Berberis</i> , <i>Taxus</i> , <i>Cupressus</i> , <i>Pinus</i> , <i>Juniperus</i>
Subtropical Pine	1000-1800	<i>Pinus roxburghii</i> , <i>P. merkusii</i> , <i>P. Wallichiana</i> , <i>Tsuga demosa</i> , etc.
Subtropical Broad Leaved	900-1900	<i>Castanopsis</i> , <i>Quercus</i> , <i>Michelia</i> , <i>Alnus</i> , <i>Schima</i> sp
Tropical Wet Evergreen	Up to 900	South Bank: <i>Dipterocarpus macrocarpus</i> , <i>Shorea assamica</i> , North Bank: <i>Mesua ferrea</i> , <i>Altingia excelsa</i> .
Tropical Semi-evergreen	Upto 600	<i>Terminalia myriocarpa</i> , <i>Bombax ceiba</i> , <i>Canarium strictum</i> , <i>Ailanthus grandis</i> , etc.

Note: All these forests are home for the State's rich wild life.

Source: Champion and Seth (1968).

Considering the land use pattern in Arunachal Pradesh (Table 8.2), out of the total geographical area of 83,743 sq km, 51,540 sq km (61.54 per cent) falls under forest. Cropped area is only 1931.93 sq km. Rest of the land is either fallow, uncultivable or waste lands. Large chunk of the degraded forest areas belong to various communities inhabiting the State and traditionally enjoying rights over them.

TABLE 8.2

## Land-use Classification in Arunachal Pradesh

(Area in Sq. Km)

Sl. No.	Land use	Area	% of Geographical Area
1.	Total Geographical Area	83743.00	
2.	Forest Area	51540.00	61.540
3.	Fallow Land	646.30	0.771
4.	Land under Misc. Tree Crops	444.55	0.530
5.	Cultivable Wasteland	330.94	0.395
6.	Cropped Area	1931.93	2.307
7.	Area not Available for Cultivation	426.89	0.5109

Source: Statistical Abstract of Arunachal Pradesh, 1998.

## Legal Status of the Forests

The forests of the State are legally classified as reserved forests (RF), protected forests, *anchal* and village forest reserves, national parks and wild life sanctuaries (Table 8.3) under relevant provisions of Assam Forest Regulation 1891, Anchal and Village Forest reserve Act

1978, 1981 and Wild Life Protection Act 1972. Unserved forests where status of right and ownership is not settled are classified as unclassified state forests (USF). The USF is a very ambiguous word and there is not much departmental control on it.

TABLE 8.3

## Legal Status of Forests

Sl. No.	Legal Classification	Area (Sq Km)	% of Recorded Forest	% of Geographical Area
1.	Reserved Forests	9815.37	19.04	11.72
2.	Protected Forests	7.79	0.01	0.01
3.	Anchal Reserve Forests	256.08	0.50	0.30
4.	Village Reserve Forests	175.20	0.34	0.21
5.	National Parks	2468.23	4.79	2.94
6.	Wild Life Sanctuary	6777.75	13.15	8.09
7.	Unclassified State Forest	32039.00	62.16	38.25
	Total	51540.00	100.00	61.54

Source: SFRI News Bulletin No. 27 (Sinha, 2008).

The reserved forests are scientifically managed. Most of them are covered under working plan and resource surveys. To replenish the dwindling resource, the department has been taking up various afforestation programmes. A large area of plantation has also been raised under various state and Central schemes.

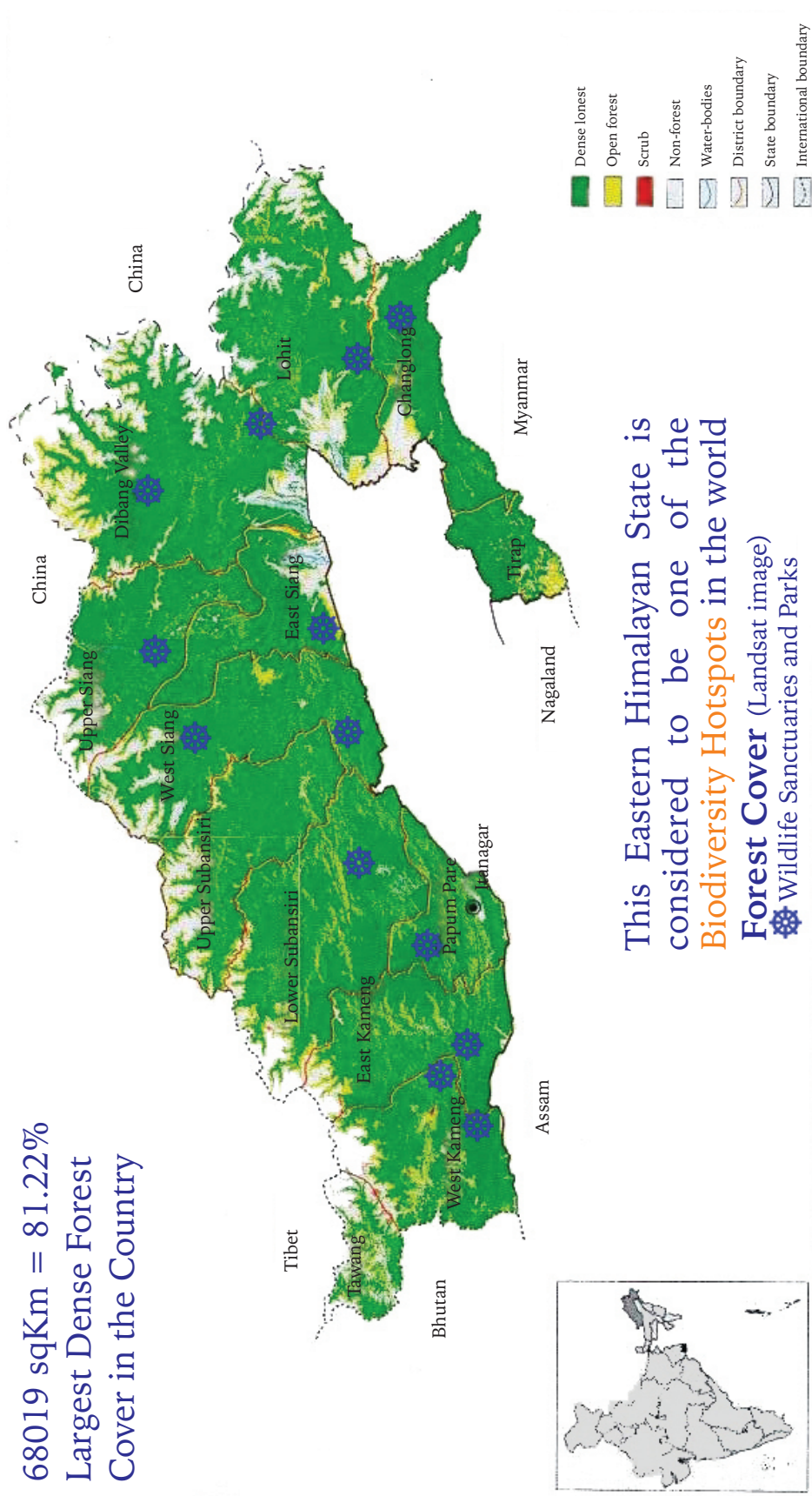
According to the directives of Supreme Court of India, it is mandatory to prepare working plans for felling trees in any forest area. In this direction Arunachal Pradesh Forest Department has made significant progress in carrying out resource survey and preparation of working plans/schemes. Out of 9815.37 sq km of reserved forests, 8490 sq km has so far been covered under working plan. Similarly, under USF, 13 working schemes have been prepared covering 4,564.73 sq km area and approval for 11 schemes had so far been obtained.

Based on the up-to-date survey of resources and working plan prescriptions, it is expected to have an annual yield of timber at 74,152.55 cum. Similarly, the yield of non-wood forest products like cane, bamboo and resin are: cane—1,53,36,851 rmt.; bamboo—2,78,162 nos; resin—2,28,980 blazes.

## Management and Conservation/Protection of Forests

Keeping in view people's needs, traditional rights, sustainable economic development, industrial needs and conservation and protection of rich biodiversity the Department of Environment and Forests has adopted and

FIGURE 8.1  
Forest Cover of Arunachal Pradesh



Source: Forest Cover of Arunachal Pradesh (Landsat Image) Working Plans and Forest Management.



initiated a number of eco-friendly and people-friendly schemes/programmes involving the local people as given below:

### Ongoing Schemes/Programmes

#### State Sector

- Artificial plantation
- Aided natural regeneration
- Social forestry
- Joint forest management
- Apanaban
- Minimum needs programme (fuel wood plantation)
- Minor forest products

#### Central Sector

- Social forestry
- MFP i.e., medicinal plants
- Area oriented fuel wood and fodder project
- Integrated wasteland development project
- Operation soil watch

#### The State has also taken up initiative in following areas

- Bamboo, cane and medicinal plant development
- Establishment of Medicinal Plant Board
- Ban on unplanned timber and cane harvesting
- Emphasis on NTFPs
- Catchment area development and watershed management system
- Establishment of wildlife board
- Establishment of biodiversity cell

Under Compensatory Afforestation Programme, out of the stipulated area of 1796.166 ha for compensatory afforestation, 1451.57 ha has been achieved.

### Forest-based Industry

Prior to the intervention of the Supreme Court there were 242 licensed saw and veneer mills in the State. All of them came to a grinding halt and the State's revenue dropped considerably after the imposition of the Supreme Court's restriction.

### Joint Forest Management

In Arunachal Pradesh, by and large, various tribal communities have been utilising the forests as their own common property resource (CPR) since time immemorial. Realising the sentimental attachment of the local people and the role and importance of involvement of local communities in the protection and sustainable development of forest resources through Apanaban and *anchal* reserve schemes, government of Arunachal Pradesh adopted Joint Forest Management (JFM) Resolution in 1997 for proper protection and regeneration of degraded forest areas. The basic objective of JFM is to meet the requirement of fuel, fodder, minor forest produce and small timber of the tribal population, and to prevent at the same time degradation of the forests. The JFM is expected to reduce demand and supply imbalances by increasing the productivity of forests. In this direction Arunachal Forest Department has been able to achieve significant progress by establishing 21 forest development agencies (FDA) and 364 village forest management committees (VFMC) in 21 territorial forest divisions of the State. Under this scheme, an area of 21,416 hectare has been covered under plantations generating 1,33,559 labour days. Efforts should be made to cover all the villages of Arunachal Pradesh under JFM system for sustainable development of the forest resources for socio-economic upliftment of villagers and maintenance of ecological balance.

### Development of Non-timber Forest Products

Non-timber forest products (NTFP) play an important role in the State, as described below:

- (i) *Bamboo*: In Arunachal Pradesh, there are as many as 89 species recorded, some of which find multifarious uses such as in the house construction, and in the manufacturing of baskets, various utensils, handicrafts, furniture, etc., besides its commercial use in mat board. The total area under bamboo of the State is 4,590 sq km (5.5 per cent of geographical area). There is a potential for raising it to 8000 sq km. Hence, Government of Arunachal Pradesh has come up with a Bamboo Development Policy which is a positive step for the growth of bamboo sector.
- (ii) *Cane*: Arunachal Pradesh has about 18 species of canes available at different climatic areas. It is an important resource catering to the needs of the furniture and handicraft industry. Keeping in view of the scarcity of cane in many parts of the country and

its suitability in the State, it is necessary to promote replantation of canes both in forest lands and private lands for sustainable economic returns to the State.

(iii) *Medicinal Plants*: Arunachal Pradesh with its varying climate and topography provides a congenial agro-climate for the occurrence and cultivation of large number of medicinal plants which are used in various traditional and modern system of medicine. There are more than 500 species that have been listed so far from this State. However, the medicinal plants like *Acorus calamus*, *Aconitum* sps. *Andrographis paniculata*, *Gymnadenia orchidis*, *Acquillaria agallocha*, *Catheranthus roseus*, *Illicium griffithii*, *Piper peepioides*, *Panax* sps. *Picrohiza kurroa*, *Podophyllum hexandrum*, *Rauvolfia serpentina*, *Rubia cordifolia*, *Taxus buccata*, etc., provide immense scope for commercial cultivation in varying climatic conditions of the State. A coordinated effort is required by all the stakeholders under an Apex Body like State Medicinal Plant Board for establishing a vibrant industry, making use of the traditional knowledge of the local healers and systems in a modern perspective.

(iv) *Gums, Resins and Oils*: Exudates from trees are collected for various household purposes and for trade in the State. In West Kameng district chir pine resin is collected commercially for industrial use. Similarly, *dhuna* (*Canarium strictum*) is collected in the foot hill areas for fumigation as disinfectant. Agar is another important tree in the foothill areas for extracting agar oil. Some of the important oil yielding plants found in the State are *Cinnamomum*, *Cymbopogon*, *Illicium*, *Piper*, *Geranium*, *Chinopodium*, *Murraya*, *Litsea*, *Zanthoxylum*, etc. Of late, cultivation of Pachouli is also becoming popular.

(v) *Orchids and other Ornamentals*: The State is known for its rich occurrence of orchids. Out of about 600 species about 150 species are commercially important. Since the entire family *Orchidaceae* is considered as endangered, trade of these has been regulated under Wildlife (conservation) Act. Hence, modern biotechnological approach has to be adopted. In this regard, Orchid Research Centre, SFRI has done pioneering work with exemplary results which needs to be popularised amongst local people through various incentive schemes and infrastructure development for its trade/marketing. Similarly, there are large numbers of wild ornamental plants which need adequate attention for commercial exploitation.

TABLE 8.4

#### Status of the Timber-based Industries in Arunachal Pradesh

Sl. No.	Name of the Industry	HPC Cleared Mill	Presently Functioning
1.	Plywood Mill	11 nos.	4 nos.
2.	Saw-cum-Veneer Mill	32 nos.	4 nos.
3.	Saw Mill	72 nos.	6 nos.

### Management of Wildlife and Biodiversity

With the adoption of Wildlife Protection Act in 1972, wildlife management underwent a radical change qualitatively. So far, 10 wildlife sanctuaries and two national parks have been constituted for wildlife conservation and management. Arunachal Pradesh is perhaps the only state in India, which has four big cats viz., tiger, leopard, clouded leopard and snow leopard. Smaller cats are also found here.

The total number of tigers, leopards and elephants in the State as per 1993 census is:

- a) Tiger - 256 nos.
- b) Leopard - 98 nos.
- c) Elephant - 2098 nos.

Besides, the following four elephant reserves and two tiger reserves have also been established for the conservation of the scheduled animals in their natural habitat.

Elephant Reserves	Area in sq km
1. Kameng Elephant Reserve	4,600
2. Central Arunachal Elephat Reserve	3,700
3. Eastern Arunachal Elephant Reseerve	1,021
4. Southern Arunachal Elephant reserve	1,950
Tiger Reserves	Area in sq km
1. Pakke Tiger Reserve	861.95
2. Namdapha Tiger Reserve	1985.00

Major portion of wildlife rich areas fall outside the protected area network, which need to be brought under scientific management in a phased manner. Accordingly a new wildlife sanctuary under the name Yarde-Rabe Supse in West Siang district covering an area of about 491.65 sq km is proposed to be constituted soon for which preliminary notification has already been issued. Similarly,



there is also a proposal under consideration of the Central government to establish one biosphere reserve covering about 5126 sq km in the State.

### Wildlife Development Schemes

The developmental schemes on wildlife in the state sector envisage protection of wildlife, upkeep and health care of animals in zoos and strengthening of infrastructure facilities. These schemes also envisage carrying out census, conducting wildlife research and survey, making bridle paths, promoting wildlife awareness, etc., in various protected areas of the State. The following special schemes in the Central Sector are also implemented in the State:

- Project Tiger
- Project Elephant
- Eco-development around protected areas.

‘Project Tiger’ scheme has been operational in Namdapha National Park since 1983 and ‘Project Elephant’ in the foothill belt of the State within and outside the protected areas. This scheme was launched in 1992 with the objective of stabilising the dwindling elephant population through habitat improvement, corridor linking and control of poaching.

### Forest Research

Recognising the importance of R&D backup for afforestation and forest management, the department established the State Forest Research Institute in 1993. This is the only institute of its kind in north-east India and is catering to the needs of the State. However, the technology developed here is applicable to other states as well. The fruits of research have now been available to the common people. The institute has field research stations at different locations like Namsai, Chessa, Tipi, Dirang, etc. Its main concentration is in the field of non-timber forest produce covering bamboo, cane, medicinal plants, broom grass and orchids. The different programmes of the institute help in biodiversity management and conservation.

### Major Forestry, Wildlife and Biodiversity Related Issues

With rapid development and administrative expansion, there is a considerable change in the lifestyle and the consequent influence on the flora and fauna of the State. Some of the important factors that have led to deforestation and loss in wildlife and biodiversity are as follows:

1. Agricultural expansion/*jhumming*;
2. Logging and timber extraction for various wood-based industries;
3. Road and building construction;
4. Construction of dams;
5. Urbanisation and new settlements;
6. Unscientific method of harvesting bio-resources;
7. Increasing use of high yielding varieties of crops replacing traditional ones;
8. Increasing population.

The State is now at the crossroads of tradition and modernisation. There is an increasing pressure on land and natural resources and as a result forests are getting depleted. At the same time the forest and wildlife management suffers from some specific constraints as follows:

- Poor infrastructure and communication,
- Inadequate manpower for protection,
- Inadequate resource and fund supports,
- Forest fires and other natural calamities,
- Lack of awareness among people about forestry schemes and peoples participation,
- Unexpected conflicts with encroachers and illegal settlements.

### Forest Laws

Arunachal Pradesh has adopted the Assam Forest Regulation Act 1891 which has been amended from time to time keeping in view the objective of sustainable development of forests through a participatory mechanism of the local people. The following are the acts and regulations in forestry and wildlife sector:

#### *Acts and Regulations in Forestry and Wildlife Sector*

##### State Enactments

- Assam Forests Regulation, 1891
- Anchal Forest Reserve (Constitution and management) Act, 1975
- Village Forest Reserve (Constitution and management) Act, 1978
- Arunachal Timber Regulation Act, 2000
- Jhum Land Regulation, 1948

## Suggested Changes in Forest Laws/Rules

Name of the Law	Number	Suggested Change	Reasons For Change
(i) Assam Forest Regulation	24, 25, 27, 35, 41(1) 59, 68	1. Enhanced penal provisions and power to conduct prosecution. 2. Setting up of special courts to try forest offences.	1. Current penal provision is inadequate. Power to conduct prosecution is a procedural advantage. 2. Delay in disposal of forest offence cases due to lack of separate judiciary.
(ii) Wildlife Protection Act, 1972	Section 43 and 40A	Sale of domestic elephants and transportation outside the State be permitted.	1. Transfer of ownership by way of inheritance is meaningless as domestic elephants were required for forestry operations in the past and there is surplus of domestic elephants now whose maintenance is highly costly for individuals.
(iii) Forest Conservation Act, 1980		Tea, coffee, plantations be permitted in <i>jhummed</i> areas.	1. Such an amendment will improve economic conditions of people engaged in <i>jhumming</i> and wean them away from <i>jhumming</i> .

- Arunachal Pradesh Minor Mineral concession rules 2002, Central enactments
- Forest (Conservation) Act, 1980
- Wildlife (Protection) Act, 1972.

In spite of acts and regulations mentioned above, constraints have been experienced in effective implementation of these laws in the protection and development of forest resources. Hence, some changes have been suggested as given below:

Further, in order to develop the bamboo sector, the government in 2005 approved a Bamboo Development Policy which is expected to create an impact on the socio-economic development of the people of the State. Thus, the suggested changes in laws and regulations are expected to uplift the rural economy in the following ways:

- Ensuring ecological and environmental security
- Effective scientific management in accordance with working plans.

TABLE 8.5  
Protected Areas in Arunachal Pradesh

Biosphere Reserve/National Parks/Sanctuaries	District	Area in sq.km.	Major Animals
<b>Biosphere Reserve</b>			
Dihang Debang Biosphere Reserve	Upper Siang and Upper Dibang Valley	5112	Clouded/Snow Leopard, musk deer, <i>takin</i> , deer, <i>macaques binturong</i> , rare birds and snakes.
<b>National Parks</b>			
Namdapha National Park and Project Tiger Reserve	Changlang	1985.00	Hoolock gibbon, tiger, clouded/snow leopard, musk deer, <i>takin</i> , capped <i>langur</i> , <i>binturong</i> and rare birds.
Mouling National Park	Upper Siang	483.00	<i>Takin</i> , <i>serow</i> , <i>goral</i> , leopard, black bear, pheasants, etc.
<b>Wildlife Sanctuaries</b>			
Pakke Wildlife Sanctuary and Tiger Reserve	East Kameng	861.95	Elephant, tiger, <i>gaur</i> , <i>sambar</i> , barking deer, <i>binturong</i> , leopard, pheasants etc.
Itanagar Wildlife Sanctuary	Papum Pare	140.30	Elephant, tiger, <i>binturong</i> , leopard, <i>serow</i> , barking deer and birds.
D'Ering Memorial Wildlife Sanctuary	East Siang	190.00	Hog deer, hispid hare, otter bengal, florican, reptiles and migratory birds.
Mehao Wildlife Sanctuary	Dibang Valley	281.50	Elephant, tiger, leopard, <i>binturong</i> , hoolock gibbon etc.
Kamlang Wildlife Sanctuary	Lohit	783.00	Tiger, <i>takin</i> , leopard, red panda, hoolock gibbon, capped <i>langur</i> , etc.
Eaglenest Wildlife Sanctuary	West Kameng	217.00	Elephant, <i>serow</i> , red panda, <i>sambar</i> , black bear, <i>goral</i> , etc.
Dibang Wildlife Sanctuary	Dibang Valley	4149.00	<i>Takin</i> , <i>serow</i> , leopard, <i>goral</i> , monal, <i>tragopan</i> , black bear, kalij pheasant, rare birds, etc.
Sessa Orchid Sanctuary	West Kameng	100.00	Orchids, <i>goral</i> , etc., <i>binturong</i> , hornbill, pangolin.
Tale Valley W/L. Sanctuary	Lower Subansiri	337.	Temperate flora and fauna. Clouded leopard, deer, hornbill.
Kane Wildlife Sanctuary	East Siang	55.00	Elephant, deers and small cats.
Proposed Yarde—Rabe-Supse Sanctuary	West Kameng	496.15	<i>Capped bugur</i> , clouded leopard, tiger, hornbill and lesser cats.

- Flow of tangible and intangible economic benefits to the people.
- Ensuring people's participation especially women in protection and conservation of forests.
- Ensuring basic livelihood needs of the local tribal population.
- Dovetailing traditional knowledge and modern scientific management for conservation of biodiversity and sustainable development.

### Future Vision

In order to achieve conservation and sustainable development of forest resources, the State requires a forest policy of its own to address the multifarious needs and aspirations of the people of the State. These suggested measures are as follows:

- Increase in the investment in forestry sector.
- Scientific management of NTFPs like bamboo, cane, medicinal plants, orchids, etc., and establishing strategic market linkages with private sector.
- Strengthen protection mechanism and legal framework.
- Conservation and development of wildlife and biodiversity.
- Involve indigenous communities especially women for conservation, protection and sustainable

development through JFM/local systems for utilising the traditional wisdom and ethos of conservation.

- Ensure ways and means for sustainable utilisation of forestry resources for poverty alleviation, environmental stability and ecological security.
- Promote eco-tourism.
- Initiation for carbon trading in the line of the State's interest.

### Conclusion

There is scope for scientific management to improve the productivity and sustainable utilisation of vast forest resources in the State. Various projects and programmes are being implemented in the State. In the past, the state's economy depended to some extent on forest. This dependency has showed a decline recently owing to the structural transformation of the economy. However, economic transformation and development has led to the loss of biodiversity and deforestation. Now serious attempts are being made to counter this by involving the local committee in Joint Forest Management. Alternatives are being explored and the forest management is reoriented towards NTFP and sustainable utilisation without compromising on conservation issues. A long-term perspective plan is being evolved in forestry, research and wildlife sectors. With these expected shifts in policies and plans the State is poised for a better environment and sustainable development.

## APPENDIX 8.1

**Carbon Financing in Arunachal Pradesh: Pros and Cons**

Carbon trading is a contract-based transaction of carbon dioxide equivalent emission reductions (t CO<sub>2</sub> e) in compliance with the regulations of Kyoto protocol. Two common methods of carbon trading are:

- Allowance-based transactions where the buyer purchases emission allowances from regulators under Cap-and-trade regime.
- Project-based carbon trading which refers to the purchase of emission credits from a project with a valid and authentic track record of emission reduction.

There was a three-fold increase in project-based carbon trading (374t CO<sub>2</sub> e) in 2006 as compared to the traded volume in the previous year. About 79 million tonnes of emission reduction contracts were signed by the end of March 2006 exhibiting a bullish trend in the carbon trading market. The prices for certified emission reductions (CERs) also climbed from an average of USD 5.15 in 2004 to 11.56 in the first three months of March 2006.

In view of the profitable trend in the global carbon market, there is a considerable scope for participation of Arunachal Pradesh in global carbon transactions. In order to reap the optimum benefits of carbon trading, following measures could be incorporated in the state level planning:

- A proper rapport with World Bank and state government should be established to evolve the strategy for future carbon trading.
- A project-based approach for carbon trading should be adopted ensuring an active participation from government and non-governmental organisations and local populace in forest regeneration.
- In the first phase, the projects based on forest regeneration on wastelands covering a huge area may be submitted for carbon financing.
- The forest regeneration should be initiated after a careful selection of the plant species and a consortium of plant species with high carbon sequestration rate e.g., *Mesua ferrea*, *Dipterocarpus microcapsule*, *Shorea assamica*, etc., shall be propagated for the regeneration purpose.

*Courtesy:* Dr. S.P. Shukla, Department of Botany, Rajiv Gandhi University, Rono Hills, Itanagar, Arunachal Pradesh.

## Chapter 9

# Land Use and Potentials

### Introduction

Arunachal Pradesh, enjoys a geo-environmentally unique, sensitive and strategic location at national and global scale. The State has distinct topography, monsoon climatic regime and advantage of variation of altitude along with rich diversity in environmental conditions, flora, fauna and equally diverse cultures in human space.

#### Land cover

The physical surface of the earth, including various combinations of vegetation types, soils, exposed rocks, water bodies as well as anthropogenic elements such as agriculture and built environments. Land cover classes can generally be discriminated by characteristic patterns using remote sensing data and technique.

#### Land use

Land use refers to the domain of anthropocentric utilisation of land. It is studied with a management objective. Some land uses, such as agriculture, have a characteristic land cover pattern. These generally appear in land cover classifications. Other land uses, such as nature conservation, are not readily discriminated by a characteristic land cover pattern.

Historically, the relationship of humans with the environment has evolved, although often without feeling of necessity, through—modification, control, exploitation, management and restoration—a full circle and Arunachal Pradesh is no exception even if the scale of this pattern of relationship is small. Land as a resource has been primarily colonised by human beings for their sustenance and as a consequence they have changed the land cover pattern to a distinct land use pattern.

As the relationship between human beings and environment changes direction over time, understanding of environment *vis-à-vis* the land cover/land use pattern provides an insight into the socio-cultural fabric, socio-

economic endurance, and vision for future path for progress of the community. Some of the benefits of land cover/land use inventories and optimisation procedures are:

- Generation of timely and reliable information base for effective land use management (Gautam *et al.*, 1994),
- Increasing in the production of cereals, pulses and oil seeds,
- Increasing in the fodder production to support the livestock system leading to higher production of milk, meat, eggs, etc.,
- Saving land from degradation and bringing more areas under cultivation,
- Increasing production of vegetables and fruits,
- Improving the economic and nutrition standards of the people,
- Improving the environmental conditions all over the study area.

Land is the most important primary natural resource that is characterised by soil, water and components of ecosystem. An assessment of the present land cover and the other controlling factors like altitude, slope, rainfall, dissection of land by drainage, land capability, etc., helps in identifying the areas of potentialities and vulnerabilities. This State is the least densely populated area in the country. Its unique geo-environmental set-up has facilitated such uniqueness. Arunachal Pradesh is a biological hotspot, but it has a very delicate and fragile ecosystem which evolves around a symbiotic relation between nature and human. A careful assessment and exploration of potential areas for planned development needs a careful study of the characteristics of land.

## Altitude

As a part of Himalayan Orogenic Belt, traversing around 700 km with altitude ranging from about 150m to 6000m, Arunachal Pradesh poses a challenge for proper utilisation of each and every part. Figure 9.1 shows altitude zones of Arunachal Pradesh and presents an account of the inaccessibility as a challenge for potential use of land. Altitude and relative relief are two dominant factors that define complexity of terrain in terms of solar illumination, slope and aspect, and thus control the land cover and land use type of the State. Altitude information in the form of Digital Elevation Model (DEM) is now being integrated with the remote sensing data for vegetation discrimination and land cover—land use inventory (Singh *et al.*, 2005).

High altitude terrain of Arunachal Pradesh is beneficial in maintaining a high endowment of natural resources but simultaneously it acts as a retarding agent and hinders development. As there is lack of data on this terrain parameter, only about 80 per cent area (i.e., 66320 km<sup>2</sup>) has been studied for this exercise (Table 9.1). Out of this more than 65 per cent area is highly elevated being 1000 metres above the mean sea level, a condition which reduces the potential of land for any intended use and increases the

cost of developmental programmes. Districts like Tawang have no land below 1000m; Dibang Valley and Anjaw have no low altitude area and major rivers have carved out large and wide valleys. These areas are also characterised by high dissection of land. Areas close to international border, which are excluded for this parameter, have extremely high altitude and are inaccessible.

## Slope

Slope is the derivative of altitude, an inclined surface over which all the bio-physical activities take place. Arunachal Pradesh located on the young folded mountain of Himalayas, which is still growing tall due to tectonics and simultaneously is being eroded due to denuding agents of running water and glacier. This process has produced a marvelous geo-physical complex as well as a forbidding landscape for habitation and use of Kurung Kumey, Upper Subansiri, Upper Siang, Dibang Valley and Anjaw districts are covered with high slope values and are also identified as the most underprivileged districts of Arunachal Pradesh (Government of Arunachal Pradesh, 2005). Slope has a direct bearing on the cost of building infrastructure and its maintenance. Future expansion of agriculture in a predominantly agrarian state of Arunachal

TABLE 9.1  
District-wise Altitude Class

Altitude Class District	Very Low <200m	Altitude Class (Area in sq Km) (Data available area only)				Mountainous 3000-4000m	Alpine >4000m	Total
		Low 200-500m	Mid Level 500-1000m	Upper Level 1000-2000m	High Altitude 2000-3000m			
Tawang	0	0	0	175	400	610	638	1823
West Kameng	21	222	534	1370	1820	618	380	4965
East Kameng	165	554	1477	2179	1188	340	107	6009
Kurung Kurney	0	15	771	2542	1289	302	56	4976
Papum Pare	358	627	587	1430	498	58	0	3557
Lower Subansiri	23	93	720	1688	298	0	0	2821
Upper Subansiri	7	147	1194	1541	1325	533	106	4852
West Siang	134	878	2221	1933	1135	617	16	6933
Upper Siang	16	188	728	2178	926	423	6	4465
East Siang	938	896	958	1006	91	0	0	3889
Dibang Valley	0	0	346	1092	2305	805	27	4575
Lower Dibang Valley	576	612	545	827	776	264	15	3614
Lohit	1068	1120	489	726	523	165	0	4092
Anjaw	0	0	225	1021	1201	1045	323	3815
Changlang	448	981	1312	1596	484	215	4	5039
Tirap	108	525	647	640	62	0	0	1982
Total	3861	6857	12753	21943	14320	5994	1674	67405
Percentage	5.73	10.17	18.92	32.55	21.25	8.89	2.49	100.00

Source: Computed on the basis of SoI toposheets.



FIGURE 9.1  
Altitude Zones

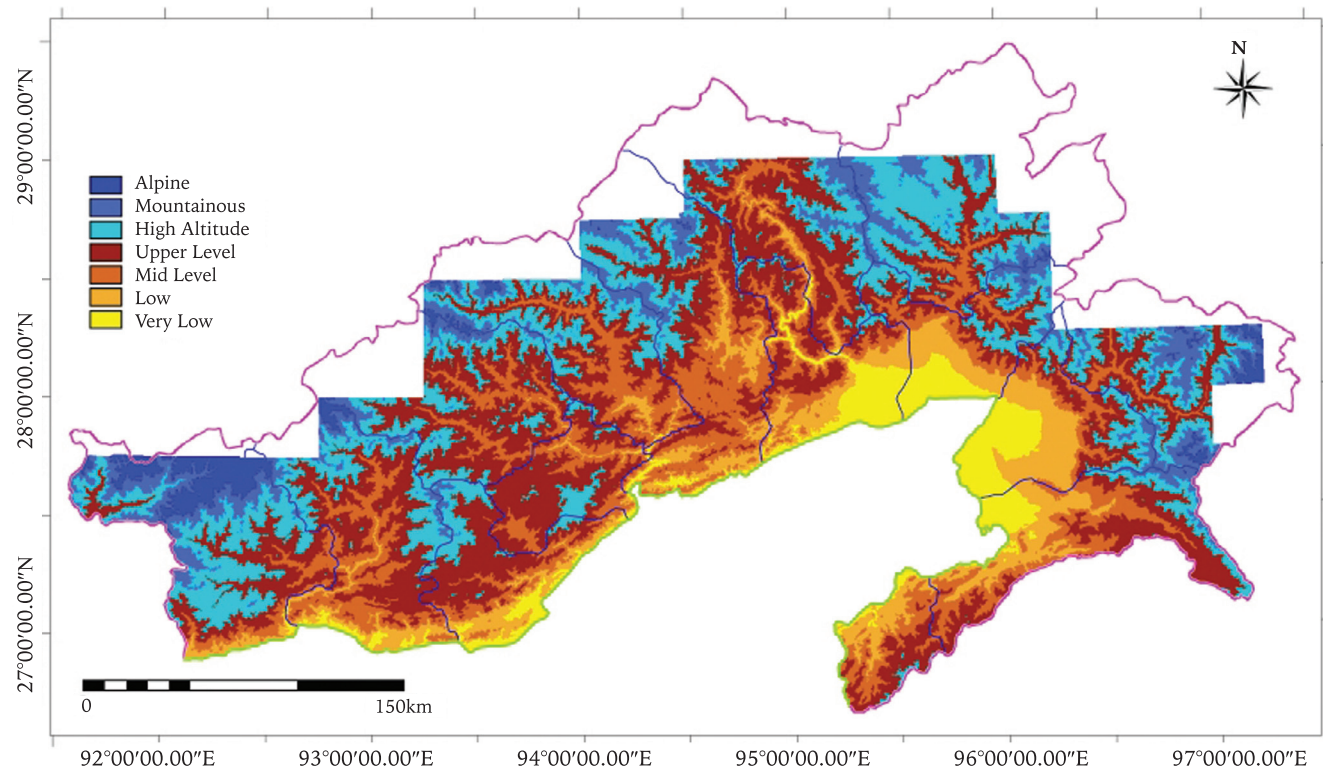


FIGURE 9.2  
Rainfall

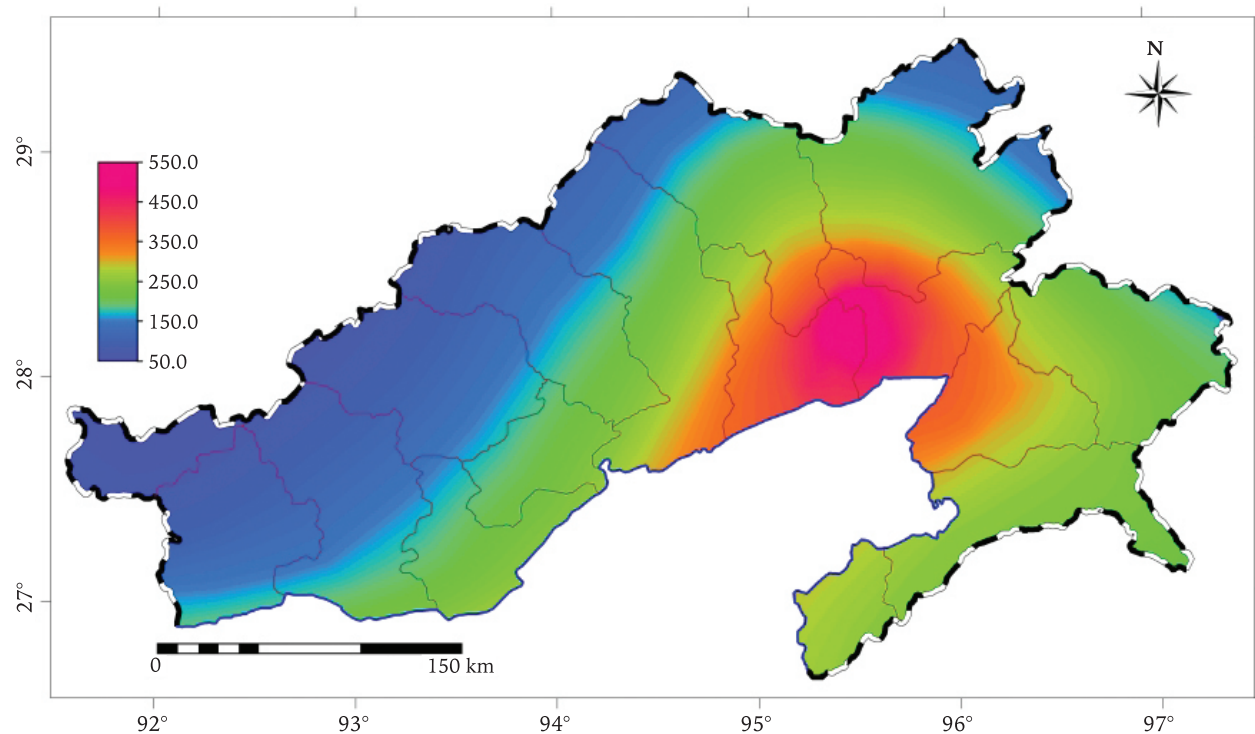


TABLE 9.2  
District-wise Slope Category

Slope/Class Districts	Area (sq Km) in Slope Class					Total
	Plain<5°	Moderate5-10°	Steep10-20°	Very Steep20-45°	Hanging>45°	
Tawang	111	116	573	973	51	1823
West Kameng	370	476	1896	2187	36	4965
East Kameng	827	456	2333	2351	42	6009
Kurung Kumey	309	268	1563	2738	99	4976
Papum Pare	701	493	1432	929	3	3557
Lower Subansiri	411	281	1287	834	8	2821
Upper Subansiri	403	324	1175	2801	151	4852
West Siang	1003	663	2257	2932	79	6933
Upper Siang	480	359	782	2744	101	4465
East Siang	1469	413	802	1190	17	3889
Dibang Valley	597	407	864	2594	113	4575
L Dibang Valley	1374	237	336	1552	115	3614
Lohit	2187	266	493	1102	43	4092
Anjaw	296	242	514	2525	239	3815
Changlang	1525	593	1722	1163	36	5039
Tirap	373	368	713	527	2	1982
Grand Total	12436	5962	18742	29142	1135	67415
Percentage	18.5	8.8	27.8	43.2	1.7	100

Source: Computed on the basis of SoI toposheets.

Pradesh is also affected by non-availability of land for settled cultivation. Lohit, Changlang, East Siang, Lower Dibang Valley and West Siang districts have comparatively large proportion of plain land (Table 9.2). But extensive tracts of mighty rivers coupled with high rainfall account for loss of land through soil erosion. Hence, these areas need to be put under multiple cropping of cereals and vegetables and mixed farming to optimise utilisation of available land.

## Rainfall

Precipitation, main agent of land sculpturing and life support resource for organisms, is seasonal and follows the dynamics of monsoon in the State. A strong seasonality and high amplitude orography control vegetation, and climax variety maintain a rich biodiversity in this part of the Himalayas. Rainfall ranges from below 100cm per year in Tawang district to over 500cm per annum in Siang and Lower Dibang Valley districts. Hydrological resource endowment for this State is high from power resource perspective, but areas of high rainfall have become permanent flood hazard zone and susceptible to crop failure and loss of arable land. Another effect of such high rainfall is channel migration and damage to infrastructure.

A very little amount of plain land available in Arunachal Pradesh is transformed to cultivable waste by the floods. The other part of the extreme scenario is the low precipitation areas of higher Himalayas where the high elevation is coupled with cold climate. So estimation of land resources requires a deep understanding of each and every land and climate parameter, and aims to resolve for a best agro-climatic area for each intended crop in the State. Papum Pare, Lower Subansiri, Lohit, Changlang and Tirap districts are in a rainfall regime that is appropriate for a wide range of cereals, pulses and horticulture. Other districts are either rain deficient or excess where only a few crops may be cultivated.

Generic Name	Conventional Equivalence
<i>Ustalfs</i>	High base status red loamy, red sandy and alluvial soil.
<i>Aqualfs</i>	High base status soil (hydromorphic).
<i>Udalfs</i>	High base status soils of humid regions.
<i>Ochrepts</i>	Shallow black, brown and alluvial soils of northern region.
<i>Aquepts</i>	Brown soil hyperthermic.
<i>Orthents</i>	Recently formed soils.
<i>Aquents</i>	Recently formed hydromorphic soil.
<i>Fluvents</i>	Alluvial soils.
<i>Umbrepts</i>	Red and yellow forest soil.

## Soil

Soils of Arunachal Pradesh are rich in base status due to high moisture content, thick leaf litter and higher quantum of rainfall and leaching of base metals. Soils are well drained owing to steep slope but are coarse textured and less fertile which limit its potential in agriculture and commercial plantations. Soil types in Arunachal Pradesh mostly belong to Entisol Order, which primarily owe its genesis to i) Unweatherable parent materials—sand, iron oxide, aluminum oxide, kaolinite clay, ii) Erosion—common on shoulder slopes; other kinds also are important, iii) Deposition—continuous, repeated deposition of new parent materials by water, wind, colluvium, mudflows and other means, iv) Flooding or saturation, v) Cold climate not sufficiently cold in winter for permafrost, vi) Shallow to bedrock being “unweatherable” rock such as quartzite or ironstone.

## NDVI

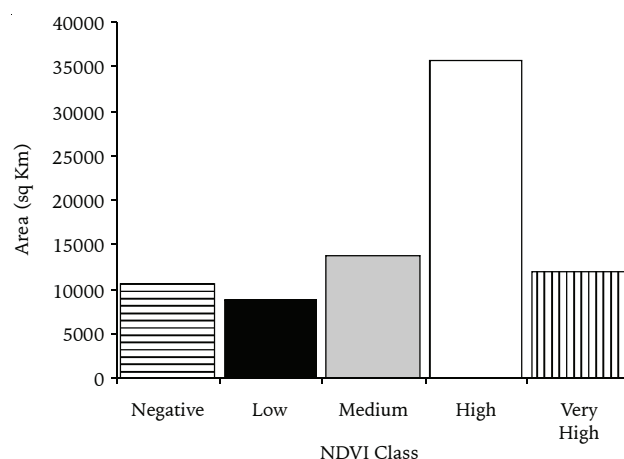
NDVI is one of the most successful of many attempts to simply and quickly identify vegetated areas and their “condition”, and it remains the most well-known and used index to detect live green plant canopies in multispectral remote sensing data. The index is derived from a simple algorithm of:  $(\text{near infrared band} - \text{visible band}) / (\text{near infrared band} + \text{visible band})$ . As a result, vigorously growing healthy vegetation has low red-light reflectance and high near-infrared reflectance, and hence, high NDVI values. This relatively simple algorithm produces output values in the range of -1.0 to 1.0. NDVI values less than zero indicate non-vegetated features such as barren surfaces (rock and soil) and water, snow, ice, and clouds. Large chunks of area in Arunachal Pradesh thereby have no prerequisite capability for plant growth; on the other hand luxuriant forest covered areas cannot be sacrificed for expansion of agriculture. Hence, limited areas are available for diversification and intensification of agriculture as envisaged by the Government of Arunachal Pradesh (2007).

Negative NDVI areas have been isolated as these are the agriculturally inoperable areas like barren slopes and snow capped areas. On the other side of the spectrum, the high NDVI areas are luxuriant forest areas and have been excluded. So less area is left for agriculture, horticulture, plantation crops and other development programme.

Remotely sensed data are the recorded response of land surface characteristics including natural and artificial cover. This digital information is processed (digital image processing: DIP) either through cluster analysis or through supervised classification using known spatial

information base as training set wherein each pixel (i.e.,  $23.5\text{m} \times 23.5\text{m}$  ground area of LISS 3 sensor of IRS) is treated as one unit for computation. The other method of classification is through screen digitisation/visual interpretation, wherein delimitation of any land cover unit is delineated by the user. Both the methods have their own advantages, however, for Arunachal Pradesh supervised classification has been preferred as contextual spatial information carries more meaning to the interpreted land cover/land use map.

FIGURE 9.4  
NDVI Class *versus* Area



## Land Cover

Classification criteria for delineating land parcels are standardised since the successful attempt of Anderson (1971), Anderson *et al.* (1972), which are referred to as USGS or Anderson classification. In this, a four-level classification scheme is suggested. Level I information caters to the requirement at state level planning, Level II for statewide to regional level planning, Level III for regional to local level planning, and Level IV for local to micro level planning. National Remote Sensing Agency (NRSA), Hyderabad developed a classification scheme for Indian context (NRSA, 1990) which is used by several user departments including Planning Commission, Government of India and has been demonstrated efficiently by Rao *et al.* (1991, 2002). However, Arunachal Himalaya does not provide a homogeneous and constraint free terrain for implementation of an ideal theoretical model.

Eleven IRS 1D LISS III Satellite images with  $23.5\text{m}$  resolution covering Arunachal Pradesh (for an area of  $80659\text{ km}^2$ ) has been classified using supervised classification Digital Image Processing (DIP) technique. Out of the area processed for land cover: 37.61 per cent



FIGURE 9.3

Soil

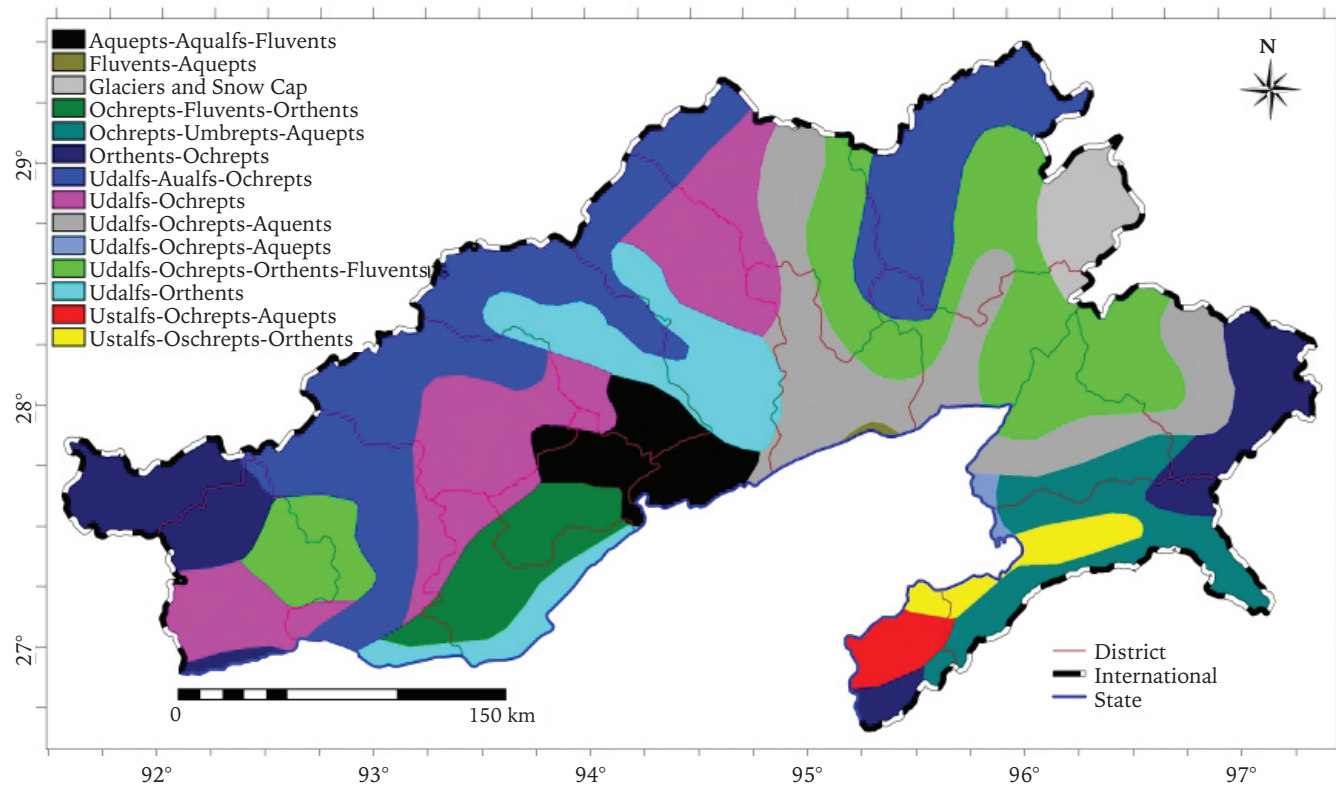


FIGURE 9.5

NDVI

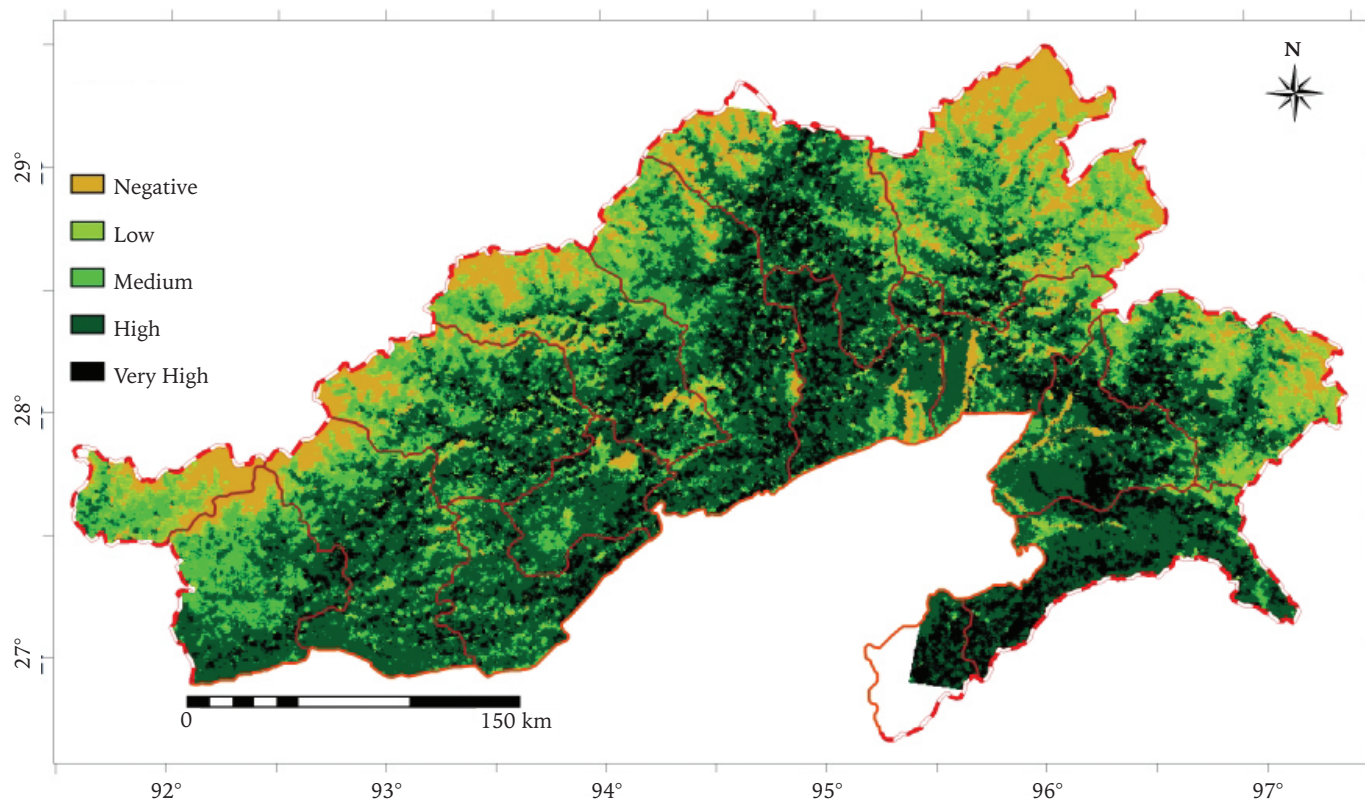
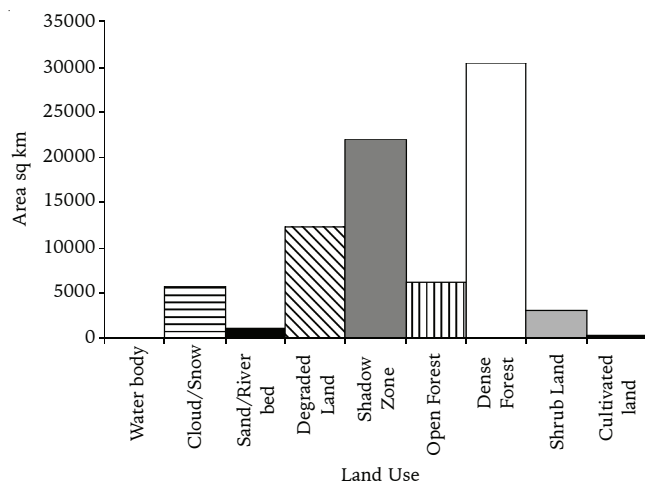


FIGURE 9.6  
Landuse versus Area



area is under dense forest followed by shadow zone (27.13 per cent) and cultivated area is only 0.34 per cent.

### Land Potential

Potential of any parcel of land is dependent on the above mentioned factors coupled with financial strength of the State and needs of the people. As of Arunachal Pradesh, the severe challenge posed by the adverse

controlling factors can be mitigated with an alternative eco-friendly and sustainable course of action. The avenues are eco-tourism, harnessing hydro-power potential and limited agriculture-horticulture-plantation based on site specific investigations and recommendations. Different geophysical spatial information layers have been prepared viz., land cover, NDVI, digital elevation model (DEM), slope, aspect, rainfall, soil; and on the basis of it, an area of 66320 km<sup>2</sup> has been modeled into different suitability classes. According to these suitability classes (Table 9.3) “most suitable class” is appropriate for cultivation of paddy and out of these areas high rainfall areas are suitable for jute that belongs to hydrophyte group. The areas of suitable category are appropriate for intensification of existing crops, such as paddy, vegetables, and wheat in colder areas of the State. Moderately suitable areas are target areas for millet and maize, and other important crops of the State. Horticulture, especially, cash crops have a high prospect in augmenting economic standing of the people of Arunachal Pradesh. There is a need for diversification as per macroclimatic conditions for a number of varieties of horticulture practiced in Arunachal Pradesh, viz., orange, banana, apple, pineapple, kiwi, etc. Identification of area for each specific plant is possible with parametric combination of different geospatial layers at a finer resolution.

TABLE 9.3  
District-wise Land Potential Area

Districts	Unsuitable	Percentage	Land potential in Arunachal Pradesh (Area is in km <sup>2</sup> )								Grand Total
			Least Suitable	Percentage	Moderately	Percentage Suitable	Suitable	Percentage	Most Suitable	Percentage	
Tawang	1331	73.70	283	15.65	153	8.46	36	1.99	4	0.19	1806
West Kameng	2747	55.35	788	15.88	629	12.67	568	11.44	231	4.66	4963
East Kameng	2949	49.09	813	13.53	823	13.70	787	13.10	636	10.58	6006
Kurung Kumey	2450	49.24	972	19.53	878	17.64	536	10.77	141	2.83	4976
Papum Pare	1898	53.40	324	9.12	335	9.42	426	11.97	572	16.09	3554
Lower Subansiri	1542	54.65	243	8.60	368	13.04	405	14.35	264	9.36	2821
Upper Subansiri	3065	63.17	709	14.61	562	11.59	376	7.74	141	2.90	4852
West Siang	4488	64.76	506	7.30	590	8.52	723	10.44	623	8.98	6929
Upper Siang	2749	61.57	385	8.62	524	11.73	560	12.53	248	5.55	4465
East Siang	2325	59.84	85	2.18	197	5.07	319	8.21	959	24.70	3884
Dibang Valley	2168	47.38	587	12.84	582	12.71	881	19.26	357	7.81	4575
L Dibang Valley	2043	56.54	229	6.33	244	6.75	397	11.00	700	19.38	3612
Lohit	2437	59.55	203	4.96	135	3.30	144	3.52	1173	28.67	4091
Anjaw	2770	72.63	371	9.72	340	8.91	259	6.78	75	1.95	3813
Changlang	4080	81.05	178	3.53	202	4.00	207	4.11	368	7.31	5034
Tirap	791	84.24	9	0.96	14	1.46	25	2.61	101	10.73	939
Grand Total	39830	60.06	6682	10.07	6573	9.91	6646	10.02	6591	9.94	66320

Source: Computed on the basis of land and land cover parameters.





FIGURE 9.7  
Landcover

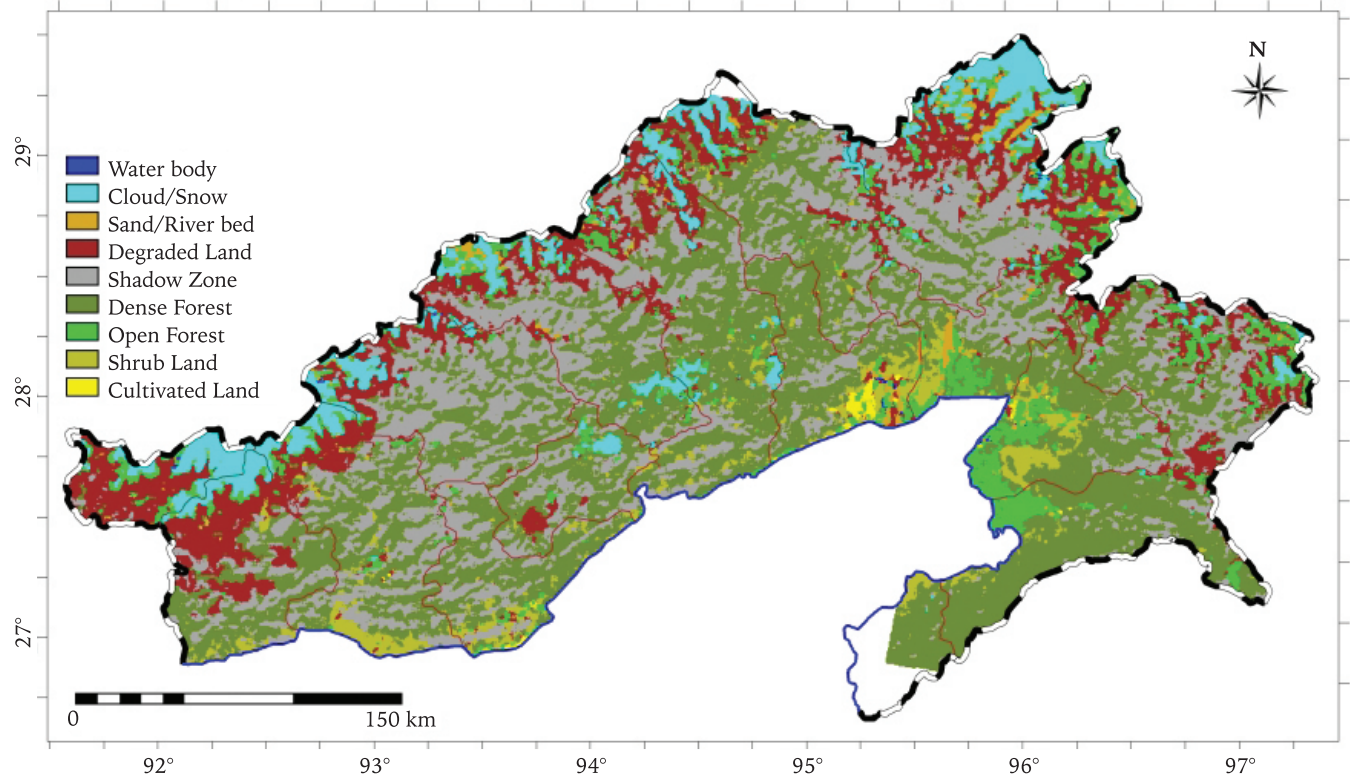


FIGURE 9.8  
Agriculture Potential Area

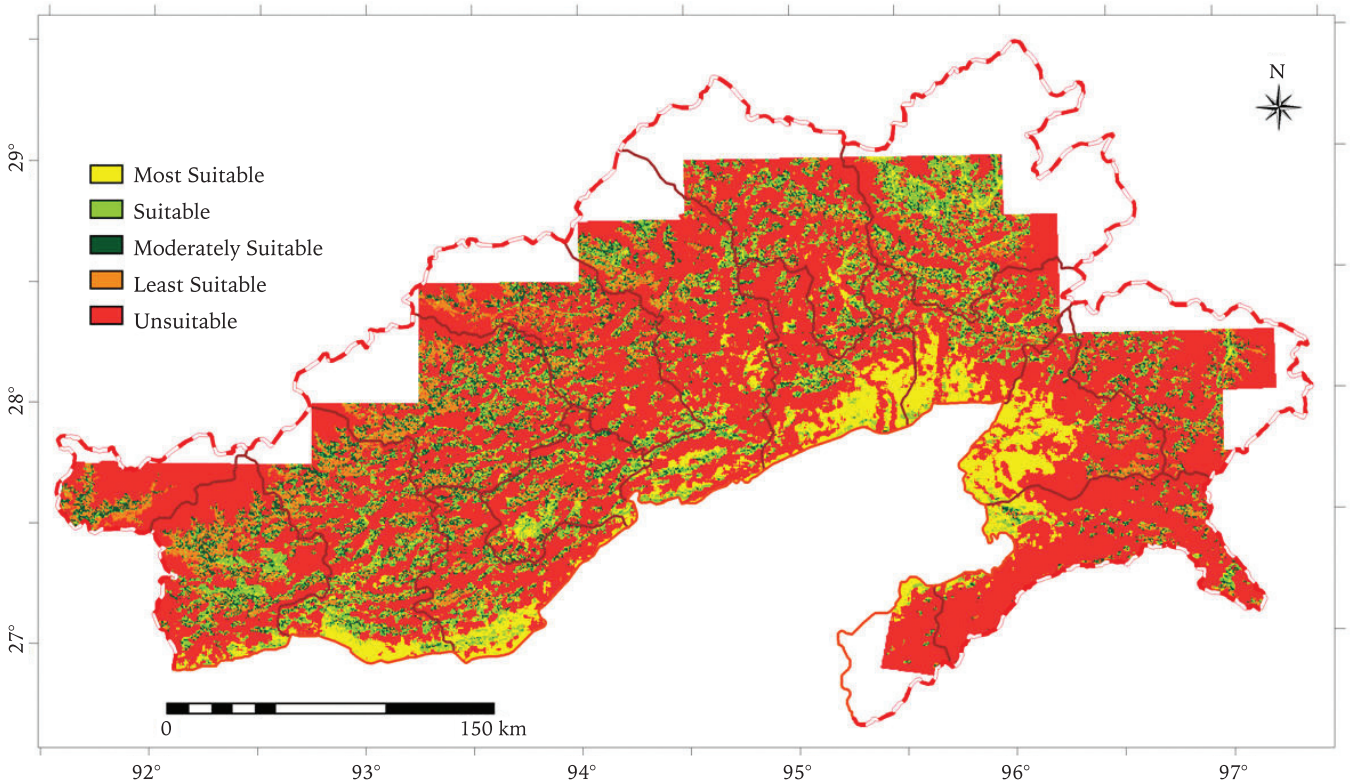


TABLE 9.4  
Potential Area (in km<sup>2</sup>) for Agriculture for Specific Crops

<i>District</i>	<i>Rice</i>	<i>Wheat</i>	<i>Millet</i>	<i>Apple</i>	<i>Ginger</i>
Tawang	0	20	305	134	0
West Kameng	676	277	718	604	80
East Kameng	1784	181	681	297	388
Kurung Kumrey	786	166	919	226	173
Papum Pare	1415	71	231	130	389
Upper Subansiri	897	31	284	204	283
Lower Subansiri	940	135	969	0	366
West Siang	2347	103	688	293	530
Upper Siang	859	51	446	29	440
East Siang	1054	4	36	0	198
Dibang Valley	179	112	759	0	240
L Dibang Valley	393	0	32	0	155
Lohit	2211	0	127	0	126
Anjaw	191	69	409	0	123
Changlang	2961	49	93	0	167
Tirap	640	0	9	0	22

*Source:* Computed on the basis of agro-climatic parameters derived from SoI toposheets, NATMO Climate map, LISS III Satellite images.

TABLE 9.5  
Maximum Area available at District Level for Development Planning Altitude and Slope Classes Explained in Tables 9.1 and 9.2

<i>Altitude vs. Slope Districts</i>	<i>Low vs. Mod</i>	<i>Low vs. Plain</i>	<i>Mid Level vs. Mod</i>	<i>Mid Level vs. Plain</i>	<i>Upper Level vs. Mod</i>	<i>Upper Level vs. Plain</i>	<i>High Alt vs. Mod</i>	<i>High Alt vs. Plain</i>	<i>Total Area</i>	<i>Percentage</i>	<i>Area of District Calculated</i>
Tawang	0.0	0.0	0.0	0.0	10.3	11.5	15.5	13.3	50.5	2.8	1822.5
W Kameng	84.0	38.0	70.8	57.5	83.0	88.8	153.3	93.5	668.8	13.5	4965.3
E Kameng	105.5	237.8	100.0	183.0	131.8	168.8	76.0	75.0	1077.8	17.9	6009.0
Kurung Kumrey	1.3	1.8	46.5	96.3	147.3	142.3	55.3	56.3	546.8	11.0	4975.5
Papum Pare	190.3	187.8	65.5	60.8	115.3	160.0	37.3	45.5	862.3	24.2	3557.0
Upper Subansiri	28.3	40.3	88.0	202.3	99.3	76.0	70.8	50.8	655.5	13.5	4852.3
Lower Subansiri	2.5	18.0	66.3	100.3	178.0	241.5	31.8	42.3	680.5	24.1	2821.0
West Siang	139.3	327.5	238.5	355.3	130.0	169.3	92.3	67.3	1519.3	21.9	6932.5
Upper Siang	18.3	59.3	67.8	128.5	183.8	206.0	49.5	47.3	760.3	17.0	4464.5
East Siang	161.0	433.5	116.8	149.3	81.3	99.3	4.0	9.5	1054.5	27.1	3889.3
Dibang Valley	0.0	0.0	17.8	77.8	79.0	128.0	234.8	274.3	811.5	17.7	4574.8
L Dibang Valley	46.0	531.5	71.8	102.3	59.8	71.8	43.0	62.5	988.5	27.4	3613.5
Lohit	104.0	963.5	75.0	81.3	47.3	38.0	29.8	22.0	1360.8	33.3	4091.5
Anjaw	0.0	0.0	12.8	41.8	61.8	53.8	61.3	40.5	271.8	7.1	3814.8
Changlang	231.0	523.3	169.0	275.0	132.5	250.8	34.8	31.3	1647.5	32.7	5039.3
Tirap	174.0	160.8	109.0	101.0	60.3	34.0	5.5	7.0	651.5	32.9	1982.3
Grand Total	1285.3	3522.8	1315.3	2012.0	1600.3	1939.5	994.5	938.0	13607.5	20.2	67404.8

*Source:* Key to Altitude category and Slope classes are given in Table Nos. 9.1 and 9.2.

## Chapter 10

# Rural Development

### Introduction

There is an increasing realisation that provision of certain social and physical infrastructural facilities is the key to improving the level of living as well as the quality of life and to eradicating poverty and hunger.

By providing the facilities the economic condition of the people can be improved. It is to be borne in mind that an evaluation of development in the basic services in rural Arunachal Pradesh is severely hampered by non-availability of data. This chapter aims at an assessment of rural development in terms of: (i) rural Infrastructure, (ii) access to basic services like provision of education and health services, (iii) rural assets, (iv) rural livelihood, (v) rural technology, and (vi) rural development programme.

### Rural Infrastructure

Road is the only means of transport among the villages in the State since it is not connected by railways. The road density may not throw proper light on the lack of proper road communications among villages in Arunachal Pradesh since the villages are scattered and many of the interior villages are yet to be connected by the motorable roads. Therefore, this indicator has been supplemented by another relevant indicator, road accessibility. The road accessibility refers to the distance (physical or in terms of time or otherwise), which is computed from user's location like villages where users live to the nearest road connection (i.e., bus stop, etc.). Based on 1991 census data the road accessibilities of the villages have been calculated (Table 10.1).

It shows that in 1991 only 16.96 per cent of the villages in Arunachal Pradesh had bus stop facilities, while as high as 62.86 per cent of villages had the bus stop

facilities more than 10 km away. These villages may be regarded as relatively inaccessible. On that basis, 80.50 per cent of villages in Upper Subansiri, the highest among all districts were inaccessible followed by East Kameng with 72.00 per cent being inaccessible.

TABLE 10.1

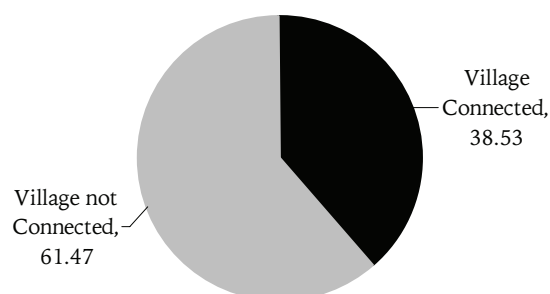
Percentage of Villages with Bus Stop Facilities on the Basis of Distance Covered, 1991

District	0 km	0-5 km	5-10 km	10 km
Tawang	6.75	25.15	22.09	46.01
West Kameng	17.65	11.76	8.09	62.50
East Kameng	9.46	10.18	8.36	72.00
Papum Pare	6.08	16.35	17.49	60.08
Lower Subansiri	44.03	2.69	1.18	52.10
Upper Subansiri	6.17	4.69	8.64	80.50
West Siang	9.56	12.99	7.35	70.10
East Siang	22.55	12.75	11.76	52.94
Dibang Valley	16.39	10.50	7.98	65.13
Lohit	9.65	15.81	6.78	67.76
Changlang	11.58	20.35	13.33	54.74
Tirap	28.21	7.69	8.97	55.13
<b>Arunachal Pradesh</b>	<b>16.96</b>	<b>11.46</b>	<b>8.72</b>	<b>62.86</b>

Source: Census of India, 1991, District Census Hand Books of Different Districts of Arunachal Pradesh.

The road connectivity status of the villages in Arunachal Pradesh was defined by the Arunachal Pradesh Public Works Department in 1997 on the criterion that the villages falling within a radius of 1 km in a hilly terrain and 5 km in plains from the constructed roads (*pucca* or *kutchra*) would be considered to be connected (Human Development Report, 2005]. The details are given in Figure 10.1.

FIGURE 10.1  
Road Connectivity Status, 1997



It shows that 38.53 per cent of the villages of Arunachal Pradesh are connected by road (out of which only 12.30 per cent of the villages are connected by *pucca* road and the rest by *kutchra* road). Among the districts, East Siang (73.68 per cent) has the highest connectivity by roads followed by Lower Dibang Valley (66.96 per cent). Kurung Kumey has the lowest road connectivity (7.47 per cent) (Table 10.2). In rural Arunachal Pradesh 46.51 per cent of the population has access to *pucca* road, 26.93 per cent to *kutchra* road, and 26.56 per cent has no connectivity at all.

In Kurung Kumey only 1.35 and 21.89 per cent of rural population have access to *pucca* and *kutchra* roads respectively (Table 10.3). Even within villages, the higher the population the higher is the road connectivity. For example, among the villages having a population of more than 1000, 93.96 per cent are connected by *pucca* or *kutchra* roads.

TABLE 10.2  
Road Connectivity Status of Villages, 1997

District	% of Villages Connected	% of Villages not Connected
Tawang	25.66	74.34
West Kameng	46.97	52.03
East Kameng	26.52	73.48
Papum Pare	43.02	56.98
Lower Subasiri	33.17	66.83
Upper Subansiri	28.18	71.82
Kurung Kumey	7.47	92.53
Upper Siang	56.00	44.00
East Siang	73.68	26.32
West Siang	45.72	54.28
Lower Dibang Valley	66.96	33.04
Dibang Valley(New)	23.58	76.42
Lohit	40.70	59.30
Changlang	59.57	40.43
Tirap	57.23	42.77
<b>Arunachal Pradesh</b>	<b>38.53</b>	<b>61.47</b>

Note: Connectivity status for all 15 districts has been calculated on the basis of data available in the circles.

Source: Connectivity of Villages, Public Works Department, Government of Arunachal Pradesh, Itanagar, 1997.

However, only 34.98 per cent of villages having a population of less than 500 are connected by any type of road (Table 10.3).

TABLE 10.3  
Road Connectivity Status on the Basis of Population, 1997

District	% of Total Rural Population of Dist. Connected by Pucca Road	% of Total Rural Population of Dist. Connected by Kutchra Road	% of Total Rural Population of Dist. not Connected by any Road
Tawang	20.10	27.78	52.12
West Kameng	49.13	29.89	20.98
East Kameng	27.19	20.28	52.53
Papum Pare	64.90	16.59	18.51
Lower Subasiri	78.37	2.68	18.95
Upper Subansiri	38.19	19.57	42.24
Kurung Kumey	1.35	21.89	76.76
Upper Siang	4.66	81.51	13.83
East Siang	47.22	44.24	8.54
West Siang	45.77	30.33	23.90
Lower Dibang Valley	66.21	27.11	6.68
Dibang Valley(New)	0.16	62.26	37.58
Lohit	60.24	23.92	15.84
Changlang	34.26	32.79	32.95
Tirap	46.67	27.79	25.54
<b>Arunachal Pradesh</b>	<b>46.51</b>	<b>26.93</b>	<b>26.56</b>

Note: Connectivity status for all 15 districts has been calculated on the basis of data available in circle level.

Source: Connectivity of Villages, Public Works Department, Government of Arunachal Pradesh, Itanagar, 1997.

Now, an attempt is made to examine the other infrastructural and basic services of the rural areas across the districts. Electricity is a basic infrastructure and an input to many amenities today. In Arunachal Pradesh, the successive five year plans had specific targets for extending the coverage of electricity to households.

#### BOX 10.1

##### Prime Minister's Announcement

On 31<sup>st</sup> January and 1<sup>st</sup> February 2008, the Prime Minister announced, "We will surely provide the required funds for providing drinking water facilities in remote villages and settlements of Arunachal Pradesh. In order to stop losses due to floods and bring about improvements in flood affected areas, we will provide an assistance of 400 crore rupees from the Central Government. Many projects in the State are lying unfinished. We will provide an amount of Rs.265 crore for completion of these projects."



According to 2001 census 44.53 per cent of the rural households were electrified. However, there were variations among the districts. For example, Papum Pare had the highest coverage of electricity (77.19 per cent) in rural areas while Lohit had the lowest (25.85 per cent) (Table 10.4).

The source of drinking water is another indicator of infrastructural development. The rural households in Arunachal Pradesh use multiple sources like tap, tubewell, pond, well and others including spring and river water. According to 2001 census 63.34 per cent of the rural households had tapped water as the dominant source, 15.26 per cent used tubewells and wells, and 23.40 per cent used other sources like springs, rivers, etc. (Table 10.5). The rural Arunachal Pradesh had poor drainage and sanitation facilities. In 2001, only 3.27 per cent of rural households had closed drainage, 22.80 per cent open drainage and as high as 73.93 per cent had no drainage facilities (Table 10.7).

TABLE 10.4

**Percentage of Rural Households having Access to Electricity and Other Sources of Lighting**

<i>Districts</i>	<i>Electricity</i>	<i>Kerosene</i>	<i>Solar Energy</i>	<i>Other Oil</i>	<i>Any Other</i>	<i>No Lighting</i>
Tawang	63.86	34.86	0.06	0.01	0.20	1.01
West Kameng	73.84	17.88	0.04	0.17	6.98	1.09
East Kameng	12.69	23.68	0.08	0.00	21.10	42.46
Papum Pare	77.19	10.68	0.20	0.02	1.96	9.94
Lower Subansiri	58.62	6.64	0.07	0.51	5.15	29.01
Upper Subansiri	24.78	40.53	0.28	0.25	9.71	24.45
West Siang	37.78	34.48	0.52	0.52	13.55	13.15
East Siang	33.97	62.28	0.15	0.31	1.42	1.87
Upper Siang	57.94	23.74	0.09	2.69	11.09	4.45
Dibang Valley	41.83	52.18	0.33	0.01	0.49	5.16
Lohit	25.85	64.34	0.56	5.22	1.35	2.68
Changlang	33.05	61.37	0.20	0.12	4.05	1.20
Tirap	52.22	30.88	0.07	0.05	7.05	9.73
AP Rural	44.53	37.86	0.23	0.96	5.91	10.52
AP Urban	89.42	9.35	0.22	0.02	0.28	0.70
AP Total	54.69	31.41	0.23	0.74	4.63	8.30

Source: Census of India 2001, H-Series: Tables on Houses, Household Amenities and Assets, Arunachal Pradesh.

TABLE 10.5

**Percentage of Rural Households having Different Sources of Water**

<i>Districts</i>	<i>Tap</i>	<i>Hand Pump</i>	<i>Tube well</i>	<i>Well</i>	<i>Tank, Pond, Canal, Lake</i>	<i>River</i>	<i>Spring</i>	<i>Any Other</i>
Tawang	63.97	0.16	0.03	0.10	1.32	4.17	23.84	6.42
West Kameng	82.77	0.29	0.16	0.57	0.92	4.72	9.00	1.57
East Kameng	69.52	0.17	0.00	0.82	2.23	12.06	13.06	2.14
Papum Pare	71.62	0.39	0.32	7.40	0.93	14.45	4.23	0.66
Lower Subansiri	74.95	0.40	0.25	5.27	0.58	9.39	4.81	4.36
Upper Subansiri	78.15	1.10	0.15	0.57	0.01	7.19	8.45	4.39
West Siang	82.23	0.83	0.25	0.41	0.62	6.58	4.83	4.25
East Siang	70.19	7.89	2.78	7.05	0.31	5.73	5.76	0.29
Upper Siang	82.76	0.29	0.00	0.00	0.00	2.83	13.66	0.47
Dibang Valley	65.71	13.01	3.41	4.71	0.12	9.27	1.77	2.01
Lohit	34.65	36.30	4.59	6.59	2.45	11.84	1.42	2.17
Changlang	33.75	11.72	11.74	14.95	1.82	18.92	4.21	2.89
Tirap	64.01	0.17	0.08	1.64	2.81	6.18	20.06	5.05
AP Rural	63.34	7.76	2.59	4.91	1.26	9.65	7.64	2.86
AP Urban	83.09	6.02	1.61	3.86	0.83	2.49	1.09	1.01
AP Total	67.81	7.37	2.37	4.67	1.16	8.03	6.16	2.44

Source: Census of India 2001, H-Series: Tables on Houses, Household Amenities and Assets, Arunachal Pradesh.

TABLE 10.6

**Percentage of Rural Households having Different Types of Sanitation**

<i>Districts</i>	<i>Households having Bathroom Facility within the House</i>	<i>Pit Latrine</i>	<i>Water Closet</i>	<i>Other Latrine</i>	<i>No Latrine</i>
Tawang	9.89	66.71	7.50	5.63	20.16
West Kameng	21.96	20.17	9.23	9.84	60.76
East Kameng	6.85	9.92	3.20	14.65	72.24
Papum Pare	28.18	25.23	11.39	19.47	43.91
Lower Subansiri	13.10	14.52	2.96	30.65	51.87
Upper Subansiri	10.52	12.08	3.25	35.57	49.10
West Siang	11.62	23.75	5.21	42.73	28.31
East Siang	10.48	19.34	5.41	28.57	46.68
Upper Siang	20.79	14.52	7.40	6.65	71.43
Dibang Valley	15.16	24.67	8.54	11.41	55.39
Lohit	10.49	28.68	6.37	3.36	61.60
Changlang	11.63	30.95	7.09	5.03	56.94
Tirap	7.50	24.14	2.74	15.92	57.19
AP Rural	13.28	24.02	6.04	17.28	52.66
AP Urban	53.93	32.08	28.06	26.82	13.05
AP Total	22.48	25.84	11.02	19.43	43.70

Source: Census of India 2001, H-Series: Tables on Houses, Household Amenities and Assets, Arunachal Pradesh.

**TABLE 10.7**  
**Percentage of Rural Households having**  
**Different Types of Drainage**

Districts	Closed Drainage	Open Drainage	No Drainage
Tawang	1.09	13.29	85.62
West Kameng	7.40	27.18	65.42
East Kameng	1.04	12.01	86.95
Papum Pare	8.21	33.17	58.62
Lower Subansiri	3.58	25.03	71.39
Upper Subansiri	4.27	23.89	71.84
West Siang	4.94	41.69	53.37
East Siang	2.33	27.40	70.27
Upper Siang	2.77	15.92	81.31
Dibang Valley	1.86	17.19	80.95
Lohit	1.30	15.21	83.49
Changlang	2.37	19.09	78.54
Tirap	1.94	20.32	77.74
AP Rural	3.27	22.80	73.93
AP Urban	12.90	50.36	36.74
AP Total	5.45	29.03	65.51

Source: Census of India 2001, H-Series: Tables on Houses, Household Amenities and Assets, Arunachal Pradesh.

## Access to Basic Services

### Child Immunisation

One of the basic health services provided by the State are child immunisation. Both the Central and the State governments reiterated their commitment to the eradication of a few fatal diseases. A phased programme of free immunisation has been chalked out for all children mainly during the first year (the programme actually covers children up to the age of 10 years). For pregnant women, immunisation as well as iron supplements are provided. However, the ground level reality is very distant from the goals proclaimed by the State. In general, the pulse polio campaign has been a major success, over 68.09 per cent children have been immunised (Govt. of Arunachal Pradesh, 2006). While there have been vigorous campaigns for providing child immunisation free to all infants, the access to immunisation of children in the State is 68.09 per cent with a wide variation among the districts (Table 10.8).

### Health and Education

On the education front, Arunachal Pradesh has advanced markedly. Total rural literacy rate is about 47.8 per cent with Kurung Kumey district having lowest literacy rate 25.74 per cent. The gross enrolment ratio of children at the upper primary level is once again less than

**TABLE 10.8**  
**Access to Immunisation and School Enrolment**

	Infant Mortality Rate	% of Children Immunised against Polio and DPT	Rural Literacy Rate 2001	Gross Enrolment Ratio (Primary)	Gross Enrolment Ratio (Upper Primary)
Changlang	62	69.67	47.6	64.88	54.92
Dibang Valley (New)	98	58.82	43.27	80.72	78.15
Lower Dibang Valley	53	76.67	53.13	80.72	78.15
Kurung Kumey	113	60.00	25.74	NA	NA
East Kameng	97	66.25	31.3	110.58	81.64
East Siang	57	80.28	55.7	120.64	120.54
Lohit	72	75.13	51.0	62.42	53.62
Lower Subansiri	59	81.29	54.23	180.11	95.48
Papum Pare	67	82.62	59.0	123.07	100.01
Tawang	98	63.73	35.1	98.50	54.38
Tirap	92	63.04	34.2	74.47	66.50
Upper Siang	87	74.63	49.8	109.13	82.07
Upper Subansiri	97	63.13	41.5	131.53	73.20
West Kameng	88	60.87	58.9	92.62	46.10
West Siang	85	71.37	53.9	141.67	143.85

Source: Human Development Report of Arunachal Pradesh 2005 (2006).

100 per cent with a wide variation across districts. One of the important reasons of low level of literacy and poor educational status of population could be related to access to educational institutions. The HDR of the State clearly pointed out that 48.38 per cent of the habitations of the State do not have primary schooling facilities within a radius of one kilometre, and 68.83 per cent of the habitations do not have upper primary schooling facilities within a radius of three kilometre. There are also wide scale variations among the districts.

Similarly, as pointed out in Chapter VI, the performance of the State in all indicators of health is not satisfactory particularly in the rural and inaccessible districts. For example, Kurung Kumey had the highest infant mortality rate of 113 and the lowest Dibang Valley 53. The basic reason behind poor rural health condition is, inadequacy of health services. Only 14.29 per cent of the allopathic medical institutions in the State are located in the rural areas.

## Rural Assets in Arunachal Pradesh

Assets are enmeshed in highly intricate ways with the functioning of individuals. This relational intricacy emerges from the fact that in the action space the assets are in some forms inputs to and in others outputs of an



individual's functioning. As correlates of human action, assets reveal through their range and forms the status of social well-being. The assets are a revelation not only of the present condition, but also of the future, at least to a certain extent. The growth trajectory of the economy and its co-moving factors are partly reflected by the quantity and term structure of the assets being accumulated. Functionally assets may be directly productive—the capital assets—or they may be amenities facilitating directly or indirectly the formation of human capital. Apparently, some assets may appear functionally inert, generating neither the direct productive services nor utility, but they may provide security or act as a hedge against inflation. Hoarded gold and other precious metals are examples of such assets.

In the traditional society of Arunachal Pradesh the household assets were of highly limited variety. They were also mostly in physical form, an outcome of ownership of assets being not separated from their operation. The separation of ownership from operation came with the emergence of modern secondary and tertiary activities, monetisation of different barter economies and their integration with the national economy. With the deepening of new institutional forms of individual property rights, the changes in technology and the spread of banking, new varieties of assets got multiplied—the most abstract ones being equity of public companies and corporations, bonds, etc. In what follows an attempt is made to show the household level asset-accumulation in rural Arunachal Pradesh. The range of assets considered is very limited, the limitation being imposed by the scarcity of data. The main data source for the study is the census which reports information on a few items which are largely consumer durables such as radio, television, telephone, car, etc. The data on financial assets held by the households is not available. The only piece of information on financial assets available in the census is whether the household has a bank account or not. The data limitation narrows our analytical breadth as well as depth.

### Status of Asset-accumulation

In spite of the accumulation of modern forms of assets beginning only five decades ago, the households in the State have progressed much in the acquisition of different types of facilities, the ones which provide, apart from comforts, various services. It will be meaningful if the status of Arunachal Pradesh is compared with the national average. Table 10.9 is a comparison on the selected assets. The set of assets in the table is not a random selection. They are all included in the household utility function.

TABLE 10.9  
Household Assets in Arunachal Pradesh:  
A Comparison with the National Average  
(As per 2001 Census)

Assets	Total		Rural		Urban	
	Ar. P	India	Ar. P	India	Ar. P	India
Radio	39.00	35.10	36.20	31.50	48.30	44.50
TV	25.70	31.60	15.70	18.90	59.70	64.30
Telephone	9.20	9.10	4.20	3.80	26.50	23.00
Bicycle	17.40	43.10	16.40	42.80	20.80	46.00
Bike/Scooter	6.80	11.70	4.40	6.70	14.70	24.70
Car, Van, etc.	2.40	2.50	1.40	1.30	5.70	5.60
None	46.10	34.50	52.70	40.50	23.60	19.00

Note: Ar.P is Arunachal Pradesh.

Source: Census of India, 2001.

Assets forming inputs in the household production function are not included, nor the security providing assets are included such as gold, precious metals, etc. The overall asset position in Arunachal Pradesh is far below the national average, but in some assets the State's possession exceeds the country's average. The example is radio which is not, however, valuable; 39.0 per cent of all households own a radio in the State as compared with 35.1 per cent in the country as a whole. Radio has reached the far-flung villages of the State: as high as 36.2 per cent of the rural households own radios compared with 31.5 per cent in rural India. In telephone connectivity also, the State is marginally ahead of the country: 9.2 per cent of all households in the State have telephone connectivity compared with 9.1 per cent in the country. However, Arunachal Pradesh's better position *vis-à-vis* the rest of the country is more pronounced in the urban than in the rural areas. As high as 26.5 per cent of all urban households in the State have telephone connectivity compared with 23.0 per cent in urban India. In the possession of cars, vans, etc., rural Arunachal Pradesh is not markedly different from the rest of the country, but motorcycle/scooter makes a difference. Only 4.4 per cent of the households in rural Arunachal Pradesh are owners of motor cycle, scooters, etc., but in rural India 6.7 per cent of the households possess the two-wheelers. In the use of television rural Arunachal Pradesh lags behind the rest of the country. In the State 15.7 per cent of the rural households enjoy television against 18.9 per cent in rural India.

The asset which has a markedly lower rate of use in the State than in the rest of the country is bicycle. In rural Arunachal Pradesh only 16.4 per cent of the households use bicycle as compared with 42.8 per cent in rural India. One of the least valuable of all selected assets, bicycle,

finds a low use in the State because of its hilly topography. It is the bicycle which makes a difference between the State's use of at least one of the selected assets from the national average.

The selected assets are not uniformly used throughout the State; there are substantial inter-district and rural-urban differences. Telephone connectivity is lowest in East Kameng with only 0.96 per cent of the rural households having this facility. Not far better situation is in Tirap or Upper Subansiri. In Tirap only 1.29 per cent of the rural households have telephone connectivity and in Upper Subansiri only 1.37 per cent. On the other side of the spectrum is the district Papum Pare with its 14.93 per cent of the rural households having telephone connectivity. Upper Siang, an all-rural district occupies the second position with 7.49 per cent of its households having telephone connectivity. East Siang, the district with the highest human development index, has not much advanced in extending telephone facilities in the rural areas. In this district only 5.35 per cent of the rural households have telephone connectivity.

The lowest user of television is rural East Kameng where only 3.63 per cent of the households possess television. The highest user is again rural Papum Pare with as high as 34.35 per cent of the households possessing television. The range of inter-district variation in the ownership of cars, vans, etc., is not as high as in that of other assets. The lowest user is rural East Kameng with only 0.33 per cent of households owning cars, vans, etc. The highest user is rural Papum Pare with 2.75 per cent of the households having cars, vans, etc. Scooter/motor cycle use is partly determined by the topography and road connectivity. In Tawang, a hilly district, the use of scooter/motor cycle in the rural areas is very low but it is high in the districts with some plains and having better road connectivity. Hilly conditions make the highest difference in the use of bicycles. Tawang is the lowest user with its only 0.14 per cent rural households owning bicycles. On the other side, rural Lohit with extensive plains witnesses as high as 38.47 per cent of its households possessing bicycles.

## Financial Assets

Proportions of different financial assets in the portfolio of a household are a measure of its efforts to diversify the sources of income and protect itself against risk. Holding of financial assets is also a reflection of the spread of financial market whose instruments also deal with risk. In Arunachal Pradesh, the financial market is relatively new and immature. The first bank branch in the State was

opened in December 1971. To date banking has not spread widely; most of the rural areas especially the remote ones remain outside the reach of banking and financial intermediation. There is an acute scarcity of data on the holding of different financial assets by the households. The data on the aggregate bank deposits are available, but its rural-urban division is not. The only information available is the number of households having bank accounts, the indicator in which Arunachal Pradesh has a very good position. As high as 37.3 per cent of all households in Arunachal Pradesh have bank accounts compared with a national average of 35.5 per cent. Among all the eight North-eastern states, Arunachal Pradesh occupies the first position in access to banking, and among all the 35 states and union territories, Arunachal Pradesh's position is 16th. Many households in rural areas have developed banking habits; 28.6 per cent people in rural Arunachal Pradesh have bank accounts against the national average of 30.1 per cent. However, in urban banking Arunachal Pradesh is far ahead of the national average; as high as 67.0 per cent of all urban households in the State have bank accounts compared with 49.5 per cent in urban India. It is remarkable that Arunachal Pradesh's proportion of urban households having bank accounts is fifth highest—only four states and union territories have higher proportions of urban households with bank accounts. In some districts of the State, the banking services have reached far off from the urban centres, but in others, banking is concentrated in and around urban areas. In rural Papum Pare 50.2 per cent of all households have bank accounts, the highest in the State. The lowest is in East Kameng with only 16.0 per cent rural households having bank accounts (Table 10.10). In a good number of districts, more than 30 per cent of the rural households have bank accounts. In East Siang, 40.5 per cent of the rural households have bank accounts. In West Siang this percentage is 33.4.

The number of bank accounts does not provide us information on the quantity of banking transactions. An idea can be formed about the magnitude of intermediation by banks by considering the state-level deposits in relation to gross state domestic product (GSDP). In Arunachal Pradesh, the aggregate bank deposits are 49.67 per cent of GSDP (the deposits relate to 31<sup>st</sup> March 2005 and GSDP to 2004-05). This is low compared with what exists at the national level. In the country as a whole, bank deposits were 67.07 per cent of gross national product (GNP) in 2004-05. Deposit-GSDP ratio is low in the State but credit GSDP ratio is still lower, being only 0.196 or 19.6 per cent. A low disbursement of credit in the State is due to various factors but the one which stands above others

TABLE 10.10

Percentage of Households Availing Banking Services and having each of the Specified Assets in Arunachal Pradesh

	<i>Dist</i>	<i>Account Bank</i>	<i>Radio</i>	<i>Television</i>	<i>Telephone</i>	<i>Bicycle</i>	<i>Scooter/Bike</i>	<i>Car/Van</i>	<i>R None</i>	<i>Some</i>
1	Ar. P	37.29	38.96	25.70	9.19	17.42	6.77	2.38	46.14	53.86
2	R	28.61	36.22	15.74	4.12	16.43	4.44	1.42	52.74	47.26
3	U	66.99	48.33	59.74	26.53	20.77	14.71	5.66	23.59	76.41
4	Taw	38.73	50.69	23.28	11.95	0.53	1.32	1.88	44.36	55.64
5	R	30.27	46.72	14.07	5.42	0.14	0.93	1.24	50.39	49.61
6	U	85.00	72.35	73.68	47.68	2.67	3.46	5.42	11.39	88.61
7	WK	42.84	40.72	30.78	8.12	1.81	3.63	2.30	46.65	53.35
8	R	38.74	39.89	25.39	5.04	1.73	3.45	1.87	50.26	49.74
9	U	72.16	46.64	69.27	30.17	2.38	4.88	5.38	20.91	79.09
10	EK	27.44	17.87	12.08	4.05	5.30	2.49	0.96	76.11	23.89
11	R	15.98	13.39	3.63	0.96	3.42	1.27	0.33	84.66	15.34
12	U	62.75	31.69	38.12	13.56	11.08	6.25	2.90	49.76	50.24
13	PP	60.63	41.44	52.91	29.04	13.29	16.34	6.41	29.39	70.61
14	R	50.20	39.52	34.35	14.93	18.50	10.14	2.75	40.32	59.68
15	U	68.76	43.02	68.25	40.70	8.99	21.46	9.43	20.35	79.65
16	LS	27.24	26.65	15.85	5.17	4.03	4.83	2.04	65.28	34.72
17	R	21.82	23.34	9.19	2.45	3.14	3.71	1.45	71.56	28.44
18	U	61.82	47.74	58.40	22.53	9.70	11.94	5.81	25.20	74.80
19	US	37.29	43.18	17.70	6.87	6.07	5.24	1.26	50.96	49.04
20	R	27.29	38.14	5.50	1.37	2.92	2.76	0.43	59.91	40.09
21	U	63.58	56.42	49.79	21.33	14.34	11.77	3.45	27.45	72.55
22	WS	43.68	47.33	26.03	8.16	12.57	9.35	2.42	41.92	58.08
23	R	33.36	44.54	14.70	3.50	10.00	6.74	1.51	48.93	51.07
24	U	77.60	56.47	63.24	23.44	21.01	17.92	5.40	18.89	81.11
25	ES	48.40	50.74	35.02	9.33	31.56	12.45	3.15	32.76	67.24
26	R	40.51	48.82	25.23	5.35	28.58	9.92	2.49	37.50	62.50
27	U	67.13	55.30	58.25	18.77	38.66	18.45	4.71	21.52	78.48
28	US	45.96	34.92	14.73	7.49	1.68	4.62	1.37	58.24	41.76
29	D	33.96	49.80	23.79	7.26	29.67	7.31	2.13	35.98	64.02
30	R	25.37	48.07	15.19	4.49	29.45	5.62	1.92	40.11	59.89
31	U	73.13	57.69	63.00	19.86	30.67	15.00	3.07	17.14	82.86
32	L	27.60	40.21	22.06	6.45	42.65	5.50	1.62	37.73	62.27
33	R	19.25	38.00	13.54	2.87	38.47	3.86	1.14	42.35	57.65
34	U	57.29	48.09	52.36	19.17	57.51	11.32	3.34	21.29	78.71
35	C	27.62	38.81	19.73	4.95	33.39	4.15	1.44	40.73	59.27
36	R	23.05	38.22	15.39	3.05	35.40	3.15	1.11	42.05	57.95
37	U	63.91	43.58	54.20	20.03	17.38	12.13	4.08	30.20	69.80
38	T	28.71	27.58	20.94	4.13	4.17	2.85	1.39	63.16	36.84
39	R	21.20	23.64	13.03	1.29	2.71	1.76	0.84	70.87	29.13
40	U	63.74	45.93	57.81	17.37	10.96	7.92	3.96	27.21	72.79

*Note:* Ar. P = Arunachal Pradesh, Taw = Tawang, WK = West Kameng, EK = East Kameng, PP = Papum Pare, LS = Lower Subansiri, US = Upper Subansiri, WS = West Siang, ES = East Siang, US = Upper Siang, D = Dibang Valley, L = Lohit, C = Changlang, T = Tirap, R = Rural, U = Urban, R None = None of the Assets and Some stands for at least one of the asset.

*Source:* Census of India, 2001 (Arunachal Pradesh).

especially in rural areas is the non-availability of collateral. Land being not surveyed cadastrally cannot be used as collateral to the banks. This restricts the expansion of bank credit.

## Land Ownership

The people of the State are adequately endowed with land, but most of it is hilly. However, with urbanisation, the value of land especially in the suburban area and in

the plains has been increasing. Consequently, land has emerged as an important asset with a high market value. Table 10.12 gives an idea about the potential land availability in different districts of the State. The table is notional giving an idea of endowment. In the State as a

whole, the net sown area is more than two lakh hectares. When this area is divided by the number of ST households, the net sown area turns out to be 1.87 hectares per household. (Here ST households are considered in view of the fact that non-ST households, in

TABLE 10.11  
Assets Ownership in ST Households in Arunachal Pradesh: 2001

	<i>Dist</i>	<i>Account Bank</i>	<i>Radio</i>	<i>Television</i>	<i>Telephone</i>	<i>Bicycle</i>	<i>Scooter/Bike</i>	<i>Car/Van</i>	<i>R None</i>
1	Ar P	33.12	33.66	19.74	7.33	10.91	7.01	2.71	55.76
2	R	26.90	31.33	12.64	3.48	9.94	4.93	1.65	61.11
3	U	69.86	47.42	61.60	30.07	16.66	19.23	9.00	24.24
4	Taw	32.61	45.09	17.44	9.21	0.42	1.13	1.95	51.22
5	R	27.16	42.14	11.62	5.14	0.13	0.86	1.31	55.39
6	U	84.90	73.45	73.29	48.33	3.18	3.66	8.11	11.13
7	WK	38.62	34.23	25.71	7.11	1.41	3.85	3.18	54.00
8	R	34.74	32.96	20.67	4.13	1.22	3.72	2.47	57.71
9	U	77.98	47.12	76.86	37.31	3.37	5.19	10.38	16.41
10	EK	21.95	12.29	7.15	2.31	4.13	2.03	0.85	82.75
11	R	13.66	10.02	1.88	0.45	2.94	1.06	0.28	88.27
12	U	56.14	21.67	28.90	9.96	9.03	6.04	3.20	60.01
13	PP	57.76	39.14	45.55	27.15	13.97	18.13	8.28	34.60
14	R	46.96	35.00	26.94	12.11	17.14	11.15	3.32	47.05
15	U	71.92	44.56	69.95	46.86	9.82	27.30	14.78	18.28
16	LS	21.21	22.51	10.42	3.37	3.48	4.36	1.80	71.38
17	R	17.14	20.31	5.41	1.36	2.83	3.29	1.20	76.07
18	U	60.14	43.56	58.29	22.61	9.79	14.62	7.52	26.55
19	US	33.09	39.77	13.61	5.03	5.69	4.95	1.25	55.34
20	R	24.89	35.7	4.01	1.20	2.75	2.50	0.40	62.48
21	U	63.14	54.7	48.84	19.06	16.49	13.92	4.36	29.15
22	WS	37.11	44.07	21.24	6.85	11.05	9.93	2.66	46.63
23	R	30.13	41.82	12.44	3.03	9.27	6.86	1.61	52.17
24	U	78.89	57.53	73.99	29.75	21.72	28.28	8.94	13.48
25	ES	47.28	50.47	32.55	8.22	30.47	14.47	3.92	33.98
26	R	41.23	48.63	26.49	5.45	28.8	12.19	3.12	37.26
27	U	83.04	61.31	68.30	24.64	40.35	27.96	8.65	14.60
28	US	42.26	30.29	10.81	6.52	1.83	5.10	1.50	64.02
29	D	35.91	48.03	22.15	8.77	26.03	10.90	3.87	40.53
30	R	32.06	47.56	18.21	7.13	25.97	9.79	3.54	42.58
31	U	79.19	53.30	66.50	27.16	26.65	23.35	7.61	17.51
32	L	26.42	34.19	19.35	6.73	27.62	8.32	3.08	49.84
33	R	20.73	31.75	13.09	3.37	23.63	6.32	2.22	54.48
34	U	69.13	52.56	66.37	31.95	57.59	23.37	9.57	14.99
35	C	32.14	34.25	20.09	5.35	25.03	5.57	2.31	48.86
36	R	28.74	33.57	16.2	3.25	26.23	4.52	1.80	50.98
37	U	70.32	41.89	63.68	28.90	11.59	17.31	8.04	25.04
38	T	20.41	22.20	13.69	2.16	2.51	2.25	1.14	71.26
39	R	16.78	20.40	9.95	0.87	1.95	1.54	0.73	74.89
40	U	62.36	42.97	56.77	17.03	9.00	10.48	5.76	29.43

*Note:* Ar.P = Arunachal Pradesh, Taw = Tawang, WK = West Kameng, EK = East Kameng, PP = Papum Pare, LS = Lower Subansiri, US = Upper Subansiri, WS = West Siang, ES = East Siang, US = Upper Siang, D = Dibang Valley, L = Lohit, C = Changlang, T = Tirap, R = Rural, U = Urban and R None = None of the Assets.

*Source:* Census of India, 2001 (Arunachal Pradesh).



general, cannot own cultivable land in the State. So the asset value of land to them is nil.) All the districts are not equally favoured with cultivable land. Dibang Valley has the highest endowment with net sown area per family being 6.54 hectares. On the other extreme is Tawang where the average land per ST household is only 0.66 hectare. The high land availability has kept the problem of landlessness in the State to a minimum.

TABLE 10.12

## Net Sown Area (hectare) Per Rural ST Household

District	Net Sown Area (hectare)	No. of ST Households	Col. 2 as % Col. 3
Tawang	4013	6035	0.66
West Kameng	6767	7233	0.94
East Kameng	11755	7995	1.47
Papum Pare	22132	6325	3.50
Lower Subansiri	7754	16030	0.48
Upper Subansiri	12383	7561	1.64
West Siang	26399	11860	2.23
East Siang	20163	8538	2.36
Upper Siang	8265	4922	1.68
Dibang Valley	28999	4432	6.54
Lohit	22921	7616	3.01
Changlang	14252	7259	1.96
Tirap	17827	13204	1.35
<b>Arunachal Pradesh</b>	<b>203630</b>	<b>109010</b>	<b>1.87</b>

Note: Net sown area relates to the Agricultural Census year 1995-96 and household data refers to 1st March 2001.

Source: Statistical Abstract of Arunachal Pradesh, 2005 and Census of India (Arunachal Pradesh, 2001).

## Rural Livelihood

As described in the chapter on employment (Chapter 4), most of the rural people still depend on agricultural activities for their livelihood. This is because of non-farm activities having not yet expanded significantly. True that some activities like construction, transport, trade, etc., have proliferated in accessible areas but in inaccessible areas overwhelming majority of the people still depend on *jhum* cultivation which is low productive providing a bare subsistence.

*Jhum* cultivation is practised where slopy land is abundant but labour is scarce. In spite of high land-labour ratio, the productivity of labour is still low because of low capital intensity in production. There is a high potential in terms of terrace cultivation (Table 9.2 of chapter on Land Potential) as 29.49 per cent of land comes under steep (10-20 degree) category which can be terraced easily for cultivation. This is possible of course, if support is given

to the *jhum* cultivators in terms of extension services and long term loans.

## Rural Technology

In the course of last 60 years the technology frontiers in the rural areas have expanded. But this expansion is limited to the accessible area. In the inaccessible areas the old technology which is in fact the oldest human technology continues to be used. In general, the inaccessible areas remain unelectrified; people practise only slash-and-burn method of cultivation, an agricultural practice which depends almost wholly on natural inputs leading to wide fluctuations in production. This renders livelihood risky. Even today people in remote areas supplement their income through hunting and gathering activities.

In the remotest part of the State, kerosene is still not available and people continue to use wood-burned fire as their source of lighting; in the absence of cash income and market many people continue to use banana leaves as their utensils and bamboo pipes as cooking pots. Thus, there exists a sharp contrast between the accessible and inaccessible areas in the levels of technological configuration of production and different amenities which enhance the quality of life.

## Rural Development Programmes

The Rural Development Department of the State government has implemented programmes that aimed at alleviation of poverty through creation of infrastructure by generating sustainable employment opportunities for the rural poor. The major schemes that have been undertaken by the Rural Development Department for enhancement of income and employment opportunities to the rural poor fall into two categories:

- (a) Centrally Sponsored Schemes (CSS): This includes programmes viz., Swarnajayanti Gram Swarajgar Yojana (SGSY), Jawahar Gram Samridhi Yojana (JGSY), Indira Awaas Yojana (IAY), Employment Assurance Scheme (EAS) and Drought Prone Area Programme (DPAP).
- (b) State Plan Schemes (SPS): This includes programmes viz., Prime Minister Gramodaya Yojana (PMGY), Community Development Programme (CDP) and Minimum Needs Programme (MNP).

These programmes aim at a direct three-pronged attack on poverty i.e.: (i) in terms of creating an income generating assets base for self-employment of the rural poor, (ii) by creating opportunities for wage employment

for the poor, and (iii) area (land) development activities in backward regions like dry-land, rain-fed, drought prone areas. Apart from this, there are also programmes for providing basic infrastructure and basic civic amenities for better quality of life in rural areas run by different concerned departments. This segment of schemes includes programmes related to rural health services, water supply, sanitation, housing, rural roads, etc.

We could get information on three rural development programmes, SGSY, IAY and PMGSY which have been launched in Arunachal Pradesh. Details are reported in Table 10.13 which suggests that most of the rural development programmes in Arunachal Pradesh lack coordination. As no targets have been fixed in many of them, the number appearing in the 'achievement' column is just an indication of some activity. One possible explanation for unpopularity of these programmes could be lack of awareness among the rural households about their existence.

TABLE 10.13  
Performance of Rural Development Programmes

Programme Name	*Month Code	Unit	Total Target	Total Achievement	Achievement as % of Target
2004-05					
SGSY	3	Individual Swarozgaris Assisted (Nos.)	...	1364	...
SGSY	3	Members of SHGs Assisted (Nos.)	...	404	...
SGSY	3	Total Swarozgaris Assisted (Nos.)	...	1768	...
IAY	3	Dwelling Units (Nos.)	4966	4162	83.81
PMGSY	3	Length of roads (in Kms.)	340	...	...
PMGSY	3	No. of roads	64	...	...
2005-06					
SGSY	10	Individual Swarozgaris Assisted (Nos.)	...	186	...
SGSY	10	Members of SHGs Assisted (Nos.)	...	58	...
SGSY	10	Total Swarozgaris Assisted (Nos.)	...	244	...
IAY	10	Dwelling Units (Nos.)	4603	2192	47.62

Note: \*month code refers to the month launched.

Source: Ministry of Rural Development, Government of India.

## Policy Options

It is observed that the rural areas in general and the inaccessible areas in particular are lagging much behind the urban and accessible areas. Various benefits of

development are yet to reach the remote part of the State. The policy needs to be reoriented to include the rural areas especially the remote ones in the process of growth. The following policy options appear pertinent:

- Connectivity needs to be improved.
- Expansion of schooling and health facilities is a *sine qua non* for promotion of inclusive growth.
- Mobile health services in the remote areas through public private initiatives may be explored.
- In order to diversify the livelihood options of the people, marketing network needs to be expanded.
- Agricultural extension services need to be revamped to popularise slope specific new crops.
- In order to expand the credit facilities Self Help Groups need to be popularised and state specific collateral in the form of community/clan as the guarantor of loan may be explored.
- Traditional technical know-how is in the verge of extinction and technology mission should upgrade the exiting indigenous technology in a way that becomes economically viable.
- Small scale food processing industries along with cold storage facilities should be developed particularly in the remote areas. This requires electricity. In order to make electricity available in the remote areas the construction of mini-hydel projects should be encouraged.
- Technology being the source of all dynamism and progress, all-out efforts should be made to improve rural technological configuration of production, distribution, etc.
- Agricultural land is yet to be cadastrally surveyed. In order to promote rural banking, it is essential that all cultivable land should be cadastrally surveyed and records of their ownership duly prepared, so that land can be used as collateral for loans from financial institutions.
- Expansion of the market including financial market in rural areas requires strengthening of the contract-enforcing mechanism.
- Steps should be taken to implement the 73<sup>rd</sup> and 74<sup>th</sup> Amendment of the Constitution to empower the Panchayati Raj Institution to monitor the implementation of various Rural Development Programmes in the State.



## Chapter 11

# Urban Development

### Introduction

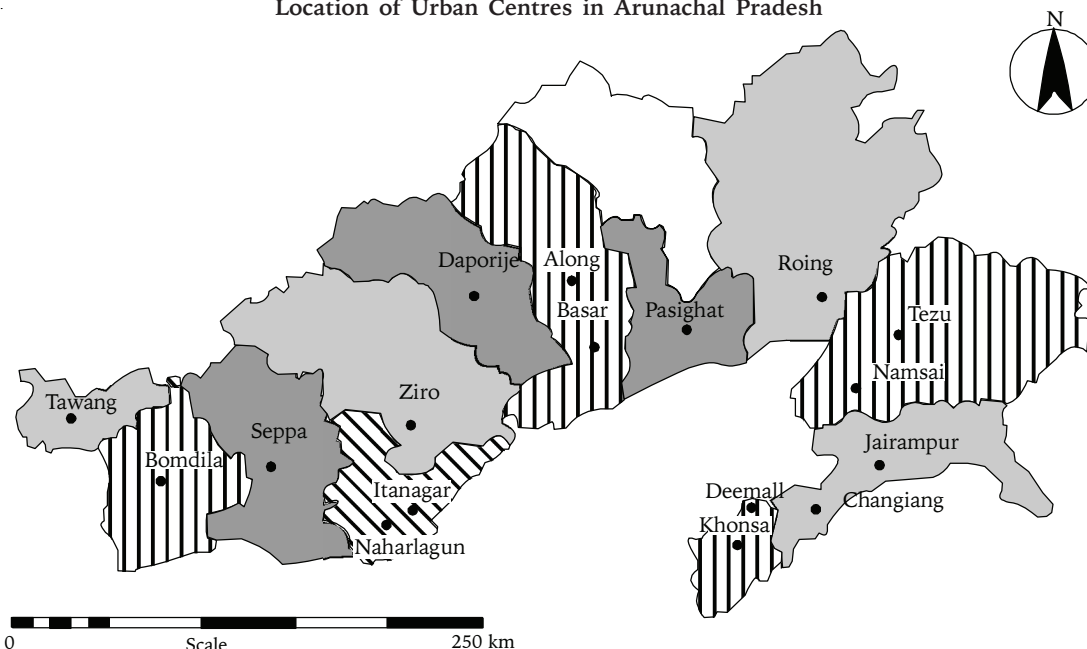
Urbanisation is relatively new in Arunachal Pradesh. It came into the urban map in 1971 census. If we go through the history of urbanisation, we find that in the 1961 census, none of the places in Arunachal Pradesh satisfied the criteria of being declared as a census town and hence the entire State was declared rural. However, four of the districts and sub-divisional headquarters of the State were found possessing distinct urban characteristics in 1971. In consideration of their pronounced urban characteristics and the occupational pattern, it was decided that the districts and sub-divisional headquarters that recorded a population of 2500 persons during 1961 census should be treated as town for the purpose of 1971

census. Accordingly, Bomdila, Pasighat, Tezu and Along were treated as census towns during the 1971 census. Two more towns were added in the 1981 census and they were Old Itanagar (now Naharlagun) and New Itanagar (now Itanagar). In 1991 census, this number increased from six to ten with the addition of four more census towns in the State. These are Ziro, Roing, Namsai and Khonsa. In 2001, the number of census towns rose from 10 to 17 (Figure 11.1). The level of urbanisation increased from 3.70 per cent in 1971 to 20.41 per cent in 2001 (Annexure Table A-11.2) as against all-India average of 27.78 percentage.

All these towns of the State are administrative centres. In fact, Arunachal Pradesh is the only State in North-east

FIGURE 11.1

Location of Urban Centres in Arunachal Pradesh



India which does not have any statutory town (Annexure Table A-11.2). In most cases, before the establishment of administrative centres, these places were full of jungle and human settlement was hardly found in them. The Town Survey Report on Tezu, undertaken during 1981 census, narrated the growth of the town in the following words: "Development and growth of Tezu started by government almost from '0' point because, excluding a very few local houses, the site of the present township was full of jungle before the establishment of the present town" (Census of India, 1981, Town Survey Report, Tezu).

Thus, though information regarding the growth of different townships is scarce, on the basis of available accounts it may safely be said that the growth of urban settlements in Arunachal Pradesh is not an outcome of socio-economic development process. Rather, it is the result of conscious administrative efforts. The year of opening of administrative centres and the early administrative status of the entire urban centres up to 1991 census are shown in Annexure Table A-11.1.

### Trends in Urbanisation across the Districts

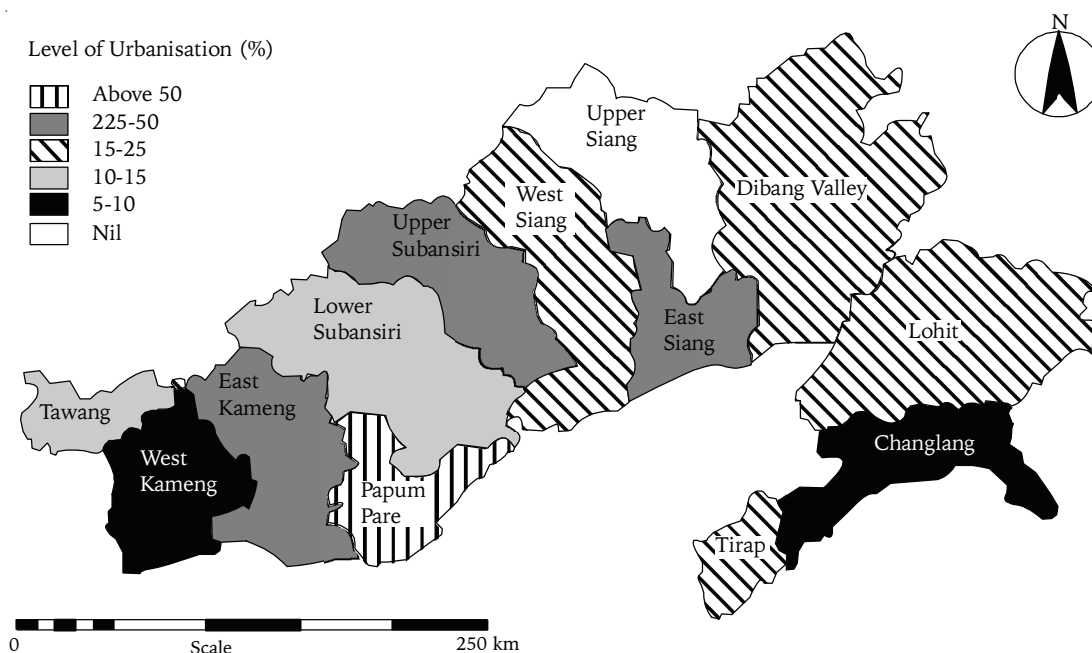
For the better understanding of the process of urbanisation across the State, it becomes pertinent to study the levels of urbanisation in different districts.

Figure 11.2 reveals some important points. First, towns are not uniformly distributed across the districts. For example, the level of urbanisation in Papum Pare district is more than 50 per cent. It is interesting to note that Papum Pare is one of the five districts in North-east India where more than 50 per cent of the population of the district lives in urban centres. Secondly, the level of urbanisation is more in the districts of the foothills adjoining Assam as compared to the districts of northern and eastern border areas (Figure 11.2). In fact, three districts on northern and eastern borders like Upper Siang, Anjaw and Kurung Kumey (newly created) are still without even a single urban centre. The coefficient of variation in the level of urbanisation across the districts has been estimated to be 66.32 per cent, which is high.

### Size Class of Towns

Arunachal Pradesh did not have class I town (city), and class II and class III towns (Medium town) till 1991. In 2001, only three urban centres i.e., Itanagar, Naharlagun and Pasighat were included as class III towns i.e., medium towns. However, 37.66 per cent of total urban population of the State was concentrated in three medium towns (Table 11.1). On the other hand, only 19.12 per cent of total urban population lived in seven class V and VI categories of towns.

FIGURE 11.2  
Level of Urbanisation in Different Districts, 2001



**TABLE 11.1**  
**Class-wise Distribution of Towns and their Population: 2001**

Sl. No.	Class of Town	Number of Town	Per cent Share	Per cent Share of Urban Population	Percentage of Decadal Growth of Population
1.	Class I(1,00,000 above)	0	0	0	-
2.	Class II(50,000-99,999)	0	0	0	-
3.	Class III(20,000-49,999)	3	17.65	37.66	-
4.	Class IV(10,000-19,999)	7	41.18	43.23	29.9
5.	Class V(5,000-9,999)	5	29.41	15.40	6.23
6.	Class VII(less than 5,000)	2	11.76	3.72	-

Source: Census of India, 2001, Paper 2 of Arunachal Pradesh.

### BOX 11.1

#### Determinants of Inter-district Variation in Urbanisation

The regression of level urbanisation (U) on district per capita income (Y), road density (R), percentage contribution of manufacturing sector to district domestic product (M), and percentage of workers engaged in non-agricultural occupation (W) is as follows:

$$U = 28.08 - 0.27Y + 0.18R - 0.15M + 0.35W$$

(3.8)    (1.2)    (0.89)    (0.7)    (2.6\*)

$$R^2 = 0.73 \quad \text{Adj}R^2 = 0.54 \quad n = 12$$

\*significant at 0.05 level of significance.

The figures in parenthesis are 't' values,  $R^2$  and  $\text{Adj}R^2$  values are given and n is the number of observations (districts). The explanatory variables have the expected sign except per capita income and percentage contribution of manufacturing sector to district domestic product but these two variables are not significant. There is only one variable i.e., percentage of workers engaged in non-agricultural occupation i.e., basically in the services sector which has the primacy in the determination of inter-district variation of urbanisation.

### Slow Internalisation of Externally Grafted Urban Centres

One of the important features of the growth of urban settlements in Arunachal Pradesh is the dominant role of the inter-State migration rather than intra-State rural-urban migration. When the process of urbanisation is the concomitant outcome of internal social dynamics, intra-State rural-urban migration is seen to be the major phenomenon that leads to the growth of urban centres. But in the case of Arunachal Pradesh such rural-urban migration played an insignificant role in the early phase of the growth of the urban settlements. The details of urban migrants based on the 1991 census are shown in Annexure Table A-11.5.

Annexure Table A-11.5 reveals that migration was an important component of the urban population of the State even in 1991. It was comparatively low in the existing towns like Bomdila in West Kameng (42.39 per cent), Pasighat in East Siang (34.32 per cent) and comparatively high in new towns like Naharlagun, Itanagar and Ziro in Lower Subansiri (66.10 per cent). The only exception is Along (59.03 per cent) in West Siang district. The table also shows that inter-State migration component was highest in Tezu in Lohit (69.97 per cent) in 1991 and also quite high in other towns of Arunachal Pradesh where urbanisation has been affected by administrative expansion. It is also noteworthy that while the percentage of scheduled tribe population in Lohit and Dibang Valley district was 38.18 per cent and 46.49 per cent respectively in 2001, but their percentage in Tezu and Namsai (Lohit) and Roing (Dibang Valley) township, accounts for only 26.42 and 19.79 percentage respectively (Annexure Table A-11.4). Similar is the case of the other districts having urban settlements. However, there is nothing to be apprehensive about because the percentage of scheduled tribes in urban population of Arunachal Pradesh increased from 17.64 in 1971 to 24.72 in 1981, and finally to 43.39 in 2001.

### Socio-economic Aspects of Urbanisation

This sub-section analyses the relationship between a district level of urbanisation ( $X_1$ ) and its developmental indicators. These indicators can be broadly divided into the following subsets:

#### 1. Economic

- (a) Per capita income of the district ( $X_2$ ).
- (b) Percentage of households below the poverty line (estimated for HDR for Arunachal Pradesh, 2005) ( $X_3$ ).
- (c) Yield of major agricultural crops ( $X_4$ ).
- (d) Number of functioning small-scale industrial units ( $X_5$ ).
- (e) Percentage share of district in terms of annual production of small scale industries ( $X_6$ ).

#### 2. Infrastructural

- (a) Road length per 100 sq km ( $X_7$ ).
- (b) Percentage of villages having connectivity status of roads ( $X_8$ ).
- (c) Percentages of villages electrified to total villages ( $X_9$ ).

- (d) Number of banks per 10,000 population ( $X_{10}$ ).
- (e) Number of hospital beds per 10,000 population ( $X_{11}$ ).
- (f) Number of schools per 10,000 population ( $X_{12}$ ).

### 3. Socio-demographic

- (a) Literacy rate ( $X_{13}$ ).
- (b) Sex ratio ( $X_{14}$ ).
- (c) Percentage of non-scheduled tribe population (a proxy indicator for migrant population) ( $X_{15}$ ).

The correlation matrix (Annexure Table A-11.6) reflects that only the hospital beds have a positive and significant relationship with urbanisation. Though the level of urbanisation exhibits a positive relationship with yield rate of major crops, small scale industries, road density, number of bank branches, number of schools, literacy rate and sex ratio, the t-values are not significant. It is interesting to note that the level of urbanisation is negatively related (although not significant) with the district per capita income. This supports our hypothesis that the process of urbanisation is not a result of economic development but it is an induced one.

### Urban Infrastructure and Basic Services: A Perspective

The development of urban infrastructure has received much attention from the planners and policymakers. In this section an attempt is made to examine the urban infrastructure and basic services across the districts in the State.

Access to electricity is a basic infrastructure and basic amenity today. According to census data 2001, 89.42 per cent of the urban households of the State were electrified which is marginally ahead of the country with 89.14 per cent. However, there were variations among the districts. For example, Lower Subansiri (98.72 per cent) and Papum Pare (97.07 per cent) had the highest coverage of electricity in urban areas while Lohit had the lowest (73.77 per cent).

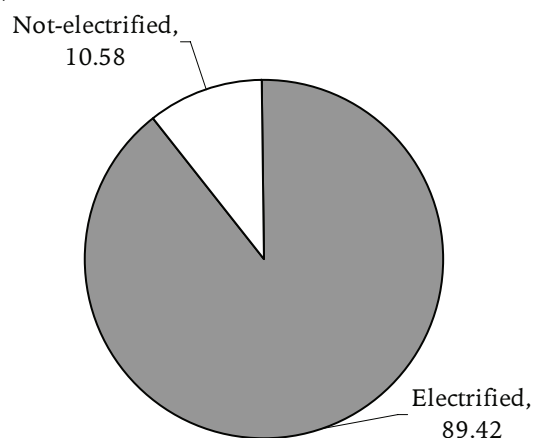
In telephone connectivity, the urban areas of the State are ahead of the country. For example, as high as 26.5 per cent of all urban households in the State have telephone connectivity as compared with 23 per cent in India. However, there are substantial inter-district variations. Telephone connectivity is the lowest in East Kameng with only 13.56 per cent of the urban households having this facility. On the other hand, Papum Pare the most

urbanised district has the highest telephone connectivity with 40.70 per cent.

Regarding the financial infrastructure the only information available is the number of households having bank accounts. In urban banking, Arunachal Pradesh is far ahead of the national average. As high as 67.0 per cent of all urban households in the State have bank accounts as compared with 49.5 per cent in urban India. It is remarkable that Arunachal Pradesh's proportion of urban households having bank accounts is the fifth highest in India.

FIGURE 11.3

Percentages of Households having Access to Electricity



The availability of drinking water is another indicator of infrastructural development. The urban households in Arunachal Pradesh use multiple sources like tap/pipe, tubewell, well, pond, and other sources (including spring and river water). According to 2001 census, 83.10 per cent of the urban households had piped or tapped water as the dominant source, 12.23 per cent reported using tubewells and wells and only 4.67 per cent used other sources of drinking water like springs, rivers, etc. (Figure 11.4).

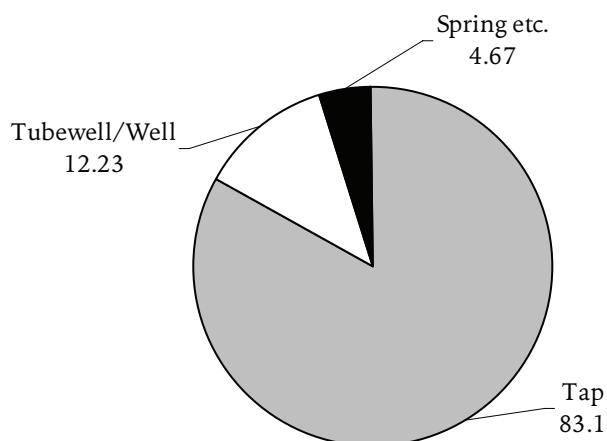
The urban centres of the State have poor drainage and sanitation facilities. In 2001, only 12.90 per cent of the urban households had closed drainage, 50.35 per cent open drainage and as high as 36.75 per cent had no drainage facilities (Figure 11.5).

As far as the different types of sanitation are concerned only 28.06 per cent of urban households had access to water closet toilets. Rest of the urban households used pit latrine (32.08 per cent) and others (26.82 per cent) which were not hygienic at all. Around 13.04 percentage of

urban households had no latrine facility (Annexure Table A-11.11).

FIGURE 11.4

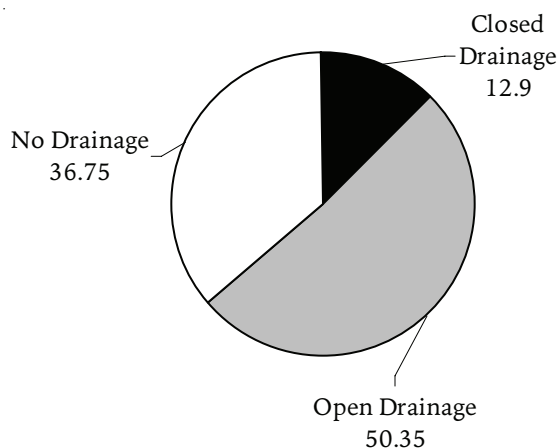
Percentage of Urban Households with Sources of Drinking Water



Source: Census of India, 2001, Tables of Houses, Household Amenities and Assets.

FIGURE 11.5

Percentage of Urban Households with Different Types of Drainage



Source: Census of India, 2001, Tables of Houses, Household Amenities and Assets.

The level of urban basic amenities like electricity, access to tap water, drainage facilities are positively correlated with urbanisation, although the values are statistically insignificant (Annexure Table A-11.12). Thus, it may not be possible to argue that more urbanised

districts provide basic amenities to a larger percentage of urban population.

### Issues of Urban Administration and Planning

Arunachal Pradesh has a unique urban administrative system. This is the only State in North-east India which does not have corporations or municipalities. There are several departments of government which are responsible for urban development in the State. These include Directorate of Urban Development and Housing, Departments of Public Health Engineering, Power, Public Works Department, etc. However, the Directorate of Urban Development and Housing is a nodal agency for the development of urban areas. Hence, in this section an attempt is made to examine the activities of the Directorate of Urban Development and Housing.

With the creation of a full fledged State of Arunachal Pradesh, the town planning unit was set up under the office of Chief Engineer, Arunachal Pradesh Public Works Department, Itanagar. A separate directorate of Urban Development and Housing was established in 1996. The Directorate was responsible for the preparation of master plans, action plans, for the urban areas in the State, preparation of designs including building designs, interior décor, plans for government buildings, traffic and transportation plans, and implementation of other developmental schemes. The Directorate was also implementing developmental schemes like infrastructural development and centrally sponsored schemes like (i) Swarna Jayanti Shahari Rozgar Yojana (SJSRY), (ii) Nehru Rozgar Yojana (NRY), (iii) National Urban Information Scheme (NUIS), (iv) National Slum Development Programme (NSDP), (v) Integrated Development of Small and Medium Towns (IDSMT). However, it was observed that these schemes could not be implemented satisfactorily as the scope and nature of the schemes were different from the schemes so far being implemented by the Directorate. The operational guidelines of these schemes require a different organisational set-up, working flexibility and work culture. Further, these schemes require participation of local voluntary agencies, social workers, etc., who are already engaged in the programmes for the upliftment of the urban poor.

The urban development sector in the State has not received the priority it deserves. The outlay on urban



development in the Ninth and Tenth Five Year Plans is shown in Table 11.2.

**TABLE 11.2**  
**State Plan Outlay in Urban Development Sector (in Rs. lakh)**

<i>Sector</i>	<i>Ninth Five Year Plan Outlay</i>	<i>Ninth Five Year Plan Actual Expenditure</i>	<i>Tenth Five Year Plan Outlay</i>
Urban Development	3710 (1.04)	1239.94	10,500 (2.70)

*Note:* Figures in the bracket indicate percentage to total outlay.

*Source:* Tenth Five Year Plan (2002-2007), Government of Arunachal Pradesh.

Table 11.2 shows that the urban development sector got only 1.04 per cent of total outlay during the Ninth Five Year Plan but it has slightly increased to 2.70 per cent during the Tenth Five Year Plan. However, this is nowhere near 8 per cent of the outlay recommended by the National Commission on Urbanisation. At the same time, it is surprising to note that only 33.42 per cent was spent on urban development out of the total fund allotted during the Ninth Five Year Plan.

### Policy Implications

Arunachal Pradesh had, no doubt, a late start in urbanisation process, but within two decades, it had overtaken Assam, which has a long history of urbanisation. The growth rate of urbanisation is high (101.29 per cent in 1991-2001). This fairly rapid growth of urban population deserves serious attention of urban planners.

- Arunachal Pradesh is basically a hilly State with different environmental set up and geomorphic characteristics. Hence, the State may not support the excessive concentration of urban population in its big towns and also the hilly terrain may not permit the lateral expansion of big towns as in the plains. Hence, it is suggested that instead of population conglomerating in one or two large towns, it is better to have more small and medium towns in different districts of the State.
- It is found that almost all the towns in the State are not planned and they grew as administrative centres only. The small towns with high potentialities can be developed in a planned way to accommodate the rising urban population of the State. The small towns are nothing but the overgrown villages that have acquired some features of urban environment.

Such urban centres need to be taken care of, as planned growth becomes necessary in view of the environmental concerns in the long run.

- It is observed that there is a mushroom growth of settlements in some urban areas particularly in Itanagar and Naharlagun where multistoried concrete buildings are coming up without following building codes and that too on unconsolidated to loose terrace material. The area falls under very high risk zone of earthquake and landslide. This needs serious attention of the urban planners. There is a need for setting up an umbrella body which can strictly check undesirable construction. In fact, there should be strict vigilance on land allotment so that the hills should not be demolished for the personal benefits of few people. It should be noted that such activities will create environmental problems in the near future and will have an adverse impact on the livelihoods of the common people.
- The other environmental issues associated with urbanisation are poor urban waste management. It is estimated that the total urban solid waste management is accumulated around 230 tonnes per day (State Development Report, Chapter 15). Although the amount may not be alarming, it needs special attention for its proper disposal. Therefore, there is need to construct treatment and disposal facilities for urban solid waste as well as biomedical waste particularly in Itanagar, Naharlagun and Pasighat towns.
- At present urban development schemes are implemented by and large on ad hoc basis. With growing urbanisation, it is necessary that a comprehensive policy on the subject should be formulated for guidance of various agencies involved in the system. The policy may spell out the framework for providing economic, social and physical inputs for proper planning and development of urban centres, the hierarchy of the urban centres, their assigned functions and their linkages with the hinter land. Therefore, the urban management structure must be streamlined by abolishing the system of multiplicity of authorities dealing with urban planning and execution.
- There is another aspect of urbanisation demanding proper planning. With urbanisation, there has invariably been the emergence and expansion of the informal sector. The size of the sector may not be



high in the State but it is expanding. In fact, a significant percentage of workers are engaged in construction sector, hotels and restaurants, vending fruit and vegetables, and small retailing. In the overall planning of urban development due importance should be given to make institutional arrangements for freeing the informal sector from unequal bargaining position.

- No plan of urban development can be successfully carried out without mobilisation of adequate resources. In this respect, urban development gets the major share of its funds from the State which heavily depends on the Centre for grants-in-aid. The State also should raise resources locally for urban development and management. There is a need for setting up the urban municipalities in the State. Recently the Government of Arunachal Pradesh has decided to establish municipality in two towns namely, Itanagar and Pasighat. The

possibility of generating resources locally will depend on the participation of the local people in planning and execution of schemes. This can be ensured by elected self-governing bodies.

- Even at the State level a broad generalised development strategy may not help in managing urbanisation. A more conscious assessment of growth at district level and its spatial configuration are essential (Sivaramakrishnan *et al*, 2005). This makes district planning crucial. The 74<sup>th</sup> Amendment has specifically mandated District Planning Committees (DPCs) to address issues of common interest to municipalities including spatial planning, integrated development of infrastructure and environmental conservation. These committees are required to integrate urban and rural planning and facilitate the development of regional infrastructure. Hence, it is necessary to constitute DPCs in the State for proper rural-urban integration.

ANNEXURE TABLE A-11.1

**Year of Opening of Administrative Centres  
and Early Administrative Status of the Towns  
in Arunachal Pradesh, 1991**

Name of the Town	Year of Opening of Administrative Centre	Administrative Status
Bomdila	1953	Divisional Head Quarters of Kameng Frontier Division
Ziro	1952	Divisional Head Quarters of Subansiri Frontier Division
Along	1948	Divisional Head Quarters of Siang Frontier Division
Pasighat	1911	Sub-divisional Head Quarters of Pasighat Subdivision in Siang Frontier Division
Tezu	1952	Divisional Head Quarters of Lohit Frontier Division
Namsai	1953	Sub-divisional Head Quarters of Namsai Sub division in Lohit Frontier Division
Khonsa	1954	Divisional Head Quarters of Tirap Frontier Division
Roing	1951	Sub-divisional Head Quarters of Anini Sub Division in Lohit Frontier Division
Old Itanagar	1974	Old Capital Complex
New Itanagar	1978	New Capital Complex

Source: District Gazetteers, Government of Arunachal Pradesh.

ANNEXURE TABLE A-11.2

**Number of Towns and Percentage of Urban  
Population in North-east India, 2001**

Sl.No.	States	Statutory Town	Census	Total	% of Urban Population
01	Arunachal Pradesh	00	17	17	20.41
02	Assam	80	45	125	12.72
03	Manipur	28	05	33	23.88
04	Meghalaya	10	06	16	19.63
05	Mizoram	01	21	22	49.50
06	Nagaland	08	01	09	17.74
07	Sikkim	08	01	09	11.10
08	Tripura	13	10	23	17.02
09	North-east	143	106	249	21.50

Source: Census of India, 2001, Paper 2 of Arunachal Pradesh.

ANNEXURE TABLE A-11.3

**Trends in Urbanisation of Arunachal Pradesh, 1971-2001**

Year	Total Urban Population	Percentage of Urban Population	Decennial Growth Rate(%)	Annual Exponential Growth Rate (%)
1971	17,288	3.70	-	-
1981	41,428	6.56	139.63	9.13
1991	1,10,628	12.80	167.04	10.32
2001	2,22,688	20.41	101.29	7.24

Source: Census of India, 2001, Paper 2 of Arunachal Pradesh.

ANNEXURE TABLE A-11.4

**Distribution of Scheduled Tribe Population  
in Urban Centres of Arunachal Pradesh, 2001**

District	% of ST Population of the District	% of ST Population in Urban Centres of the District
Tawang	74.99	29.20
West Kameng	49.53	43.09
East Kameng	86.72	70.95
Papum Pare	56.56	44.03
Lower Subansiri	90.09	68.06
Upper Subansiri	78.21	74.60
West Siang	81.72	50.63
East Siang	69.13	34.68
Lohit	38.18	26.42
Dibang Valley	46.49	19.79
Changlang	36.16	26.36
Tirap	83.76	38.35

Source: Census of India, 2001, Paper 2 of Arunachal Pradesh.

ANNEXURE TABLE A-11.5

**Percentage Distribution of Birth Place Urban  
Migrants in Arunachal Pradesh, 1991**

Sl. No.	State/Districts	Migrants as Per cent of Urban Population	Intra- district	Inter- district	Inter- state	International
1.	West Kameng	42.39	17.65	23.57	44.94	13.85
2.	Lower Subansiri	66.10	21.71	13.17	61.88	3.24
3.	West Siang	59.03	34.69	11.49	50.24	3.58
4.	East Siang	34.32	19.34	14.07	58.67	7.92
5.	Lohit	55.79	13.39	10.81	69.97	5.85
6.	Tirap	56.02	22.03	18.34	53.14	6.49
7.	Arunachal Pradesh	57.48	20.61	13.61	60.65	5.13

Note: Those districts which do not have urban centres are not included.

Source: Census of India, 1991, Series 3- Arunachal Pradesh, Migration Table, Volume I.

ANNEXURE TABLE A-11.6  
Interdependence between Urbanisation and Indicators of Socio-economic Development at District Level in Arunachal Pradesh

	$X_1$	$X_2$	$X_3$	$X_4$	$X_5$	$X_6$	$X_7$	$X_8$	$X_9$	$X_{10}$	$X_{11}$	$X_{12}$	$X_{13}$	$X_{14}$	$X_{15}$
$X_1$	1	-0.14	-0.416	0.146	0.554	0.409	0.032	-0.035	-0.336	0.35	0.814(**)	-0.141	0.498	0.218	-0.094
$X_2$	-0.14	1	-0.452	0.25	0.191	-0.046	-0.071	0.298	0.027	0.496	0.25	-0.143	0.338	-0.425	0.319
$X_3$	-0.416	-0.452	1	-0.392	-0.215	-0.037	-0.103	0.039	-0.142	-0.746(**)	-0.686(*)	-0.054	-0.285	-0.207	0.306
$X_4$	0.146	0.25	-0.392	1	0.459	0.494	-0.069	0.389	0.027	0.244	0.199	0.022	0.156	0.327	0.113
$X_5$	0.554	0.191	-0.215	0.459	1	0.644(*)	0.056	0.583(*)	-0.081	0.422	0.413	-0.382	.739(**)	-0.141	0.436
$X_6$	0.409	-0.046	-0.037	0.494	0.644(*)	1	0.219	0.700(*)	0.093	-0.02	0.215	-0.551	0.346	-0.042	0.431
$X_7$	0.032	-0.071	-0.103	-0.069	0.056	0.219	1	0.246	0.660(*)	0.365	-0.206	0.209	-0.26	0.15	-0.235
$X_8$	-0.035	0.298	0.039	0.389	0.583(*)	0.700(*)	0.246	1	0.259	0.069	-0.006	-0.391	0.449	-0.393	0.435
$X_9$	-0.336	0.027	-0.142	0.027	-0.081	0.093	0.660(*)	0.259	1	0.395	-0.413	-0.116	-0.103	-0.122	0.053
$X_{10}$	0.35	0.496	-0.746(**)	0.244	0.422	-0.02	0.365	0.069	0.395	1	0.46	0.086	0.46	-0.08	-0.005
$X_{11}$	0.814(**)	0.25	-0.686(*)	0.199	0.413	0.215	-0.206	-0.006	-0.413	0.46	1	-0.068	0.603(*)	0.012	-0.105
$X_{12}$	-0.141	-0.143	-0.054	0.022	-0.382	-0.551	0.209	-0.391	-0.116	0.086	-0.068	1	-0.492	0.476	-0.681(*)
$X_{13}$	0.498	0.338	-0.285	0.156	.739(**)	0.346	-0.26	0.449	-0.103	0.46	.603(*)	-0.492	1	-0.572	0.525
$X_{14}$	0.218	-0.425	-0.207	0.327	-0.141	-0.042	0.15	-0.393	-0.122	-0.08	0.012	0.476	-0.572	1	-0.721(**)
$X_{15}$	-0.094	0.319	0.306	0.113	0.436	0.431	-0.235	0.435	0.053	-0.005	-0.105	-0.681(*)	0.525	0.721(**)	1

Note: \*\* Significant at the 0.01 level \* Significant at the 0.05 level.

Source: Computed by the author.

ANNEXURE TABLE A-11.7

## Percentage of Urban Households having Access to Electricity

<i>Districts</i>	<i>Electricity (%)</i>
Tawang	96.44
West Kameng	95.84
East Kameng	82.81
Papum Pare	97.07
Lower Subansiri	98.72
Upper Subansiri	96.00
West Siang	95.42
East Siang	76.34
Dibang Valley	90.51
Lohit	73.77
Changlang	85.45
Tirap	85.45
Arunachal Pradesh	89.42

Source: Census of India, 2001, Tables of Houses, Household Amenities and Assets.

ANNEXURE TABLE A-11.9

## Percentage of Households having Different Sources of Water

<i>Districts</i>	<i>Tap</i>	<i>Tubewell/Well/Pond</i>	<i>River/Spring etc.</i>
Tawang	93.79	3.14	3.06
West Kameng	96.45	0.99	2.55
East Kameng	82.95	1.01	16.04
Papum Pare	85.56	7.14	7.30
Lower Subansiri	95.15	4.63	0.21
Upper Subansiri	97.66	1.36	0.97
West Siang	88.28	11.10	0.61
East Siang	72.15	26.61	1.24
Dibang Valley	99.80	00	0.19
Lohit	61.80	33.08	5.13
Changlang	90.55	5.97	3.48
Tirap	69.74	24.82	5.43
Arunachal Pradesh	83.10	12.32	4.58

Source: Census of India, 2001, Tables of Houses, Household Amenities and Assets.

ANNEXURE TABLE A-11.8

## Percentage of Urban Households having Banking and Telephone Facilities

<i>Districts</i>	<i>Banking</i>	<i>Telephone</i>
Tawang	84.99	47.68
West Kameng	72.16	30.17
East Kameng	62.75	13.56
Papum Pare	68.75	40.70
Lower Subansiri	61.82	22.53
Upper Subansiri	63.58	21.33
West Siang	77.60	23.44
East Siang	67.13	18.77
Dibang Valley	73.12	19.86
Lohit	57.29	19.17
Changlang	63.91	20.03
Tirap	63.74	17.37
Arunachal Pradesh	67.00	26.53

Source: Census of India, 2001, Tables of Houses, Household Amenities and Assets.

ANNEXURE TABLE A-11.10

## Percentage of Urban Households having Different Types of Drainage

<i>Districts</i>	<i>Closed Drainage</i>	<i>Open Drainage</i>	<i>No Drainage</i>
Tawang	18.70	70.78	10.53
West Kameng	12.42	74.71	12.87
East Kameng	16.60	35.99	47.41
Papum Pare	18.09	51.33	30.58
Lower Subansiri	29.91	62.17	7.91
Upper Subansiri	8.19	66.15	25.66
West Siang	14.38	50.41	35.20
East Siang	9.66	48.06	42.27
Dibang Valley	2.82	52.58	44.60
Lohit	5.64	26.28	68.07
Changlang	1.70	51.81	46.48
Tirap	8.14	57.84	34.02
Arunachal Pradesh	12.90	50.35	36.75

Source: Census of India, 2001, Tables of Houses, Household Amenities and Assets.

**TABLE A-11.11**  
**Percentages of Households having**  
**Different Types of Sanitation**

<i>Districts</i>	<i>Pit Latrine</i>	<i>Water Closet</i>	<i>Others</i>	<i>No Latrine</i>
Tawang	15.08	67.80	13.20	11.78
West Kameng	12.64	22.74	49.47	15.14
East Kameng	18.52	24.63	17.05	39.80
Papum Pare	26.65	25.40	36.42	11.52
Lower Subansiri	31.05	30.98	34.15	3.81
Upper Subansiri	33.27	14.93	39.61	12.20
West Siang	27.37	25.37	22.45	14.20
East Siang	45.62	15.44	31.66	7.28
Dibang Valley	22.20	54.58	10.66	12.56
Lohit	45.82	29.83	12.30	12.04
Changlang	34.62	41.00	98.26	14.55
Tirap	33.65	31.48	19.63	15.24
Arunachal Pradesh	32.08	28.06	26.82	13.04

*Source:* Census of India, 2001, Tables of Houses, Household Amenities and Assets.

**TABLE A-11.12**  
**Interdependence between Level of Urbanisation**  
**and Selected Indicators of Basic Urban Amenities**

	<i>Var.1</i>	<i>Var.2</i>	<i>Var.3</i>	<i>Var.4</i>
Var.1	1.000	0.277	0.220	0.081
Var.2	0.277	1.000	0.809 (**)	0.531
Var.3	0.220	0.809 (**)	1.000	0.224
Var.4	0.081	0.531	0.224	1.000

*Note:* \*\* Significant at the 0.01 level

Variable 1: Level of Urbanisation.

Variable 2: Percentage of Urban Households with Access to Electricity.

Variable 3: Percentage of Urban Households with Tap Water.

Variable 4: Percentage of Urban Households with Closed Drainage.

**ANNEXURE TABLE A-11.13**  
**Annual Expenditure on Urban Development**  
**in Arunachal Pradesh**

(in '000 Rs.)

<i>Year</i>	<i>Plan</i>	<i>Non-plan</i>	<i>Total</i>	<i>% to Total Expenditure</i>
1999-2000	24571	2200	26771	0.53
2000-01	26397	2389	28786	0.55
2001-02	30181	2803	32984	0.53
2002-03	36915	2369	39284	0.65
2003-04	44464	4047	48511	0.71

*Source:* Directorate of Urban Development and Housing, Government of Arunachal Pradesh.



## Chapter 12

# Development of Agriculture and Allied Sector

### Introduction

Agriculture is the predominant sector in Arunachal Pradesh, accounting for 27 per cent of the NSDP (in 2003-04) and as per 2001 census, nearly 63 per cent of total workers were engaged in agricultural activities. Given the hilly topography and diversity in farming systems in the State, modernisation of agriculture, in a way that enhances productivity and raises the earnings of those dependent on agriculture, remains one of the fundamental challenges.

### Changing Property Rights Structures

The property rights in land in Arunachal Pradesh have undergone substantial changes over the last half-century. The traditional form of land ownership was community-based, although animals, tools and implements were privately owned. Most of the villages had some institutional mechanism like village councils to manage and safeguard property rights in land and forest. While in some areas the institution of chieftainship was well developed and the individuals derived their rights of ownership from village chief, in many areas the village council, consisting of all adult male members was the basic institution of decision making, conflict resolution and collective action<sup>1</sup> (Mishra, 1979; Das, 1995). The shifting cultivation was based upon cooperation, resource pooling, and mutual insurance mechanisms. However, because of internal dynamics of the system such as non-coverage of covariant risks, absence of fairness in the distribution of agricultural land in terms of quality, lack of

sufficient surplus generation and demographic changes as well as the mutually reinforcing interventions by the State and market forces, private property rights over land have emerged in many parts of the State (Mishra, 2001; Roy and Kuri, 2001:53-59).

Although individualisation of ownership rights over land is the most widely noticed dimension of the transitional phase in Arunachal Pradesh, it is important to note that the communal property rights continue to have diverse context-specific operational meanings. For many years, the Jhum Land Regulations, 1947-48, which did recognise, to some extent, the rights of the tribes practising shifting cultivation remained the only legal framework governing access to cultivable land. Recently, the Arunachal Pradesh (Land Settlement and Records) Act, 2000 has been passed with a view to conducting the cadastral survey of land in the State. The land under shifting cultivation, generally described as under ownerships by the whole village community and over which individuals are supposed to have use rights alone, are owned by specific clans and by individual households<sup>2</sup> (Bordoloi, 1998).

### Land Use Patterns

Arunachal Pradesh is a hilly state with a very low population density. Of the total geographical area of the State around five per cent is available for cultivation. The scope for further expansion of land under cultivation is not yet exhausted, however, bringing new areas under cultivation is costlier in the State, and the scope for

1. The village chiefs had special privileges such as shares from produce, free labour-services of the villagers etc. Surplus generated through this mechanism were generally redistributed through rituals, feasts and festivals (Mishra, 1979).

2. On the basis of a micro-study, Mishra (2002a, 2002b) has reported that in case of privately owned land the rights of use, occupancy and inheritance are generally enjoyed by the owners, but the right to transfer is often conditional. In some cases 'limited transfer rights' (viz., temporary transfer rights under mortgage, use rights without inheritance rights etc.) and 'preferential transfer rights' (viz., transfer within family, clan or tribe) were found, along with unconditional rights to alienate. The specificity of the emerging private property regime lies not only in its institutional basis but also in the changing dimensions of collective ownership.

expansion of land under cultivation in some areas is rather limited. Table 12.1 provides the pattern of land use in the State. It is clear that the net area sown has been increasing as a percentage of total reported area. The shifting cultivation has been undergoing different kinds of changes in response to the emerging opportunities and constraints. First, there has been a perceptible decline in the area under shifting cultivation, although there are conflicting estimates of the area under shifting cultivation in the State. Second, the *jhum* cultivation has changed in terms of the time span of the *jhum* cycle, crop mixes and input use (see Box 12.1).

TABLE 12.1  
Changing Land Use Pattern in Arunachal Pradesh: 1970-71 to 2000-01  
(as Percentage to Total Area under Operation)

Year	Net Area Sown	Current Fallow	Other Uncultivated Land	Fallow Land other than Current Fallow	Culturable Waste Land	Land not Available for Cultivation
1970-71	23.56	10.55	3.92	24.08	30.41	7.48
1976-77	28.29	6.26	12.60	26.61	21.37	4.86
1980-81	35.22	6.89	10.39	17.05	14.18	16.27
1985-86	43.38	7.18	8.32	14.24	12.91	13.98
1990-91	47.33	8.13	12.70	10.24	9.43	12.16
1995-96	47.76	8.85	11.62	13.68	10.66	7.43
2000-01	50.86	5.83	11.74	16.27	7.07	8.23

Source: Agricultural Census of Arunachal Pradesh, various years.

### BOX 12.1

#### *Jhum* Cultivation in Arunachal Pradesh

Shifting cultivation, or *jhum*, is the traditional cultivation system of the indigenous people in many parts of Arunachal Pradesh. The Forest Survey of India data suggest that during 1987-1997, 0.23 million ha of area in Arunachal Pradesh has been affected by shifting cultivation. According to the State of India's Forests reports during the 1990s, shifting cultivation has been the major cause of forest degradation in Arunachal Pradesh. For many years the government agencies have actively pursued the policy of expansion of permanent cultivation and have discouraged shifting cultivation. However, shifting cultivation system provides livelihoods to a large section of the rural population of the State. Many of the *jhumias* still reside in remote and relatively underdeveloped pockets of the State. Pursuing them to leave their traditional way of living has not been easy for the government. A recent body of research, has however,

questioned the traditionally held opinion that *jhum* cultivation is a wasteful and inefficient method of cultivation. Linking the crop diversity to the cultivation practices, researchers point out that the *jhum* cultivation systems typically involve mixed and sequential cropping. The *jhum* farmers in Arunachal Pradesh raise between 8 to 35 crops on a small plot of 2 to 2.5 ha with simultaneous sowing and sequential harvesting. It is thus considered as 'a highly intensive system of farming in harmony with the environment'. With the shortening of the *jhum* cycle to 3-10 years, the crop-mixture and cropping pattern has also changed. As a result of high population pressure, particularly in urban vicinities, burning of slash is dispensed with, which has led to rotational/sedentary system of cultivation. A shift towards certain crop-species, which are more appropriate under reduced fertility status of the soil, signifies the response of the forest farmers to ecological stress (Ramakrishnan, 1992). Researchers point out that the redevelopment of *jhum* cultivation in the north-eastern region could be possible through inter-tribe and inter-regional transfer of technology and cropping practices, maintenance of a *jhum* cycle of minimum 10 years, which is found to be critical for sustainability; improvement of the nitrogen economy of *jhum* at the cropping and fallow phases by nitrogen-fixing legumes and non-legumes and accelerated restoration of degraded land (Ramakrishnan, 1992).

The emergence of private property rights over land is often preceded by adoption of permanent cultivation, which in turn might have followed a gradual shortening of the *jhum* cycle or abandonment of *jhum* cultivation. Thus, the increasing significance of private property rights over cultivable land could be inferred from Figure 12.1, where the share of area under settled cultivation in total operated area has been presented.<sup>3</sup> While the area under settled cultivation has increased from 5.73 per cent in 1970-71 to 31.96 per cent in 1995-96 as a proportion of total operated area, its share in net sown area has gone up from 24.31 per cent to 48.84 per cent during the same period (Table 12.2).

### Trends in Agrarian Structure

The distribution of land ownership is often considered to be an important indicator of the access to one of the most important means of production in predominantly agrarian economies. However, because of the non-availability of data on land ownership in Arunachal Pradesh, the distribution of operational holdings has been used to understand the changes in agrarian structure in Arunachal Pradesh.

3. The steady decline in the proportion of area under *jhum* cultivation during 1970-71 to 1990-91 seems to have slowed down during 1990-91 to 1995-96. While the reasons behind such a shift needs more careful investigation, a study on changing livelihood diversification in rural Arunachal Pradesh had reported that in response to the short fall in earnings, following the restriction of felling of trees in 1993, at least some households returned back to *jhum* cultivation, which they had left a few years ago (Mishra, 2003b).

FIGURE 12.1

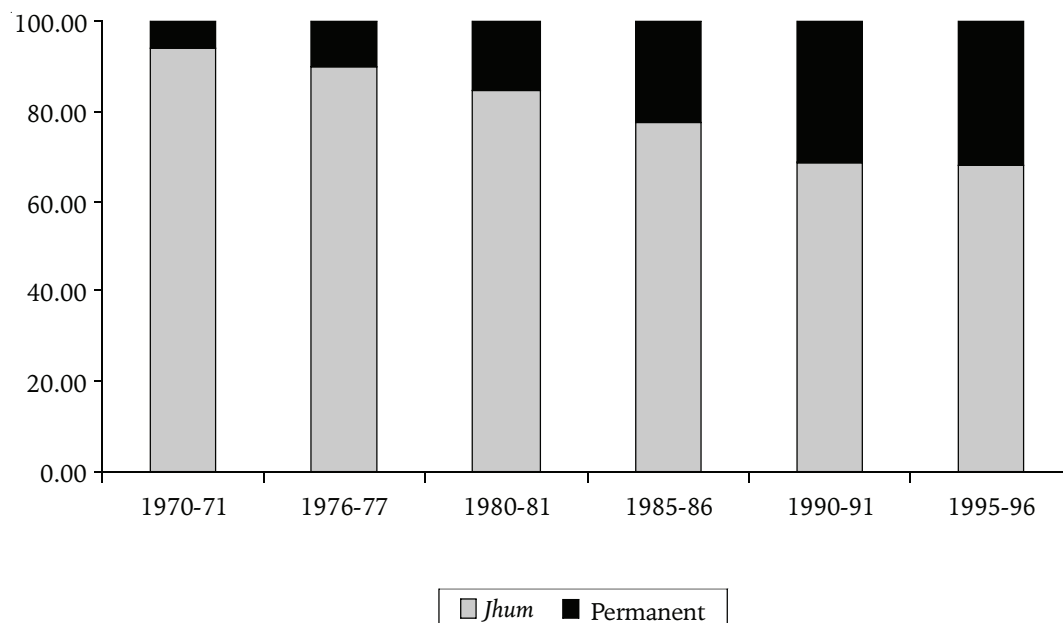
Share of *Jhum* and Settled Cultivation in Total Operated Area in Arunachal Pradesh: 1970-71 to 1995-96

TABLE 12.2

Extent of *Jhum* and Settled Cultivation in Arunachal Pradesh: 1970-71 to 1995-96

Year	Share in Total Operated Area		Share in Net Area Sown	
	<i>Jhum</i>	Permanent	<i>Jhum</i>	Permanent
1970-71	94.27	5.73	75.69	24.31
1976-77	89.88	10.12	64.25	35.75
1980-81	84.51	15.49	56.01	43.99
1985-86	77.70	22.30	48.59	51.41
1990-91	68.90	31.10	44.08	55.92
1995-96	68.04	31.96	51.16	48.84

Source: Agricultural Census, Government of Arunachal Pradesh, various years.

## Size-Class Distribution of Operational Holdings: 1970-71 to 2000-01

As per Agricultural Census, 2000-01, around 16 per cent of operational holdings were marginal, operating on less than 2 per cent of the total operated area. Around 33 per cent of holdings in the State were small or marginal (Figure 12.2). On the other hand, only 5 per cent of holdings belonging to the large size operated on nearly 23 per cent of area. Between 1970-71 to 2000-01, there was a significant increase of the share of marginal, small and semi-medium categories of holdings, while that of the medium and large size-classes declined (Table 12.3).

TABLE 12.3

Size Class-wise Distribution of Operational Holdings (Arunachal Pradesh): 1970-71 to 2000-01

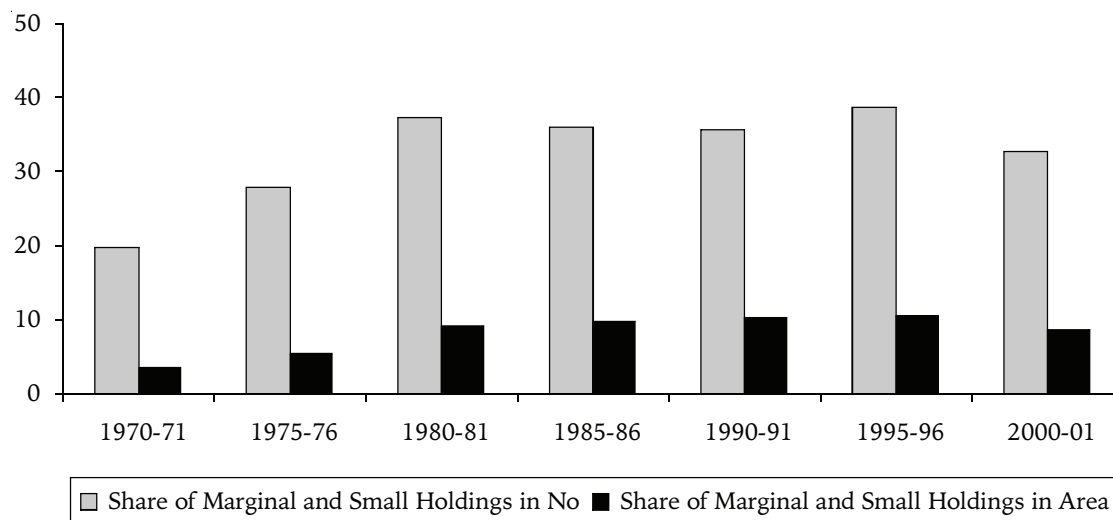
(in percentage)

Size Class of Operational Holdings (in Ha)	Share in Total Holdings													
	1970-71		1976-77		1980-81		1985-86		1990-91		1995-96		2000-01	
	No	Area	No	Area	No	Area	No	Area	No	Area	No	Area	No	Area
Marginal	7.67	0.71	9.69	0.99	16.53	2.25	17.18	2.67	17.38	2.87	19.26	3.03	14.04	1.90
Small	11.96	2.77	18.25	4.36	20.75	6.89	18.87	7.02	18.40	7.51	19.37	7.62	18.78	6.73
Semi-Medium	25.91	11.63	27.42	12.75	28.13	17.81	31.17	21.80	32.01	24.00	28.97	22.36	34.05	24.57
Medium	36.40	35.00	27.32	28.34	28.10	38.87	27.01	40.17	27.16	42.13	26.65	43.32	27.80	43.49
Large	18.06	49.89	17.33	53.57	6.48	34.18	5.77	28.33	5.04	23.50	5.75	23.67	5.33	23.30
All	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Agricultural Census, Government of Arunachal Pradesh, various years.

FIGURE 12.2

Share of Small and Marginal Holdings in Arunachal Pradesh: 1970-71 to 2000-01



Thus, the prominent feature of the agrarian structure as captured through the distribution of operational holdings is the increase in the share of smaller holdings. Various causes of this process of increasing dominance of small and marginal holdings in the agrarian structure have been put forth. The State Report of Agricultural Census, 1976-1977 explained the rise in the number of small and semi-medium holdings and the decrease in large size holdings at the state level as a result of transfer of land from larger to smaller cultivators and considered it as an 'automatic socio-economic corrective'. The fragmentation of holdings due to family/clan-partition, partial or complete abandonment of large *jhum* plots in favour of smaller permanent holdings might have caused the decline in the number of large size holdings. In addition to these, the following causes might explain the decline of large category of holdings in Arunachal Pradesh: (i) the shift of manpower from rural/agricultural occupations to urban/non-agricultural occupations; (ii) increasing population pressure on fertile plain land which is scantily available; and (iii) the influx of migrant labourers as tenants. However, given the increasing popularity of horticulture and the drive for land occupation among the neo-rich, underreporting of area under the large-category of holdings is also a distinct possibility. The gini concentration ratio demonstrates a decline in inequality in the distribution during 1980-81 to 1990-91, but between 1990-91 to 1995-96 there has again been a rise in

inequality in the distribution of operational holdings in the State, a trend that has not continued in 2000-01, although the relative share of the large-sized holdings has shown an increase (Annexure Table A-12.1). Decline during 1990-91 to 2000-01 in the inter-class concentration ratio<sup>4</sup> also shows that the relative shares of the three smaller categories, declined after an upward trend during the earlier period.

There is considerable inter-district variation in the shares of different classes of holdings in the State (Annexure Table A-12.2). The share of marginal holdings in the districts, for example, varies from a high of 70.79 per cent in Tawang to a low of 1.58 per cent in Upper Subansiri district. In a number of districts, the semi-medium category of holdings seems to have an overwhelming presence, while in others, their share is relatively small. The variations are particularly high in the case of the smallest and the largest of the size classes. The size class-wise distribution of holdings, like many other aspects of agriculture in the State, seem to have been influenced by the local topography and other agricultural conditions.

Another aspect of the agrarian structure that assumes much significance in the State is the relative share of holdings operated by the scheduled tribes. There has been a marginal decline in the share of ST operated holdings, both in number of holdings and area operated, during

4. The Index of Inter-Class Concentration Ratio for the *i*-th size class is defined as:

$$I_i = [(q_i / \sum q_i) / (p_i / \sum p_i)] * 100$$

where  $q_i$  and  $p_i$  are the area owned and number of households for the *i*-th class respectively.

1970-71 to 1995-96 (Annexure Table A-12.3). However, among various size classes, the relative share of ST operated holdings within the marginal category of holdings has seen the sharpest decline. As the operational holdings belonging to the scheduled tribes accounts for around 93 per cent of the holdings in the State, the size class distribution of ST operated holdings, by and large, follows the same pattern as that of the total holdings (Annexure Table A-12.4).

The average size of holding has declined from 6.19 ha in 1970-71 to 3.69 ha in 2000-01, partly showing increasing population pressure on the agricultural land. Within the different size classes, the decline has, however, not been uniform (Annexure Table A-12.5). In the large size class for example, the average size increased, during 1970-71 to 1980-81, thereafter it has declined steadily till 1995-96. Between 1995-96 and 2000-01, there has been a noteworthy increase in the average size of the large size-class of holdings. Another conspicuous feature is the decline in the average size of holdings in the marginal, small and semi-medium size classes during 1990-91 to 2000-01.

### Tenancy: Extent and Types

In Arunachal Pradesh, the agrarian structure continues to be dominated by owner-cultivators, although the areas under tenancy as well as the percentage share of both partly leased-in and entirely leased-in holdings are

increasing (Annexure Table A-12.6). A few micro studies have reported that a land-lease market has already developed in parts of the State, with labourers from neighbouring states and countries migrating to the rural areas as tenants (Roy and Kuri, 2001; Mishra, 2002a, 2002b). However, the agricultural censuses do not report an upward trend in tenancy. So far as the size class distribution of leased-in operational holdings is concerned, it is found that most of them belong to the marginal and small categories of holdings (Annexure Table A-12.7). In terms of the types of tenancy, it is found that in 2000-01, sharecropping accounts for the largest proportion of leased-in area, followed by 'other terms', while fixed money accounts for around 13 per cent of the area leased-in (Figure 12.3). There has been a remarkable rise in the share of area under sharecropping during 1995-96 and 2000-01. There is possibility that the extent of leasing-in is being underreported in the Agricultural Census data.

### Cropping Pattern and Diversification

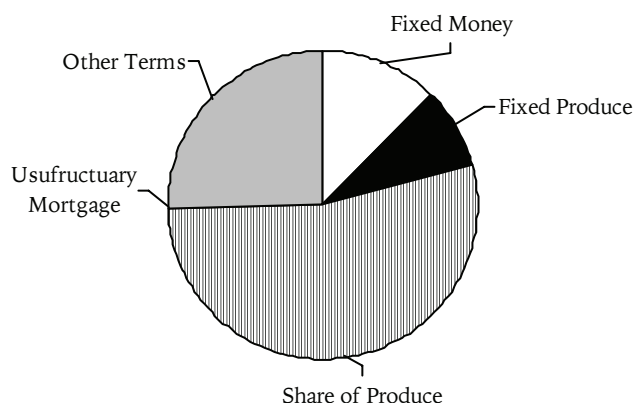
In the State, there is a significant change in cropping pattern. The percentage of area under foodgrains has declined, particularly since 1980. Out of nine major crops produced the share of foodgrains came down from nearly 87 per cent in the early 1980s to nearly 77 per cent during 2000-2003. The cereals accounted for 86 per cent of total area in 1980-1983, but their share came down by more than 11 percentage points by 2000-2003. Among the cereals, maize is the only crop that has increased its share in area during the last two decades, while all others, most notably rice, have lost their share in total cropped area. Pulses have also increased their share in total area. Among other major gainers are oilseeds and vegetables. The value of the Herfindahl Index declined from 0.38 in triennium ending 1982-83 to 0.29 during triennium ending 2002-03, suggesting a greater diversification of the cropping pattern<sup>5</sup> (Table 12.4).

### Growth of Area, Production and Yield of Major Crops: 1970-71 to 2004-05

The performance of agriculture in the state can be judged from the growth of and yield of different crops and crop groups presented in Table 12.5.<sup>6</sup> During 1980-81 to 2004-05, the foodgrain output in the State grew at a compound rate of 1.76 per cent. While area under foodgrains grew at the rate of 1.18 per cent, but the

FIGURE 12.3

Area under Different Types of Tenancy in Arunachal Pradesh: 2000-01



5. The Herfindahl Index (H) is an index of concentration. For increasing diversification H is decreasing and vice versa. It is bounded by 0 (complete diversification) and 1 (complete specialisation).

6. The following analysis draws on Mishra, 2006.



TABLE 12.4  
Changing Cropping Pattern in Arunachal Pradesh: 1980-81 to 2002-03

Crops	TE 1982-83	TE 1992-93	TE 2002-03	Change during TE 1982-83 to TE 2002-03
Rice	57.49	51.82	48.68	-8.81
Maize	14.98	15.95	15.78	0.80
Millet	11.37	8.94	8.19	-3.18
Wheat	2.13	1.68	1.65	-0.48
Total Cereals	85.97	78.39	74.29	-11.67
Total Pulses	0.90	2.41	2.72	1.82
Total Foodgrains	86.87	80.80	77.02	-9.85
Vegetables	6.34	7.67	8.91	2.57
Oilseeds	5.55	9.99	11.05	5.50
Spices	0.94	1.39	2.66	1.73
Sugarcane	0.30	0.15	0.36	0.06
Total	100.00	100.00	100.00	0.00
Herfindahl Index	0.373567	0.318886	0.290418	

Source: Computed from *Statistical Abstract of Arunachal Pradesh*, various years.

growth rate of yield was not satisfactory. Within foodgrains the highest growth in production has been recorded for pulses, followed by maize. Although the growth of area contributed significantly to the expansion of production of these two crops, their growth rates of yields were better than that of many other foodgrains. The production of rice, the major cereal crop of the State, increased at a rate of 1.28 per cent only, with an

insignificant growth in yield. Among non-foodgrains, the most promising crops include spices, oilseeds and vegetables. Their high growth rates in production, however, have to be viewed in relation to the abysmally low levels from which production of these crops shot up. Secondly, expansion of area has contributed substantially to the growth of these crops, although in the case of spices, there is considerable yield improvement.

This overall growth pattern, however, conceals a great deal of temporal variations in different sub-periods. The 1980s as a decade was substantially better than the 1990s in terms of the growth performance of all major cereals and foodgrains. The growth rate of production of rice, maize and wheat, along with that of cereals as a group, was higher than five per cent during 1980-81 to 1989-90. This was possible because of an appreciable growth in the area under high-yielding variety seeds, fertiliser and also under plant protection scheme during the same period (Table 12.5).<sup>7</sup> However, during the 1990s there was the negative growth of production and yield rates of all the foodgrains, except maize and pulses. In the case of the latter two crops as well, there was a decline in the growth rates of production. Among non-foodgrains, spices and sugarcane achieved higher growth in the 1990s than in the 1980s, while growth performance of vegetables and oilseeds worsened during the 1990s.

There seems to be some recovery in terms of growth performance of crops during 2000-01 to 2004-05. In this period, among cereals, wheat and millet have grown at

TABLE 12.5  
Growth Rate of Area, Production and Yield Rate of Crops (Arunachal Pradesh): 1980-81 to 2004-05

Crop/Crop Groups	1980-81 to 2004-05			1980-81 to 1989-90			1990-91 to 1999-2000			2000-01 to 2004-05		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y
Rice	0.97	1.28	0.30	4.27	5.39	1.08	-0.12	-1.04	-0.93	0.49	1.73	1.25
Maize	1.99	3.13	1.12	5.41	6.53	1.07	-0.79	0.62	1.42	-0.32	1.39	1.71
Millet	0.05	0.83	0.78	3.04	1.73	-1.26	-1.38	-2.30	-0.94	3.39	6.15	2.68
Wheat	0.64	0.89	0.25	4.02	6.24	2.14	-0.04	-4.30	-4.25	0.32	8.61	8.27
Total Cereals	1.04	1.61	0.57	4.35	5.30	0.90	-0.39	-0.89	-0.49	0.64	2.28	1.62
Total Pulses	7.73	10.86	2.90	18.33	23.86	4.68	2.78	5.72	2.86	2.80	2.77	-0.03
Total Foodgrains	1.18	1.76	0.58	4.55	5.46	0.86	-0.29	-0.72	-0.43	0.71	2.30	1.56
Vegetables	3.51	2.83	-0.66	5.11	9.35	4.04	0.00	-1.07	-1.07	0.53	1.99	1.45
Oilseeds	5.32	6.69	1.31	12.02	14.17	1.92	2.13	1.47	-0.65	0.79	-1.00	-1.79
Spices	7.83	15.65	7.25	8.34	14.65	5.82	9.40	20.71	10.33	0.29	-1.28	-1.57
Sugarcane	3.97	4.69	0.69	-7.55	-2.38	5.59	11.75	8.32	-3.07	-6.01	-2.50	3.74

Note: All growth rates are compound growth rates. A= Area, P= production and Y= yield.

Source: Computed from figures provided in *Statistical Abstract of Arunachal Pradesh*, various years.

7. See the section on input-use and technology.

very high rates, mainly because of high growth rates of yield rate, while rice and maize have grown at the rates of 1.73 and 1.39 per cent per annum respectively. Total pulses have grown at a rate of 3 per cent, and foodgrain production has grown at the rate of 2.3 per cent. The performance of oilseeds, spices, vegetables and sugarcane, however, has worsened off during the same period. Thus, after a negative growth of output of most of the crops during the 1990s, there seems to be some recovery during the 2000-01 to 2004-05.

Oilseeds have shown a significant growth among the major crops and crop groups of Arunachal Pradesh (Table 12.6). Among the oilseeds, mustard occupies the prominent position (Table 12.6). The share of mustard in total oilseeds production was as high as 90 per cent in 1980-81, which came down to nearly 79 per cent in 2000-2001. The other important oilseeds were soyabean, sesame and groundnut, respectively. All these oilseeds have grown at a very high rate during 1980-81 to 2000-01, but mainly because of expansion of area under cultivation rather than improvements in yield rates.

TABLE 12.6

**Growth Rate of Area, Production and Yield Rate of Oilseeds (Arunachal Pradesh): 1980-81 to 2000-01**

Name of the Oilseed	1980-81 to 2000-01			1980-81 to 1989-90			1990-91 to 1999-2000		
	A	P	Y	A	P	Y	A	P	Y
Mustard	5.88	7.56	1.59	11.30	12.70	1.26	1.54	1.83	0.27
Groundnut	5.54	5.26	-0.26	9.19	14.80	5.15	0.47	-5.44	-5.88
Sesame	8.37	7.85	-0.48	11.42	8.57	-2.56	4.10	2.43	-1.61
Soyabean	11.68	14.88	2.86	24.15	31.28	5.76	5.40	2.90	-2.36
Other Oilseeds	18.32	16.00	-1.97	24.21	27.92	2.98	5.32	-5.00	-9.80
Total Oilseeds	6.64	8.27	1.54	12.02	14.17	1.92	2.13	1.47	-0.65

Note: All growth rates are compound growth rates. A= Area, P= production and Y= yield.

Source: Computed from figures provided in *Statistical Abstract of Arunachal Pradesh*, various years.

### Agricultural Production at the District Level

The compound growth rates of the main cereal crops at the district level have been presented in Table 12.7. Due to non-availability of data, the analysis is confined to only four major cereal crops and to the 11 undivided districts of the State. However, since these crops account for around 75 per cent of the total operated area in the State, the growth performance of these crops at the

district level is likely to provide important insights into the State of the agrarian economy at a disaggregated level. During 1980-81 to 2003-04, two districts, namely Lower Subansiri and Tirap, have witnessed negative growth in overall cereal production. Relatively higher growth in total cereals is observed in Dibang Valley, Changlang, East Siang and Lohit districts. The growth rate of yield was the highest in East Siang district, while in many of the better performing districts the growth rate of area under cereals was relatively high. In terms of crop-specific performance, as many as 5 out of the 11 districts under study had negative growth rates in rice production. The decline was particularly sharp in the case of West Kameng district. East Siang, Dibang Valley and Changlang have achieved relatively high growth rates in the production of rice. Again, apart from East Siang, in all other district the growth in production of rice was largely a result of expansion of area rather than improvements in yield rates.

The growth rates of production of maize in almost all the districts have been much higher than that of rice. The only district showing a negative growth in maize production is Lower Subansiri. An important aspect of the better growth performance of maize in the districts is the relatively high growth rate of yield rate. In seven districts the yield rate of maize has increased at a rate of more than 2 per cent per annum. In the case of millet there seems to be a wide dispersion of growth rates at the district level. While Upper Subansiri has recorded a growth rate of around 8.5 per cent in the production of millet, Changlang, Tirap and East Kameng have shown negative growth rates. Some other districts like East Siang and Lohit have experienced very low growth rates in millet production. Although the growth rate of production of wheat has been very high in some of the districts, it is largely because of expansion of area. In as many as five districts, the growth rate of production of wheat was negative during 1980-81 to 2003-04. Thus, there exists a great deal of variations in the growth performance of different crops in different districts of the State. However, while analysing such aggregate growth performance over a time period, it is important to note the diversity in cropping pattern of the districts as well as the differences in the initial levels of agricultural development. For example, in the triennium ending 2003-04, rice accounted for more than 70 per cent of area under cereals in a number of districts such as East Kameng, Lower Subansiri, West Siang, East Siang and Changlang, while in some others such as Tawang and West Kameng it accounted for less than 20 per cent of area under cereals.

TABLE 12.7

Growth Rate of Area, Production and Yield Rate of Cereals in the Districts of Arunachal Pradesh: 1980-81 to 2003-04

District	Rice			Maize			Millet			Wheat			Cereal		
	A	P	Y	A	P	Y	A	P	Y	A	P	Y	A	P	Y
Tawang	-0.86	-0.46	0.40	2.38	4.91	2.47	1.41	2.28	0.85	0.16	-0.13	-0.29	0.40	0.78	0.38
West Kameng	-1.34	-2.13	-0.80	1.21	3.39	2.14	-0.96	1.56	2.53	1.28	1.48	0.20	0.17	1.98	1.81
East Kameng	1.85	1.78	-0.07	2.55	5.61	2.97	-2.68	-1.55	1.17	-5.93	-6.58	-0.70	1.54	2.18	0.63
Lower Subansiri	-0.79	-0.34	0.45	-0.38	-0.50	-0.12	2.04	2.33	0.28	9.55	5.10	-4.07	-0.52	-0.18	0.34
Upper Subansiri	2.70	-0.11	-2.72	2.93	6.87	3.82	10.33	8.45	-1.71	9.92	10.14	0.22	3.45	2.31	-1.10
West Siang	1.30	1.13	-0.17	1.71	3.10	1.35	0.60	1.89	1.29	7.18	6.22	-0.89	1.28	1.44	0.16
East Siang	1.36	2.78	1.40	-0.17	3.19	3.37	-2.20	0.09	2.34	3.41	4.37	0.93	0.47	2.54	2.06
Dibang Valley	1.77	2.90	1.12	2.42	4.52	2.06	0.76	1.47	0.71	12.08	11.61	-0.42	1.95	3.43	1.45
Lohit	1.49	1.69	0.21	6.72	5.35	-1.28	3.50	0.21	-3.18	-0.48	-0.82	-0.34	2.89	2.50	-0.38
Changlang	1.99	2.93	0.92	8.26	10.18	1.77	-0.98	-1.38	-0.41	-0.67	-1.61	-0.95	1.75	2.78	1.03
Tirap	1.24	-1.06	-2.28	2.05	2.53	0.46	0.04	-0.40	-0.44	-8.52	-7.66	0.95	0.78	-0.04	-0.82

Note: All growth rates are compound growth rates. A= Area, P= production and Y= yield.

Source: Computed from figures provided in *Arunachal Agriculture in Brief*, 1980-1993 and *Statistical Abstract of Arunachal Pradesh*, various years.

## Instability in Agricultural Production

Along with the level of production, fluctuations in production also affect the agricultural economy. The coefficient of variation in the area, production and yield of foodgrains and other major crops has been presented for the period 1980-81 to 2004-05 and also for different sub-periods in Annexure Table A-12.8. Among the major crops and crop groups the highest year-to-year fluctuations were noticed in the production of spices, oilseeds, pulses and sugarcane, when the entire period from 1980-81 to 2004-05 are taken into consideration. Among the foodgrains, production variability was the highest in the case of pulses. Whereas, among the cereals highest variation was in the production of wheat, closely followed by millet. Yield fluctuations are high in spices, sugarcane and pulses. Among the cereals, millet has recorded comparatively higher fluctuations in yield levels. However, an important fact is that compared to the 1980s, variability in production of a majority of crops declined in the 1990s.

## Trends in Input-use and Technological Change

The pattern of input-use is a reflection of the technological level in agriculture. One of the significant features of traditional agriculture is the relatively unchanging input-combinations, which keeps the sector tied to the low-level equilibrium trap (Schultz, 1964). However, while analysing the nature of input-use in Arunachal Pradesh agriculture, through conventional indicators, it is important to note that given the

considerable diversity in ecological conditions, some of these inputs may have limited applicability in certain regions.<sup>8</sup>

Notwithstanding the policy pronouncements and efforts by different government agencies to modernise agriculture in Arunachal Pradesh, the spread of irrigation and use of modern inputs such as HYV seeds, chemical fertilisers and pesticides remain limited and confined to few pockets. However, the State has made steady progress in the utilisation of these inputs (Figure 12.4). As it is evident from Table 12.8, during 1981-82 to 1991-92 the percentage of GCA under irrigation increased from 9 per cent to 19 per cent, while that under HYV seeds has increased from 10.79 to 26.76 per cent. During the same period, the area treated with chemical fertiliser has increased from merely 2 per cent to 16 per cent. Our estimates show that during 2003-2005, area under HYV seeds continue to hover around 26 per cent, but the area under fertiliser came down to nearly 10 per cent of the total cropped area. The growth rates of area under HYV seeds, area under fertiliser and area under plant protection chemicals during the period 1980-81 to 2004-05 is shown in Table 12.9. But the growth in the various sub-periods is found to be highly fluctuating. During the 1980s the areas under these modern inputs increased at more than 10 per cent per annum, while the growth in use of these inputs was relatively modest in the 1990s. During 2000-01 to 2004-05, the use of NPK fertilisers declined. Even the growth of area under HYV seeds and plant protection chemicals came down sharply.

8. The use of irrigation intensity, for example, would be of limited explanatory significance in the context of high altitude agriculture.

FIGURE 12.4

**Area under HYV Seeds, Chemical Fertilisers  
and Plant Protection Chemicals in  
Arunachal Pradesh: 1980-81 to 2004-05**

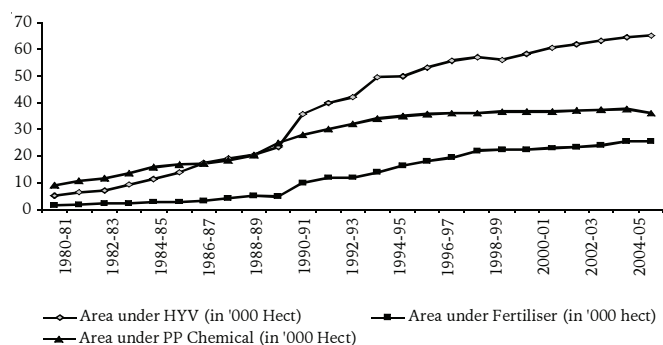


TABLE 12.8

**Use of Modern Inputs in Agriculture**

(as percentage to GCA)

Category of Holding	Area Irrigated		Area Under HYV Seeds		Area Treated with Chemical Fertiliser	
	1981-82	1991-92	1981-82	1991-92	1981-82	1991-92
Marginal	22.52	6.52	18.95	15.9	14.69	13.47
Small	15.29	19.2	10.61	26.84	4.88	16.33
Semi-Medium	10.99	19.54	10.81	33.82	2.47	17.08
Medium	8.66	19.69	9.13	25.48	1.79	16.4
Large	6.55	22.45	12.59	22.93	1.08	13.42
All	9.02	19.21	10.79	26.76	2.1	15.83

Source: Report on Input Survey, 1981-82 and 1991-92, State Agricultural Census Commissioner, Government of Arunachal Pradesh.

TABLE 12.9

**Growth Rates of Modern Inputs in Arunachal Pradesh: 1980-81 to 2004-05**

Inputs	1980-81 to 2004-05	1980-81 to 1989-90	1990-91 to 1999-2000	2000-01 to 2004-05
Area Under HYV Crops	11.14	18.78	5.46	1.98
Area Under Fertilisers	13.84	13.86	9.98	3.01
Area Under Plant Protection Chemicals	5.94	10.75	2.79	-0.25
Amount of Fertilisers (NPK) used	9.52	13.96	5.77	-0.21

Note: All growth rates are compound growth rates.

Source: Computed from figures provided in *Arunachal Agriculture in Brief, 1980-1993* and *Statistical Abstract of Arunachal Pradesh*, various years.

Apart from the limited suitability of the modern inputs to production conditions in hill agriculture, another important cause of their slow adoption is the inadequate infrastructure. The NSS 59<sup>th</sup> Round data, presented in Annexure Table A-12.9 clearly bring out the locational

disadvantages and seasonal variations in the availability of farm inputs in Arunachal Pradesh. In *khari* season, for example, more than 68 per cent of farmers have to travel more than 10 kms to get fertiliser. Around 75 per cent and 30 per cent of farmers have to travel that distance to get improved seeds and pesticides, respectively.

Given the low use of modern inputs and predominance of *jhum* cultivation, it is hardly surprising that there has been little inflow of formal credit to agriculture in the State. As per the NSS 59<sup>th</sup> Round data, only 5.9 per cent of farming households were found to be indebted in the State. Among those who have availed themselves of credit, 49 per cent have taken loans from friends and relatives, 33 per cent from traders, 10 per cent banks, 4 per cent from the government, and the rest from 'other sources'. Thus, the percentage of farmers who have depended upon informal sources of credit was as high as 86 per cent in the State. Coming to the purpose of loans, 39 per cent have taken it for consumption expenditure, 18 per cent for medical expenditure, 6 per cent for education, 3 per cent for non-farm business, 10 per cent for current expenditure in farm business, and only 4 per cent have taken a loan for capital expenditure in farming. Thus, the character of the credit market itself underlines the underdeveloped nature of the state's agrarian economy. A related problem for enhancement of access to formal credit in the State, particularly in the rural areas, is that the nature of property rights and legal safeguards against transfer of land prevents the use of cultivated land as collaterals against credit, although recently there has been efforts to expand credits to farmers in the region through alternative mechanisms. Unless adequate measures are adopted for providing credit to farmers, their dependence on informal credit is likely to continue, which in turn would act as a barrier to improvements in productivity. The ongoing efforts to expand credit support to farmers and other sections of the rural population have rightly emphasised group-lending schemes as an alternative.

There is a voluminous literature suggesting the positive impact of literacy and education of the farmers on adoption of improved technology. There has been a great deal of improvements in the literacy rate of Arunachal Pradesh, but low educational standards of the farmers continue to act as a barrier not only for use and adoption of new technology, but also for availing the benefits of different government programmes. Recent data from NSS suggests that around 50 per cent farmers in the State are illiterate and around 62 per cent of farmers were either illiterate or have studied up to below primary school level (Annexure Table A-12.10).



## Development of Horticultural Crops

In recent years, there has been a lot of emphasis on the growth of horticulture in the State. Since there are obvious limitations to the growth of traditional cereals and foodgrains in a mountainous state like Arunachal Pradesh, horticultural plantations, which could be taken on slopes also, is being promoted as part of a strategy for agricultural diversification and higher value addition within agriculture. The varied agro-climatic condition in the State offer scope for growing a wide variety of tropical, sub-tropical and temperate fruits, vegetables including off-season vegetables, spices, aromatic and medicinal plants, flowers and mushroom. By 2004-05 the total production of horticultural crops reached nearly 1,40,605 metric tonnes per annum and the total area under horticulture was 67,584 hectares. From the total horticulture production, fruits comprise 1,03,234 metric tonnes from an area of 54,212 hectares. The fruits being perennial in nature help in checking soil erosion and provide high-density green cover to the soil. The three-yearly average of area and production of some important horticultural crops in the State have been given in Table 12.10. Among the major horticultural crops in the State are citrus, pineapple, banana and apple.

TABLE 12.10

### Area, Production and Yield Rate of Horticultural Crops in Arunachal Pradesh: TE 1999-2000

Name of the Fruit	Area (In ha.)	Production (In MT)	Yield (Qtl/Hect)	Share in Area (in %)	Share in Production (in %)
Apple	6482.67	13158.67	20.30	20.10	15.18
Plum	802.33	2622.00	32.68	2.49	3.02
Walnut	2136.67	655.33	3.07	6.63	0.76
Guava	963.00	2634.67	27.36	2.99	3.04
Kiwi	19.00	1.00	0.53	0.06	0.00
Peach	239.00	1067.67	44.67	0.74	1.23
Pear	829.00	2602.67	31.40	2.57	3.00
Citrus	8066.33	17301.33	21.45	25.01	19.96
Pineapple	7271.33	30516.67	41.97	22.55	35.20
Papaya	585.00	2650.33	45.30	1.81	3.06
Banana	3414.33	11623.67	34.04	10.59	13.41
Others	1439.00	1850.67	12.86	4.46	2.13
Total Fruits	32247.67	86684.67	26.88	100.00	100.00

Source: Computed from figures provided in *Arunachal Agriculture in Brief, 1980-1993* and *Statistical Abstract of Arunachal Pradesh*, various years.

## Central and State Sponsored Schemes for Development of Horticulture

There have been various Central and State sponsored Schemes in Arunachal Pradesh in order to develop horticulture in the State.

### BOX 12.2

#### Schemes for Development of Horticulture

Some of the existing schemes for development of horticulture in Arunachal Pradesh are as follows:

*Technology Mission for Integrated Development of Horticulture:* Under this scheme a total of 3855 hectares of area have been brought under various horticulture crops like fruits, vegetables, spices and flower cultivation.

*North East Council Schemes:* Under this scheme a total of 463 hectares comprising large cardamom in 200 hectares and high density apple plantation in 263 hectares has been achieved in 2004-05.

*Swabhiman Rozgar Yojana:* A number of unemployed youths have become beneficiaries in this scheme where about 1840 hectare of land has been used for fruit gardening.

*National Horticulture Board Schemes:* Under this scheme about 2.5 hectares of land has been brought under geranium cultivation.

*Various State Sponsored Schemes* have been initiated by the government in 2004-05 in various fields like floriculture, mushroom development and training, fruit and vegetable preservation, maintenance of farms and nurseries and fairs and exhibitions. Government has also set up a Horticulture College in the State.

The tremendous potential for development of horticulture sector has remained unexploited in Arunachal Pradesh. The horticulture technology mission (HTM) which has been initiated in the State, has given the much needed impetus to this vital sector. As per government estimates, the achievement of this scheme has been quite impressive (Annexure Table A-12.12). The Government of Arunachal Pradesh in its new Agriculture Policy 2001, had specified the targeted area and production of different horticulture crops in the State for the period upto 2010 which is given below (Annexure Table A-12.13). On the ground, however, farmers do not get adequate returns on their investments, mainly because of weak market linkages.<sup>9</sup> On the production front, the gap between the

9. Interviews with ginger farmers at Pashighat, orange growers at Along and apple and kiwi growers in West Kameng district reveal that the key constraint in the cultivation of these perishable products are exploitation by middlemen and strong cartels of buyers at Guwahati and other markets, poor transport and storage infrastructures as well as informational constraints. The efforts by individual farmers to sale their products outside the region has also not been successful.



laboratories and the farmers field continues to be substantial, although several efforts are on to bridge this gap. Unless there is a well-coordinated mechanism which addresses the problems faced by horticulturists, the expected diversification towards high-value crops would remain unfulfilled. The key components of this strategy should be: (a) to provide technology and input support to enhance productivity; (b) to supply credit; (c) provision of insurance cover to mitigate risks; and finally (d) buy-back arrangement with the processing units in the short-run and setting up of processing-units in the long run. There is an urgent need to involve community organisations and civil society groups in providing the technology and information support to the farmers. Farmers' cooperatives should be built up on the foundations of already existing community structures. Establishment of clusters of horticultural processing units would help in value addition within the State itself. There is also a need to dovetail other rural development and employment generation programmes to help the horticultural development in rural Arunachal Pradesh.

### Animal Husbandry

Livestock plays a very important role in the livelihood diversification strategy of the rural population in Arunachal Pradesh. It is not only an important source of nutrition for a majority of rural people, but also acts as an insurance against sudden shortfalls in consumption and earnings. Apart from the cultural significance of the livestock in the traditional economy of many of the tribes, there is a growing demand for livestock and dairy products in the State. There has been a demand-induced growth of dairy farming and poultry-rearing activities, particularly in and around the urban centres of the State. There is, however, considerable scope for expansion of these activities both in the rural and urban areas of Arunachal Pradesh. Data generated by the Livestock Census, suggests that between, 1978-79 to 1997-98, the growth of cattle was robust, but in the case of buffalos the growth was negative (Annexure Table A-12.14). While the livestock as a whole has increased at a simple average annual growth rate of around 6 per cent per annum, the growth of the number of goats in the State has been rising at around 7 per cent per annum. What is important is that in spite of sizeable local demands, the growth in

the number of pigs and sheep has not been remarkably high.

Given the current size of livestock in Arunachal Pradesh, there is a huge scope for expanding the livestock sector, however, considering the fragility of the ecological system and the increasing demand for livestock products in the State, there is a need for careful attention to monitor and avoid localised environmental stress, if any, caused by the imbalances between the livestock and ecological systems. Livestock production has both positive and negative impacts on the environment. The positive effects include improvements in species (flora) wealth through managed grazing, less pressure on the environment as a result of alternative earning opportunities for the population, and various other benefits of mixed farming, such as sustenance, enhancement and release of resource base. The negative impacts are land degradation, deforestation and the resultant loss of biodiversity. In fragile ecological systems, it is not only the density, but also the composition of the livestock population has a bearing on the scale of environmental stress.

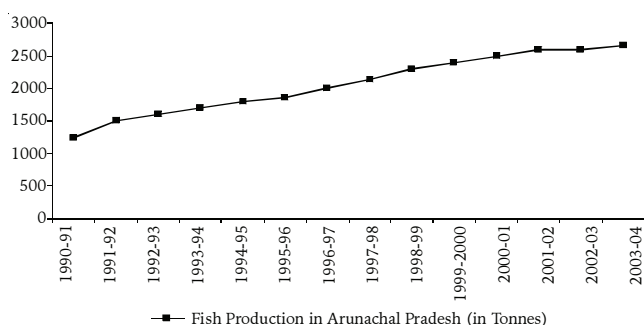
### Fisheries

Fish production in Arunachal Pradesh has grown at a compound rate of 5.66 per cent per annum during 1990-1991 to 2003-04 (Figure 12.5). The encouraging aspect of this growth of fish production in the State is that along with expansion in area under pisciculture, improvements in yield of fish production per hectare has also contributed substantially to the growth of fish production. During 1993-94 to 2003-04, total fish production in the State increased at a compound rate of 4.91 per cent per annum. While area under pisciculture grew at a rate of 1.97 per cent, yield of fish has grown at a rate of 2.87 per cent during the same period. There is, however, considerable scope for expansion of fish production in the State. The current annual demand for fish in the State is estimated to be around 9653 tonnes, out of which, production is in the order of 2500-2600 tonnes.<sup>10</sup> The traditional fish-cum-rice cultivation of the Apatani tribe of Arunachal Pradesh has attracted a great deal of attention as a successful model of convergence between traditional practices and changing demands (Box 12.3). There is, however, a need for wider replication<sup>2</sup> of such good practices.

10. As per the targets for Tenth Five Year Plan (2002-2007), Government of Arunachal Pradesh has plans to increase the fish production in the state up to 3500 tonnes, by the end of the 10th plan period.

FIGURE 12.5

## Fish Production in Arunachal Pradesh: 1990-91 to 2003-04



Source: Directorate of Fisheries, Government of Arunachal Pradesh.

## BOX 12.3

## Fish-cum-Rice Cultivation by the Apatanis

The fish-cum-rice cultivation system practiced by the Apatanis in Ziro plateau has attracted the attention of scholars as an efficient and viable strategy of raising earnings from traditional agriculture. The indigenous irrigation system of the Apatanis is a multipurpose water management system, which integrates land, water and farming systems by protecting soil, conserving water for irrigation and paddy-cum-fish culture. The rice field is utilised for fish culture by rearing fish from the month of April to September when the paddy crops grow in the field. In order to water the fields, every stream rising from the hill tops is tapped soon after it emerges from the forest, channelised at the rim of the valley and diverted by a network of primary, secondary and tertiary channels. The first diversion from the stream takes off at a short distance above the terraces. The feeder channel branches off at angles which lead water through the series of terraces so that by blocking or opening the channels ducts (*huburs*) any field can be flooded or drained. To prevent trashes or migration of fish, a semi-circular wooden/bamboo net is installed at the inlet and to reduce beating action of flowing water resulting in soil erosion, wooden sticks or planks are put at the outlet. The *huburs* are installed about 15 to 25 cm above the bed level of the fields in order to maintain proper water level. They are made of plank or pine tree trunk or bamboo stems of different diameters. The Apatanis utilise varieties of domestic waste products to their paddy field to enhance crops productivity, which in turn enhance soil fertility as well as feed to fishes. The State support to the farmers in terms of providing seeds has been crucial in sustaining and improving the system. It has been reported that fish output has started dwindling in some areas because of the use of chemical fertilisers and pesticides.

## Conclusion

Despite the institutional and ecological constraints in the State, the agriculture and allied activities have grown

rapidly. Some of the worrying aspects of this growth in agriculture are the continuing dependence on *jhumming* and regional variations in growth performance. The key issues that need to be addressed in the context of agricultural development in the State are as follows:

- conduct of cadastral survey in order to define property rights over land;
- an institutional mechanism to monitor and control land alienation and land reforms legislation;
- development of location-specific farming technologies that are suitable and compatible with the local ecology;
- establishment of an effective data collection, processing and disseminating agency for agricultural sector;
- creation of basic market infrastructure;
- provision of credit and other inputs to the farmers;
- support for high-value diversification within agriculture and related activities; a comprehensive support strategy for development of horticulture;
- establishment of research and agricultural extension linkages;
- development of agro-processing industries;
- horizontal coordination of various programmes designed to support the farmers and the farm sector.

While the New Agricultural Policy of Arunachal Pradesh, 2001 has clearly identified the key areas of concern for overall agricultural development (see Box 12.4), much remains to be done in terms of development of rural infrastructure and capital formation in agriculture. For example, there is a clear mismatch between the institutional realities of the State and the institutional assumptions of the various programmes. To overcome this, at the field level, a farmers' group should be considered as an economic unit instead of an individual farmer. This unit should be assured of the supply of high yielding variety of seeds and seedlings thereby establishing linkage with new 'technology to enhance productivity'. The second component should be 'supply of credit'. The third component should be 'an insurance to cover the risk'. The fourth one should be 'buy-back arrangement' with the processing units in the shorter run and setting up of processing units in the longer run (Sarma, 2006). There is a tremendous scope for expanding commercially viable organic farming in the State. The key constraint seems to be developing the marketing link between the

## BOX 12.4

**New Agricultural Policy of Arunachal Pradesh, 2001**

The New Agricultural Policy of Arunachal Pradesh has identified the following as the major constraints faced by the State in the agriculture sector: low level of productivity, capital inadequacy, lack of infrastructural support, unfavourable terrain, high cost of production and demand side constraints. Since the non-availability of basic preservation, storage and processing facilities, low value addition and unfavourable price of agricultural commodities are considered to be the main reason behind the lack of growth impetus in the agricultural sector, the policy basically emphasises shift towards cultivation of cash crops, floriculture, horticulture, fisheries, piggeries and agro-processing. In specific terms the policy envisages strong state support in the following directions.

**Addressing Problems related to Shifting Cultivation**

Special emphasis needs to be given on shifting cultivation, ensuring better land management, introducing improved cultivation in slope land through agro-forestry, horticulture and encouraging other household activities. The programme is to be designed in such a way that there would be simultaneous thrust in weaning the *jhum* farmers towards better cultivation.

**Development of Location-specific Strategy and Convergence of Allied Activities**

Efforts would be made to formulate an area specific differentiated strategy taking into account the agronomic, climatic, socio-economic practices as well as the resource worthiness of the farmer. Special emphasis will be made for introducing the newly developed H.Y.V. seeds, improved planting material, adoption of new technology and mechanised farming. The policy will aim at avoiding duplication of programmes by different functionaries, as far as possible.

**Technological Adoption**

Importance will be accorded to identify new location specific and economically viable improved species of agriculture, horticulture, livestock and fish etc. Accordingly, motivational aspect of agriculture extension would receive due attention. The entire extension system will be revitalised. Innovative and decentralised institutional change will be introduced to make extension system responsible and accountable. Development of human resources through capacity building and skill upgradation of extension functionaries will receive due attention.

**Supply of Inputs**

Adequate and timely supply of inputs such as seed, fertiliser, pesticides, agri-tools and implements, credit at reasonable rate to farmers will be provided by the government and other institutions, subject to availability of resources and funds. Greater emphasis will be given to increase the consumption of such inputs for achieving the targeted increase in per unit area productivity. As far as possible use of organic manure/compost will be encouraged to avoid ill effects of inorganic fertilisers. Soil health card, quality testing of inputs like fertiliser, chemicals etc., will be introduced and supply of spurious inputs will be checked. On farm management of water, increasing the area under irrigation through the use of surface water and sub-surface water will receive added attention.

**Facilitate Private Investment in Agriculture**

Efforts would be made to create conditions that encourage participation of the private enterprises in the establishment of agro-based industries. An incentive package and guideline would be finalised ensuring participation of private sector and financial institutions in the agricultural sector as a whole. NABARD will have to play a major role in channelising investment. To meet local credit needs of farmers, rural credit banks are to be set up.

**People's Participation**

The new policy would encourage formation of self help groups and village committees at different levels. The village committee would be vested with the task of maintaining and managing the assets created so far, like irrigation channel, terraces market shed etc.

**Marketing Infrastructure**

Emphasis will be laid on development of marketing infrastructure and techniques of preservation, storage, and transportation etc., with a view to reduce the post-harvest losses and ensuring a better return to the grower. Direct marketing and procurement by a notified State level procurement agency, as and when required with storage facilities of different items will be made available to the production areas. Upgradation and dissemination of market intelligence will receive particular attention. Efforts will be made to strengthen the market infrastructure.

**Agro-processing**

Setting up of agro-processing units in production areas will be given due priority. To reduce post-harvest wastage, effort would be made to add values especially to agricultural and horticultural produce by setting up small processing units. The Small Farmers Agricultural Business Consortium (SFAC) will be activated to cater to the need of farmer entrepreneurs.

**Price Support**

Market intervention scheme involving procurement through a notified agency will be implemented for selected agricultural/horticultural crops so that farmers are assured of remunerative prices.

producers of organic food products and the consumers of such niche markets.

Given the levels of development in different parts of the State, there is an enormous need for strong government intervention in various aspects of agricultural development outlined above. While there has been no dearth of schemes and promotional ventures within agriculture, by and large, the impact of these programmes has been limited because of the unsuitability of the schemes to the local economic, ecological and social

conditions, and secondly because of a host of implementational failures. There is an urgent need to make these programmes participatory, transparent and locally relevant. There is tremendous scope for learning from the success stories of other mountain states, such as Himachal Pradesh in the case of horticulture. To enhance the scope for cooperation, a special agency should be created at the national level to support mountain agriculture in different parts of the country, including Arunachal Pradesh.

ANNEXURE TABLE A-12.1

## Index of Inter-class Concentration Ratio and Gini Ratio

<i>Size Class of Operational Holdings (in Ha)</i>	<i>1970-71</i>	<i>1976-77</i>	<i>1980-81</i>	<i>1985-86</i>	<i>1990-91</i>	<i>1995-96</i>	<i>2000-01</i>
Marginal	9.26	10.23	13.67	15.54	16.60	15.74	13.53
Small	23.16	23.89	33.49	37.20	41.36	39.50	35.85
Semi-medium	44.89	46.50	63.88	69.97	77.57	72.24	72.17
Medium	96.15	103.69	139.52	148.72	159.19	162.21	156.46
Large	276.25	309.24	518.52	490.99	509.03	411.30	437.43
Gini Concentration Ratio	—	0.52444	0.527604	0.491387	0.460899	0.47723	0.46113

Source: Computed from *Agricultural Census*, Government of Arunachal Pradesh, various years.

ANNEXURE TABLE A-12.2

## Size Class-wise Distribution of Operational Holdings in Districts of Arunachal Pradesh: 1995-96

(in percentage)

<i>District</i>	<i>Share of Holdings and Area</i>									
	<i>Marginal</i>		<i>Small</i>		<i>Semi-medium</i>		<i>Medium</i>		<i>Large</i>	
	<i>No.</i>	<i>Area</i>	<i>No.</i>	<i>Area</i>	<i>No.</i>	<i>Area</i>	<i>No.</i>	<i>Area</i>	<i>No.</i>	<i>Area</i>
Tawang	70.79	50.38	26.51	41.72	2.69	7.9	0	0	0	0
West Kameng	25.5	6.56	24.04	17.4	45.28	61.38	4.95	12.64	0.24	2.01
East Kameng	7.57	1.64	21.89	10.01	38.62	33.46	31.63	50.43	0.29	4.46
Papum Pare	17.12	2.47	17.04	5.66	32.53	21.55	27.97	42.41	5.33	27.92
Lower Subansiri	20.01	3.5	23.07	9.74	32.02	26.35	19.8	35.49	5.1	24.91
Upper Subansiri	1.58	0.17	6.25	1.82	37.17	21.19	44.32	50.88	10.68	25.94
West Siang	4.76	0.37	5.52	1.35	22.08	9.39	48.04	46.85	19.6	42.04
East Siang	6.07	0.67	13.62	4.08	26.62	15.25	44.88	54.03	8.81	25.98
Upper Siang	29.28	3.97	17.03	6.28	18.8	12.44	25.12	43.67	9.78	33.64
Dibang Valley	27.27	7.56	24.86	15.86	26.06	28.89	16.4	31.09	5.41	16.6
Lohit	24	5.32	24.09	13.67	34.66	34.31	13.86	30.71	2.74	15.99
Changlang	26.9	6.07	33.77	19.42	25.48	24.9	10.69	21.86	3.16	27.74
Tirap	8.93	1.36	13.57	4.22	31.53	24.75	42.75	59.48	3.22	10.18
Arunachal Pradesh	19.24	3.03	19.33	7.64	28.96	22.37	26.69	43.31	5.75	23.65

Source: Computed from *Agricultural Census*, Government of Arunachal Pradesh, various years.

ANNEXURE TABLE A-12.3

## Share of ST Operated Holdings in Total Holdings and Area in Arunachal Pradesh: 1980-81 to 1995-96

<i>Size Class of Operational Holdings (in Ha)</i>	<i>Share of ST Operated Holdings in Total Holdings and Area</i>							
	<i>1980-81</i>		<i>1985-86</i>		<i>1990-91</i>		<i>1995-96</i>	
	<i>No.</i>	<i>Area</i>	<i>No.</i>	<i>Area</i>	<i>No.</i>	<i>Area</i>	<i>No.</i>	<i>Area</i>
Marginal	96.39	96.77	87.85	94.43	93.75	93.08	88.44	87.7
Small	93.91	95.11	92.9	93.7	93.8	94.63	88.77	88.7
Semi-medium	92.58	93.85	93.24	94.77	97.44	97.81	93.31	93.9
Medium	98.92	99.11	98.4	98.65	98.97	99.08	98.34	98.5
Large	99.63	96.85	99.64	99.54	99.87	99.54	99.44	99.5
All	95.72	97.07	94.01	97.6	96.67	98.38	93.13	96.6

Source: Computed from *Agricultural Census*, Government of Arunachal Pradesh, various years.



ANNEXURE TABLE A-12.4

**Size Class-wise Distribution of Operational Holdings among Scheduled Tribes  
(Arunachal Pradesh): 1970-71 to 1995-96**

Size Class of Operational Holdings (in Ha)	Share in Total Holdings							
	1980-81		1985-86		1990-91		1995-96	
	No.	Area	No.	Area	No.	Area	No.	Area
Marginal	16.65	2.24	16.05	2.59	16.85	2.72	19.09	2.67
Small	20.36	6.75	18.64	6.74	17.86	7.22	18.45	6.84
Semi-medium	27.21	17.22	30.92	21.17	32.26	23.86	28.37	21.78
Medium	29.04	39.69	28.27	40.61	27.81	42.43	28.38	45.72
Large	6.75	34.10	6.11	28.89	5.21	23.77	5.71	22.99
All	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Computed from *Agricultural Census*, Government of Arunachal Pradesh, various years.

ANNEXURE TABLE A-12.5

**Average Size of Holdings in Arunachal Pradesh: 1970-71 to 1995-96**

Size Class of Operational Holdings (in Ha)	1970-71	1975-76	1980-81	1985-86	1990-91	1995-96	2000-01
Marginal	0.57	0.61	0.59	0.62	0.61	0.48	0.50
Small	1.44	1.42	1.43	1.49	1.51	1.28	1.32
Semi-medium	2.78	2.77	2.73	2.80	2.78	2.62	2.66
Medium	5.95	6.17	5.97	5.95	5.75	5.53	5.77
Large	17.11	18.39	22.74	19.65	17.27	13.84	16.13
All size classes	6.19	5.95	4.31	4.00	3.71	3.31	3.69

Source: Computed from *Agricultural Census*, Government of Arunachal Pradesh, various years.

ANNEXURE TABLE A-12.6

**Extent of Tenancy across Size Classes of Operational Holdings (Arunachal Pradesh): 1970-71 to 2000-01**

*(as Percentages to Total Operational Holdings)*

Year	Type	Marginal	Small	Semi-medium	Medium	Large	All Size Classes
1970-71	Self Operated	99.67	99.47	99.71	99.76	100	99.75
	Partly Leased in	0.33	0.53	0.29	0.24	0	0.25
	Wholly Leased in	0.17	0.63	0	0	0	0.1
1976-77	Self Operated	90.41	98.18	99.52	99.29	99.11	98.26
	Partly Leased in	6.69	1.57	0.38	0.66	0.89	1.38
	Wholly Leased in	1.47	0.25	0.1	0.05	0	0.23
1980-81	Self Operated	97	98.39	97.19	98.43	99.27	97.89
	Partly Leased in	1.26	1.39	2.57	1.54	0.73	1.7
	Wholly Leased in	1.74	0.21	0.24	0.02	0	0.41
1985-86	Self Operated	99.26	98.12	97.85	99.54	99.66	98.7
	Partly Leased in	0.6	1.85	1.95	0.46	0.34	1.21
	Wholly Leased in	0.14	0.03	0.2	0	0	0.09
1990-91	Self Operated	99.41	98.85	98.28	99.38	99.68	98.95
	Partly Leased in	0.47	1.15	1.56	0.6	0.32	0.97
	Wholly Leased in	0.12	0	0.17	0.02	0	0.08
1995-96	Self Operated	97.94	97.7	99.24	99.31	98.41	98.66
	Partly Leased in	1.35	0.94	0.03	0	0	0.46
	Wholly Leased in	0.71	1.35	0.73	0.68	1.59	0.88
2000-01	Self Operated	95.51	99.36	99.36	99.00	96.91	98.59
	Partly Leased in	2.27	0.37	0.14	0.08	0.30	0.47
	Wholly Leased in	2.18	0.27	0.50	0.92	2.80	0.93

Source: Computed from *Agricultural Census*, Government of Arunachal Pradesh, various years.

ANNEXURE TABLE A-12.7

## Extent of Tenancy in Arunachal Pradesh: 1970-71 to 1995-96

Size Class of Operational Holdings (in Ha)	Percentage of Leased-in Holdings to Total Holdings											
	1970-71		1976-77		1980-81		1985-86		1990-91		1995-96	
	No.	Area	No.	Area	No.	Area	No.	Area	No.	Area	No.	Area
Marginal	0.50 [10.71]	0.12 [2.02]	8.17 [49.30]	3.64 [19.06]	3.00 [23.55]	1.81 [6.01]	0.74 [9.04]	0.32 [3.81]	0.59 [9.71]	0.29 [2.84]	2.07 [23.09]	2.39 [30.90]
Small	1.16 [39.29]	0.14 [9.41]	1.82 [20.71]	0.65 [14.95]	1.61 [15.82]	0.80 [8.09]	1.88 [27.58]	0.57 [18.00]	1.15 [20.12]	0.42 [10.78]	2.30 [38.36]	1.57 [33.05]
Semi-medium	0.29 [21.43]	0.08 [22.37]	0.48 [8.25]	0.15 [10.12]	2.81 [37.50]	1.58 [41.53]	2.15 [52.17]	0.57 [56.37]	1.72 [52.58]	0.58 [47.45]	0.77 [17.27]	0.23 [16.13]
Medium	0.24 [25.00]	0.03 [27.73]	0.71 [12.09]	0.17 [25.63]	1.57 [20.89]	0.71 [40.47]	0.46 [9.67]	0.09 [15.77]	0.62 [16.08]	0.24 [35.39]	0.68 [13.36]	0.09 [13.62]
Large	0.00 [0.00]	0.00 [0.00]	0.89 [9.65]	0.11 [30.24]	0.73 [2.23]	0.08 [4.00]	0.34 [1.54]	0.05 [6.04]	0.32 [1.52]	0.04 [3.53]	1.59 [7.96]	0.11 [6.31]
All	0.35 [100]	0.04 [100]	1.60 [100]	0.19 [100]	2.11 [100]	0.68 [100]	1.30 [100]	0.22 [100]	1.05 [100]	0.29 [100]	1.34 [100]	0.30 [100]

Note: Figures within square brackets refer to percentage to column totals.

Source: Computed from *Agricultural Census*, Government of Arunachal Pradesh, various years.

ANNEXURE TABLE A-12.8

## Coefficient of Variations in Area, Production and Yield of Crops in Arunachal Pradesh: 1980-81 to 2004-05

Crop/Crop Group		Coefficient of Variation			
		1980-81 to 2004-05	1980-81 to 1989-90	1990-91 to 1999-2000	2000-01 to 2004-05
Rice	A	9.399	12.716	3.626	2.036
	P	13.725	15.698	10.263	7.555
	Y	6.618	3.643	7.195	6.994
Maize	A	15.844	16.364	5.632	2.666
	P	21.929	19.406	3.085	3.225
	Y	8.857	3.491	6.343	2.808
Millet	A	12.320	17.124	8.373	5.711
	P	12.479	11.745	10.910	9.705
	Y	12.404	15.944	5.400	4.343
Wheat	A	17.485	26.221	11.507	5.359
	P	22.658	29.170	18.822	18.874
	Y	16.805	19.366	15.905	16.189
Cereals	A	9.711	13.068	2.947	1.983
	P	14.006	15.392	6.807	5.948
	Y	5.951	3.392	4.733	4.742
Pulses	A	44.135	54.182	9.149	6.004
	P	55.226	64.222	16.905	5.475
	Y	21.602	21.497	9.230	1.360
Foodgrains	A	10.402	13.543	2.670	2.097
	P	14.689	15.837	6.419	5.899
	Y	5.898	3.234	4.612	4.584
Vegetables	A	25.404	15.120	6.141	6.197
	P	21.321	25.755	5.731	3.555
	Y	12.846	14.147	6.463	6.768
Oilseeds	A	33.830	35.350	7.015	3.060
	P	40.643	40.628	7.355	5.167
	Y	12.971	13.798	6.446	3.561
Spices	A	51.128	24.637	27.098	1.530
	P	82.821	43.656	48.506	6.116
	Y	48.385	20.816	27.997	5.054
Sugarcane	A	39.245	29.301	32.496	14.866
	P	39.808	58.423	25.130	12.455
	Y	27.496	41.229	11.443	7.036

Note: All growth rates are compound growth rates. A= Area, P= production and Y= yield.

Source: Computed from figures provided in *Statistical Abstract of Arunachal Pradesh*, various years.

ANNEXURE TABLE A-12.9

## Distance Covered by Farmers for Inputs in Arunachal Pradesh: 2003

Name of the Input	Crop Season	Distance Covered by Percentage of Farmer Households						
		Within Village	<2	2-5	5-10	10-20	≥20	Non Response
Fertiliser	K	10.7	7.5	7.0	5.7	31.8	36.5	0.8
	R	1.3	10.6	11.8	5.8	31.7	38.1	0.6
Organic Manure	K	20.3	7.2	2.9	6.4	24.5	37.1	1.6
	R	14.2	9.0	7.3	5.1	27.3	36.5	0.6
Improved Seeds	K	2.1	8.5	5.5	7.9	31.1	44.0	0.9
	R	0.5	9.9	9.5	5.0	35.3	39.8	0.0
Pesticides	K	6.2	1.8	16.9	25.5	24.2	8.4	0.0
	R	2.6	10.0	11.2	5.3	32.5	38.4	0.0
Veterinary Services	K	7.5	8.0	6.3	12.2	28.2	36.8	0.9
	R	1.8	10.9	10.2	15.4	25.6	36.0	0.0

Note: Distance is in Kms. K = Kharif, R = Rabi.

Source: NSS Report No:596, Situation Assessment Survey of Farmers, Some Aspects of Farming, NSS 59<sup>th</sup> Round (Jan.-Dec., 2003).

ANNEXURE TABLE A-12.10

## Educational Levels of Farmers in Arunachal Pradesh

Educational Standard	Percentage of Farmers in Farmer Households 7 Years and above					
	Arunachal Pradesh			All India		
	Male	Female	Total	Male	Female	Total
Not Literate	43.8	57.9	50.5	35.1	69.2	48.8
Literate without Formal Education	1.9	3.0	2.4	1.7	0.9	1.4
Literate below Primary	9.4	8.2	8.8	10.1	6.4	8.6
Primary	14.7	12.5	13.6	15.7	10.2	13.5
Middle	19.5	11.7	15.8	18.8	8.5	14.7
Secondary	7.7	5.5	6.7	10.0	3.2	7.3
High School	2.9	1.3	2.1	4.8	1.1	3.3
Diploma	0.0	0.0	0.0	0.4	0.1	0.3
Graduate	0.1	0.0	1.0	2.6	0.3	1.7
Postgraduate	0.0	0.0	0.0	0.7	0.0	0.4

Source: NSS Report No: 596, Situation Assessment Survey of Farmers, Some Aspects of Farming, NSS 59<sup>th</sup> Round (Jan.-Dec., 2003).

ANNEXURE TABLE A-12.11

## District-wise Crop Area and Production of Horticulture Fruits and Spices during 2004-05

Districts		Fruits							Spices			Total
		Apple	Walnut	Kiwi	Citrus	Pineapple	Banana	Others	Large Cardamom	Black Pepper	Ginger	
Tawang	A	1808	1102	18	56	-	16	181	-	-	37	3218
	P	2280	17	3	19	-	3	387	-	-	61	2770
Bomdilla	A	5357	1415	97	159	19	74	313	172	26	50	7684
	P	7005	31	53	20	-	82	1268	29	-	152	8640
Seppa	A	120	81	-	504	58	151	279	140	94	80	1507
	P	-	-	-	79	4	215	784	55	2	185	1324
Papum Pare	A	-	23	-	447	188	221	399	261	203	81	1823
	P	-	-	-	89	912	347	984	9	7	182	2530
Ziro	A	821	513	32	527	36	310	384	305	26	82	3036
	P	189	10	3	787	10	691	2779	45	-	240	4754
Daporijo	A	37	8	-	3564	835	300	131	259	31	110	5275
	P	-	-	-	2919	3500	1148	644	33	2	220	8466
Kurum Kumey	A	-	-	-	304	43	130	6	194	15	75	821
	P	-	-	-	155	4	131	103	9	-	7	409
Along	A	64	52	4	8355	4078	770	477	405	194	907	15306
	P	-	-	-	9707	21846	1446	1104	66	17	4864	8794
Pasighat	A	-	-	2	4535	1122	576	1077	355	330	797	8794
	P	-	-	-	7764	4139	4041	1537	54	28	4111	21674
Anini	A	106	124	25	191	-	63	41	81	26	371	1028
	P	-	-	3	117	-	351	119	14	4	1893	2501
Roing	A	3	6	1	727	99	571	390	381	113	3318	5609
	P	-	-	-	351	1649	526	1063	52	18	17028	20687
Lohit	A	27	52	1	1596	133	325	581	407	244	1239	4605
	P	-	-	-	559	456	1274	835	73	32	6689	9918
Changlang	A	37	27	-	483	663	475	735	328	96	108	2952
	P	-	-	-	303	2369	1290	1286	40	-	122	5410
Tirap	A	-	55	2	804	119	600	513	605	192	223	3113
	P	-	-	-	306	95	1008	1374	62	23	608	3476
Total	A	8403	3516	190	23360	7913	4914	5916	4142	1612	7618	67584
	P	9474	58	62	27251	36310	14817	15262	572	133	36666	140605

Note: A=Area in hectares, P=Production in Metric tonnes.

Source: Annual Report 2004-2005, Department of Horticulture, Government of Arunachal Pradesh.

ANNEXURE TABLE A-12.12

## Present Area and Production of Horticulture Crops and Percentage Increase over Pre-Mission Period

(area in hectare and production in metric tonnes)

Crops	2004-05 Post-Mission Period			2001-02 Pre-Mission Period			Percentage Increase over Pre-Mission Period	
	Area	Production	Surplus Production	Area	Production	Surplus Production	Area	Production
Fruits								
Apple	8403	9474	6632	6852	8588	5153	22.6	10.3
Walnut	3516	58	41	2374	51	31	48.1	13.7
Kiwi	190	62	44	55	5	NA	245.5	11.40
Citrus	23360	27251	19076	19626	24232	14540	19.0	12.5
Pineapple	7913	36310	25417	7549	22289	19374	4.8	62.9
Banana	4914	14817	10372	3958	13302	7982	24.2	11.4
Others	5916	15262	10683	4360	10953	6572	35.7	39.3
Total	54212	103234	72265	44774	79420	53652	21.1	30.0
Spices								
Large Cardamom	4142	572	400	2342	512	307	76.9	11.7
Black Pepper	1612	133	93	820	118	71	96.6	12.7
Ginger	7618	36666	25666	6579	32295	19377	15.8	13.5
Total	13372	37371	26159	9741	32925	19755	37.3	13.5
Grand Total	67584	140605	98424	54515	112345	73407		
Medicinal Plants	750	NA	NA	NA	NA	NA	NA	NA
Aromatic Plants	1307	7000	6000	NA	NA	NA	NA	NA

Note: NA = Not Available.

Source: Annual Report 2004-05, Department of Horticulture, Government of Arunachal Pradesh.

ANNEXURE TABLE A-12.13

## Targeted Area and Production of Different Horticulture Crops up to 2010

Crops	2005-06		2006-07		2007-08		2008-09		2009-10	
	A	P	A	P	A	P	A	P	A	P
Fruits										
Apple	8070	11544	8554	12467	9067	13464	9611	14541	10188	15704
Citrus	24066	30629	25509	33079	27040	35725	28662	38538	30381	41621
Pineapple	8932	40643	9468	43894	10036	47405	10638	51197	11276	55292
Banana	4368	16688	4630	18024	4907	19466	5201	21023	5513	22705
Walnut	2854	73	3025	80	3206	86	3398	102	3602	110
Other Fruits	6319	19757	6698	21332	7100	23038	7526	24881	7977	26871
Total	54609	119334	57884	128876	61356	139184	65036	150282	68937	162303
Spices										
Large Cardamom	2734	655	2898	707	3072	764	3256	825	3451	891
Black Pepper	814	188	863	203	915	219	970	237	1028	256
Other Spices	7911	37631	8386	40641	8888	43892	9421	47403	9986	51195
Total	11459	38474	12147	41551	12875	44875	13647	48465	14465	52342
Grand Total	66068	157808	70031	170427	74231	184059	78683	198747	83402	214645

Note: A=Area in hectares, P=Production in metric tonnes.

Source: New Agriculture Policy 2001, Department of Agriculture, Government of Arunachal Pradesh.



ANNEXURE TABLE A-12.14  
Livestock in Arunachal Pradesh: 1978-79 to 1997-98

<i>Livestock</i>	<i>Type</i>	<i>1978-79</i>	<i>1988-89</i>	<i>1991-92</i>	<i>1997-98</i>
Cattle	Male over 3 yrs	49611	111464	126215	155166
	Female over 3 yrs	58427	85697	99004	144413
	Young Stock	43405	54669	52968	153341
Buffalo	Male over 3 yrs	2131	3311	2452	1405
	Female over 3 yrs	5557	4426	4064	4160
	Young Stock	3643	1396	1934	5985
Sheep		19041	28742	32774	28245
Horses & Ponies		5196	5472	5814	6678
Pigs		206963	242853	221062	275372
Goats		76949	108389	127956	183826
Other Livestock		94881	112114	196660	229330
Total Livestock		565804	758533	870903	1187921
Poultry		965123	1086832	1113391	1164700

*Source:* Computed from figures in *Statistical Abstract of Arunachal Pradesh*, various years.

## Chapter 13

# Indigenous Industries

### Introduction

Indigenous industries essentially present a picture of embeddedness. These operate not separately but form a component in the domain of economic activities embedded in the culture of the people. Indigenous industries are associated with the indigenous skill and knowledge system of the community. The importance of indigenous industries derives from the fact that they are the embodiment of the skills accumulated over many generations. Refinement and improvement of the traditional skills into the modern industrial skills is a challenging task especially in Arunachal Pradesh where modern industries are yet to make a breakthrough.

The basic characteristics of the indigenous industries are as follows:

- They are undertaken for the fulfilment of the immediate needs of the households.
- These industries have their community-specificity.
- Skills and knowledge are passed to future generation, within the communities and households.

With the modern industries having not yet made much headway in the State, the indigenous industries have retained their importance in employment and income. Therefore, in the development perspective, the aims of the chapter are to analyse:

- Status of the indigenous industrial activities.
- Demand base of the indigenous products.
- Relative position of the indigenous industrial activities in the total economic activity of the household in terms of employment and income.
- Possibilities of linking industries to market, and
- Policy formulation.

### Status of Indigenous Industrial Activities

The indigenous industries can be seen from two broad perspectives. First, activities bearing on fulfilment of basic material needs like food, clothing, shelter, etc., and second, having a bearing on spiritual needs of the people. However, these activities are now undergoing changes and are becoming diversified. The tribes of Arunachal Pradesh have different types of manufacturing activities as shown in Table 13.1.

Industrial Activities	Tribes in which Popular	Nature of Products
Textile	Monpa, Miji, Apatani, Galo, Adi, Khampti, Mishmi, (Idu, Mizu Digaruh), Nyishi, Tagin, Singpho, Wancho, Tangsa, and Hill Miri.	Skirt, blouse, shawl, coat, carpet, bag, lungi, loin, cloth, etc.
Basketry	Almost in all tribes.	Baskets for different uses, mats, etc.
Pottery	Monpa, Nyishi, Adi and Apatani.	Earthen vessels, plates, etc.
Ornaments	Monpa, Khampti, Mishmi, Adi, Nyishi, and Nocte.	Beads, necklace, ear-ring, bracelet etc.
Wood Carving, mask, etc.	Monpa, Khampti, Nocte, Wanchos, Tangsa, Memba, Khamba and Sherdukpens.	Statues, stair, masks, drum, mortar and pestle, monger, etc.
Head-dress	Monpa, Adi, Galo, Nyishi, Apatani, Hill Miri, Mishmi and Nocte.	Hats of different varieties.
Painting/Scroll Painting	Monpa, Miji, Khampti, Memba, Khamba and Meyor.	Scroll painting, wall painting, etc.
Dying	Monpa, Adi, Nyishi, Khampti, Tangsa, Wancho, Singpho, Apatani and Mishmi.	Preparing vegetable colour and dying.
Smithy	Nyishi, Puroik (Sulung) Adi, Mishmi and Nocte.	Dao, spear and arrow heads, knife, axe, scrapper, etc.
Local wine	All tribes.	Home brewed wine from rice, millet, etc.
Leather Salt	Monpa and Adi Nocte	Shoe, hover sack, etc. Salt

Source: Field data.

Textile products are not same in all the tribes. For example, the Khamptis, the Singphos and the Tangsas exclusively make *lungi*, while carpet-making goes with Monpa identity. The Akas and the Noctes hardly have the traditions of weaving; they mostly depended on neighbouring people. Presently, they have also taken up weaving. The Puroiks (Sulungs) are expert in weaving and iron smithy. Interestingly, the tribes which had the tradition of weaving, have now diversified their products. Mention may be made of Apatanis who make neckties, shirts and baby suits. Weaving has not remained as an activity in households to meet the requirement of its members; it has now entered in the organised sector where its products are marketed beyond the community. *Adi Gale* (skirt for women) now has a good demand in almost all the districts of the State. Similarly, *Lupling* (Adi coat) traditionally for rich people, is now produced in different designs and colours for wider market. Efforts have been made to improve technology through training and supply of improved looms.

Technological improvement has spread to other indigenous industries. For example, traditional baskets are improved with lids. Manufacturing of cane stool, chair, and teapoy are very common among the Adis and Apatanis. The making of masks and drums still continues. The masks are now used as toy objects. Earlier, a statue was not separated from its maker in the belief that his soul would pass on to the stranger with the statue (Elwin, 1958; 1988). The statues were made for specific purposes. But presently statues of different varieties are made for sale also. In Nocte community, for example, statues of Jesus, animals and birds are made for the market. In general, the skill in wood carving and basketry is extended to produce such items as pen-stand, candle-stand, artificial flower, table mats, plastic cane bags of different sizes and purposes, flower vessels, wooden elephant, swan, snake, peacock, letter-box, tray, cane toy, bottle holder, purse, chair, table, stool, etc., for market purpose. Though basketry is a male activity, it is not a taboo for women. At Pasighat, Roing and Khonsa, it was found that women are fondly engaged in making plastic cane bags.

Scroll painting and wall painting is still a skill preserved in Buddhist tribes though they use synthetic dyes in place of earlier vegetable dyes. Obviously dying skill and practice is no more in use. Similarly, manufacturing of ink, salt and pottery items has been discontinued since long. However, paper is still made in Monpa area, though it has disappeared in Khampti area. So is the case with hydro-powered mills. These mills are in operation in Monpa area only.

The demand for iron and steel products has increased manifold because of diversified occupational and adoption of modern technology in agricultural practices. The increased area under wet rice cultivation has necessitated the use of implements like spade, shovel, plough, etc. Traditional iron-smithy has disappeared except in few pockets of some tribes.

The manufacturing of hats has changed with the inclusion of new inputs. Previously natural cane was the input used; it has been partially replaced by artificial cane. However, the demand is limited to some local people only. Earlier, beads were obtained from Tibet, but now these are mostly manufactured in craft centres. However, they are not valued much like that of the original beads which were brought from Tibet in early days; Tibetan beads have been preserved and are of high value.

The changes in technology in general are the results of governmental promotional drive to industrialise the State through indigenous and other manufacturing activities. The government of Arunachal Pradesh has craft centres and ITIs to develop skill through training. Ten craft centres in the name of Craft Training-cum-Production Centres (CTPCs) were first established during 1953-54 in which common crafts like weaving, cane and bamboo works, sewing, knitting, tailoring, soap making, carpet making, bee keeping, painting, wood carving, pottery and black smithy were introduced taking into consideration the traditional expertise of the people. As in 2004 there were 88 craft and weaving centres, 6 handloom development centres, 18 emporia, 5 showroom-cum-sales counters and 1 research design unit. The craft and weaving centres mostly provide training and improve skills in such activities in which the people have some traditional expertise. However, the two ITIs of the State provide training in non-traditional trade like electrician, fitter, mechanic, wiremen, draftsman, carpentry, welder, plumber, surveyor, secretarial practice, etc. Except carpentry, people did not have any traditional skill or familiarity with new trades.

### Salient Features of Indigenous Industries

*Technology:* Technology used in the production is basically simple and unsophisticated in nature. The only metal equipment that is invariably used is iron knife (*dao*). Tools like loom are made of wood, bamboo and stone.

*Skill acquisition:* The skill is acquired through imitation and learning by doing. The skill acquisition has a gender dimension as the males do not weave in communities like Adi, Apatani, Nyishi and females do not learn hunting.

Prevalence of skill difference in different types of activities of different persons has resulted in a system of barter exchange of labour.

**Labour:** Reciprocal labour exchange is predominant in all types of production. For example, setting of yarn in the looms requires the participation of three to four women who come from neighbouring household without any wage payment.

**Seasonality:** The traditional manufacturing activities are largely seasonal in nature. Weaving is generally undertaken during off-season. Except very old men, all working male members undertake basketry work during off-season. Seasonality affects the supply of raw materials. Bamboos and canes are not harvested, for example, in all seasons. The dying and drying of papers are not undertaken during rainy season. Seasonality of harvesting, some raw materials and lack of effective preserving technology tend to spread the manufacturing work all over the year.

### Nature of Demand for Traditional Manufacturing

The demand for goods manufactured traditionally has certain distinct characteristics.

**Religious demand:** Idu communities require large quantity of clothes during funeral rites. Robes for the

monks are made by Khampti women in one night on the occasion of Kathing festival. *Mukham* is usually made by Noctes when a new chief assumes his authority ceremonially. Mask have their uses only for pantomimes during festivals.

**Cultural specificity of demand:** In some cases the taste and preference for a product is limited to the tribes, which produces the product. For example, in rural areas, an Adi woman hardly uses Apatani skirt and vice versa. Thus, identity consciousness of the people limits the use of the product.

**Income specificity of demand:** The wealth and income of a family influence the demand of certain articles. For example, Adis produce costly jackets called *Lupling*, which is generally used by the rich people.

**Seasonal specificity of demand:** The indigenous industries are prone to seasonal specificity of demand. For example, clothes are more in demand during winter seasons.

### Changing Nature of Indigenous Industries

**Decline in number of units:** Data related to indigenous industries is not available. However, status of indigenous industrial activities can be understood by taking into account the non-agricultural establishment as reflected in economic censuses of 1977, 1980, 1990 and 1999. There was a consistent increase in number of non-agricultural

TABLE 13.2  
Classification of Industries in Arunachal Pradesh

Sl. No.	Agro-based Industries	Sl. No.	Forest-based Industries	Sl. No.	Mineral-based Industries	Sl. No.	Demand-based Industries
1.	Mustard Oil Mill	1.	Wooden Furniture Units	1.	Stone Crushing Unit	1.	Printing Press Unit
2.	Ginger Drying	2.	Wood-carving	2.	Cement Factory	2.	Barbed-wire
3.	Tea Factory	3.	Cane and Bamboo Product Unit	3.	Ferrous Alloy Unit	3.	Blacksmithy
4.	Horticulture Processing Unit	4.	Saw Mill			4.	Garage
5.	Citronella Oil Unit	5.	Veneer and Plywood Mill			5.	Dry-cleaning Unit
6.	Rice Mill	6.	Handmade Paper Unit			6.	Steel Fabrication Unit
7.	Paddy De-husking Mill	7.	Incense Sticks Manufacturing Unit			7.	Tailoring Unit
8.	Flour Mill					8.	Carpet Making Unit
						9.	Painting Unit
						10.	Xerox Unit
						11.	Electronic Items Service Unit
						12.	Weaving Unit
						13.	Bakery Unit
						14.	Tourism
						15.	Transport

Source: Directorate of Industries, Government of Arunachal Pradesh, Itanagar.

establishment from 4410 in 1977 to 6331 in 1980 and 11193 in 1990. This number declined to 10045 in 1998. The decline in industrial activities can be understood from Table 13.3.

Table 13.3 reveals that around 50 per cent of the small-scale industries were closed as on 31<sup>st</sup> October 2002. The closure rate is higher in rural than in urban areas. The data gives a proxy estimate of the decline in industrial activities in the State in general and indigenous industries in particular.

TABLE 13.3

**Rural-Urban Characteristics of Small-Scale Industries**

Sl. No.	Rural/Urban	No. of SSI Working	Closed SSI Units	% of Closed Units	% to Total Closed Units
1.	Rural	145	183	55.79	72.62
2.	Urban	121	66	36.31	27.38
3.	Total	266	249	48.65	100

Source: Directorate of Industries, Government of Arunachal Pradesh.

*Squeezing of demand:* With the expansion of market even in the interior areas of the State and availability of cheaper substitutes have resulted in diversion of local demand from the indigenous products to the cheaper products from the rest of the country. As a result the demand for indigenous manufactures has been squeezed.

*Product variation:* Market has facilitated in some cases product variation. For example, Apatanis have switched over to the production of indigenously designed neckties, shirts and other clothes. These diversified textile products of the Apatanians have helped them to market their product in a better way. This type of product variation is limited to certain tribes only.

*Decline of mutual reciprocity:* With the emergence of money, economy and the spread of education many people have switched over to better-paid non-traditional activities. As a result, traditional labour supply based on mutual reciprocity is on the decline in the indigenous industries. Wage labour is hired in some cases for production in traditional industries. Thus, the industries have started using a combination of indigenous and non-traditional skills.

### Findings of the Field Survey

- Through indigenous industrial activities some families earn around 25 per cent of their income. Thus the activities are not full-time livelihood options.

- Value added per worker in the indigenous industries is higher than the non-indigenous industries.
- Marketing network is mainly responsible for the low price, that the producers get. This is the reason why in indigenous textiles sector, the value added becomes negative in some cases.
- Demand for the indigenously produced good is very low, because of competition from the substitutes available in the market. The existing demand is because of promotional drive of the government and the NGO sector. This demand is not enough to promote mass production. Further seasonal nature of the demand refuels the process and mass production is discouraged.
- The promotional role of the government and NGOs is restricted to the urban centres only.
- Product diversification is limited to certain tribes only.
- Institutional credit is limited to a few entrepreneurs.

### Potentials and Prioritisation

Of the 12 indigenous activities shown in Table 13.1, three activities namely local wine manufacturing, textile and basketry still have significance in the changing economic life. Textile products with innovations not only meet the changing needs of local consumption but also create a market demand outside the locality and the State. Basketry products with innovations and modifications meet the changing tastes of the people in setting up drawing-rooms and creating market demand. Though local wine is produced in almost all households, it does not have market demand beyond the locality. Salt manufacturing is limited to some brine wells in Barduria and Namsang areas of Noctes in Tirap. Increasing the scale of production depends on investigation into the sustainability of wells, refinement of salt and cost-effective technology of manufacturing. Manufacturing of pottery and ornaments, and the skill of doing has declined. Similarly, leather work and smithy have also declined. Wood carving, scroll painting and head-dress have decreased at some quarters because of the growing middle class and consumerism among the tribes. These products also have a demand base outside. For large scale marketing the products need to be standardised, less expensive and marketed through a marketing network. If these things can be achieved, then the following industrial activities can be promoted.



<i>Activities</i>	<i>Districts</i>	<i>Innovations</i>
Textile	West Kameng, Tawang, East Kameng, Lower Subansiri, East Siang, West Siang, Upper Siang, Lohit, Anjaw, Dibang Valley, Lower Dibang Valley and Papum Pare	Standardisation, marketing network, innovations in colour pattern and design, designing products for use in different occasions by different age groups.
Basketry	All districts	Designing for different uses and for competing available substitutes.
Wood carving	Tirap, Changlang, Lohit, West Kameng, Tawang	Diversification of items to meet market demand for utilitarian and decorative objects.
Headdress	West Siang, East Siang, Upper Siang, West Kameng, Tawang, Tirap, Lower Dibang Valley and Papum Pare	Designing for various uses.
Paper	Tawang, West Kameng	Technological innovation and attractive source of raw materials.
Painting/Scroll painting/Carpet	Tawang, West Kameng	Cost effectiveness
Smith	In all districts (Generally one in each big village but it is declining)	Technological innovation.
Local Wine	All districts	Technological innovation or preservation and flavour.

The number of units in the State for each activity needs to be decided before starting the activities. Too many units will fall victim to competition and be unremunerative.

### Policy Options

- Introduction of better technology to improve the product quality so that it can capture the market outside the State.
- Priority should be determined on the basis of quantification of backward and forward linkages.

- Linkage between indigenous industrial activities and modern industries to be strengthened.
- Identification and promotion of the indigenous industrial products, which enjoy a comparative advantage.
- Institutional credit facilities with procedural simplification may be ensured to the indigenous industries.
- Alternative sources of raw materials may be ensured for the products like incense stick as the existing inputs may not be sustainable in the long run.
- To promote the indigenous industrial activities a state level Commission may be set up.
- Reliable data base may be generated for proper monitoring and evaluation of indigenous manufacturing activities.
- In order to promote the marketing of the indigenous product tie up may be made with the reputed companies. In order to facilitate such tie-ups institutional mechanism may be evolved. Marketing network, preferably marketing cooperatives under public-private partnership may be established starting from at least circle HQ to the state level. The state organisation may solely look after the marketing within the country and abroad (export).
- The marketing network will deal with the provision of raw material supply to manufacturer, producers and product marketing.
- In order to translate industrial potentiality into viable production units training, in production of innovations and issues regarding intellectual property rights may be given top priority.

## Chapter 14

# Development of Resource-based and Modern Industries

### Introduction

In economic literature, connotation of the term industry is not entirely unambiguous. In the context of perfect competition, an industry comprises all firms producing a homogeneous product. In input-output parlance an industry corresponds to production of a particular commodity as per classification of total domestic product into various categories. In more common usage the term is used to mean a manufacturing based production unit as distinct from agriculture and services. However, these days tourism, IT and IT-enabled activities, which essentially fall in the service sector are also referred to as industries. Since the present chapter is concerned with development of resource-based and other modern industries, the meaning of the term industry is confined to manufacturing.<sup>1</sup> It is well known that Arunachal Pradesh has considerable potential for generation of power, especially hydro-power. Hence, power generation is obviously a major prospective resource-based industry. But since power has been dealt with in a separate chapter it will not be discussed in the present chapter. For the same reason the problems and prospects of traditional handicrafts—despite the sector being based on local raw materials and the significant but intangible local resource of traditional skill of the ethno-culturally rich population of the state—will not be discussed here. Thus in this chapter the meaning of the term ‘resource-based and modern industries’ will be confined to such manufacturing activities which are based

on forest<sup>2</sup> and mineral resources of the State and/or which can add value to output of agriculture and related sectors through processing.

### The Status of Manufacturing Industries in Arunachal Pradesh

In the present structural composition of the economy of Arunachal Pradesh manufacturing sector constitutes a rather thin layer. In 2003-04 the sector contributed only 2.05 per cent of net domestic product of the state.<sup>3</sup> This share is very low not only by all-India standard, but even by the standard of the North-eastern region, which is well recognised as one of the least industrialised parts of the country. Not only is the share low but it has been declining steadily through the last decade from 3.20 per cent in 1993-94 to 2.05 per cent in 2003-04. Moreover, at constant prices, the contribution of manufacturing has been declining even in absolute terms in the last four years. Another feature, rather a weakness, of the manufacturing base of the State is that the entire value addition from manufacturing takes place in the unregistered segments, while in the most parts of the country the registered segment is more dominant. Here in Arunachal Pradesh this segment is conspicuous by its absence.

The decline in industrial production can be largely traced to the closure of plywood and other timber processing units following the restrictions imposed on felling of trees in Arunachal Pradesh by the Supreme

1. Oxford Advanced Learner's Dictionary (Oxford University Press 2000) gives the first two meanings of ‘industry’ as “the production of goods from raw material especially in factories” and “the people and activities involved in producing a particular thing or providing a particular service”. ‘Manufacturing’ on the other hand has been defined as “the business or industry producing goods in large quantities using machinery”.
2. The techno-economic survey of the State conducted in late 1960s by the National Council for Applied Economic Research (1967: 63-79) identified forests and hydro-power as the physical resources for immediate development. While forest-based plywood industry flourished in the State till a few years back, the hydro-power potential remains yet largely untapped.
3. Table 36.9, *Statistical Abstract of Arunachal Pradesh*, 2004.

Court of India in 1996. Forest-based industrial units had come up and were functional till 1996. The plywood industry clustered in the three contiguous districts of Dibang Valley, Lohit and Tirap in the eastern part of the State<sup>4</sup> (Table 14.2) and the cluster actually extended up to the neighbouring Tinsukia district of Assam.

**TABLE 14.1**  
**Position of Manufacturing in the Economy**  
**of Arunachal Pradesh**

Year	Percentage Share of Manufacturing in NSDP at Current Prices			Contribution of Manufacturing to NSDP at 1993-94 Prices (in lakh Rupees)
	Registered	Unregistered	Total	
1993-94	0	3.20	3.20	2536
2001-02	0	2.31	2.31	2903
2002-03	0	2.22	2.22	2751
2003-04	0	2.05	2.05	2734

Source: Statistical Abstract of Arunachal Pradesh 2004, Directorate of Economics and Statistics, Government of Arunachal Pradesh, Pages 111 and 112.

**TABLE 14.2**  
**District-wise Wood-based Industries in**  
**Arunachal Pradesh (as in 1985)**

Sl. No.	Name of District	Plywood Mills	Saw-cum-Veneer Mills	Saw Mills	Total
1	Tawang	-	-	3	3
2	West Kameng	1	2	-	3
3	East Kameng	-	1	7	8
4	Lower Subansiri	-	2	10	12
5	Upper Subansiri	-	-	3	3
6	West Siang	-	-	7	7
7	East Siang	-	-	9	9
8	Debang Valley	2	-	11	13
9	Lohit	1	3	11	15
10	Tirap	9	9	6	24
	Total	13	17	67	97

Source: Forest Statistics, 1985, Chief Conservator of Forest, Government of Arunachal Pradesh.

Closure of the timber-based industrial units has left the State with hardly any medium and large scale resource-based industrial units. Virtually all industrial activity now in existence in the State is in the small scale sector. Details about the sector are presented in Table 14.3.

Table 14.3 reveals that industrial activity is most vibrant in the Papum Pare district which contributes 67 per cent of the output and 26 per cent of employment generated in these units and also has the best output investment ratio in the State. This is incidentally the district where the state capital is located and which has a relatively high density of population, more than half of which is concentrated in urban area.<sup>5</sup> The district also has the highest infrastructure index value in the State. Though Lohit and West Siang have larger number of industrial units, the shares in output of the two districts are disproportionately lower. The third SSI survey<sup>6</sup> finds that incidence of industrial sickness is rather high as 52 per cent of surveyed units were found sick.

The case of Arunachal Pradesh amply clarifies that availability of natural resources alone does not necessarily lead to industrialisation of a location. In India, the entire North-east and states like Jharkhand and Chhattisgarh which are recognised as rich in natural resources have lagged behind in industrial growth as well as in the pace of overall economic development. In contrast, states like Gujarat, not as richly endowed with natural resources, have prospered as location of industries. Prospects of Arunachal Pradesh as location of resource-based and other modern industries needs to be assessed keeping in view conditions which have a bearing on location and growth of industries in a specific region.

### Strengths and Weaknesses of Arunachal Pradesh as Location of Resource-based and Modern Industries in the Existing Environment

The theories of industrial location seek to explain the phenomenon of industrial location in terms of a variety of factors. Though the attempts to synthesise these theories have not been greatly successful, it may be useful to list the different factors which have been identified to have some bearing on location of industries. Narayan (1997) has enlisted these factors as: (a) availability of efficient and economic labour, (b) availability of raw materials and their proximity, (c) cheap and quick credit supply, (d) a network of transport system, (e) marketing facilities, (f) conducive natural and economic climate, (g) availability of efficient and effective management personnel, (h) presence of scientific and technological know-how, (i) sound, stable and well-consolidated

4. This was indeed one of the two locations for forest-based industries recommended in the techno-economic survey report of the State by the National Council of Applied Economic Research (1967: 144-145).

5. Table No. 12, page 6 of Statistical Abstract of Arunachal Pradesh 2004.

6. Third SSI Survey (2005), Department of Industries, Government of Arunachal Pradesh.

**TABLE 14.3**  
**Some Details of the Small Scale Industrial Units in Arunachal Pradesh as in 2003-04**

District	SSI Units		Persons Employed		Total Investment		Output		Infrastructure Index	Output Investment Ratio
	No	% share	No	% share	In Rs Lakhs	%share	In RsLakhs	%share		
Tawang	15	5.64	90	2.92	14.14	0.95	14.91	0.44	3.87	1.054
West Kameng	18	6.77	298	9.66	20.53	1.38	102.02	3.04	2.76	4.969
East Kameng	4	1.50	24	0.78	2.18	0.15	14.8	0.44	1.43	6.789
Papum Pare	46	17.29	811	26.29	242.15	16.33	2246.37	67.03	4.96	9.277
Lower Subansiri	12	4.51	62	2.01	16.73	1.13	22.35	0.67	2.56	1.336
Upper Subansiri	5	1.88	34	1.10	17.19	1.16	16.38	0.49	2.16	0.953
West Siang	52	19.55	670	21.72	248.44	16.76	237.09	7.07	3.01	0.954
East Siang	16	6.02	180	5.83	91.19	6.15	69.3	2.07	4.04	0.760
Upper Siang	1	0.38	10	0.32	4.98	0.34	4.22	0.13	2.10	0.847
Dibang Valley*	6	2.26	30	0.97	6.83	0.46	8.64	0.26	1.69	1.265
Lohit	60	22.56	414	13.42	57.47	3.88	44.83	1.34	2.17	0.780
Changlang	22	8.27	336	10.89	633.4	42.73	461.61	13.77	3.44	0.729
Tirap	9	3.38	126	4.08	126.97	8.56	108.97	3.25	3.66	0.858
<b>Arunachal Pradesh</b>	<b>266</b>	<b>100</b>	<b>3085</b>	<b>100</b>	<b>1482.49</b>	<b>100</b>	<b>3351.36</b>	<b>100</b>	<b>2.91</b>	<b>2.261</b>

Note: \*Including Lower Dibang Valley.

Source: Statistical Abstract of Arunachal Pradesh 2004, Directorate of Economics and Statistic and Human Development Report of Arunachal Pradesh 2005, Department of Planning, Government of Arunachal Pradesh.

political atmosphere, (j) existence of complementary industries, and (k) historical and regional importance. Though the list of factors appears to be exhaustive, all of them are usually not available in any location. All the factors are also not equally important for each and every industry. Hence, the net impact of the favourable factors over the unfavourable factors in a specific location compared to the same in other competing locations become decisive for industries to come up and get established in a region or place.

Some of the above-listed factors having bearing on location of industries can be dealt with relatively easily with suitable policy instruments. Cheap and quick credit supply, and political atmosphere are some such factors. For factors such as technological know-how and management personnel, the State can rely on imports when and till they are not locally available. The most critical of the factors from the list in the previous section for establishment of industries and consolidation of industrial base in the State appears to be market access, availability of skilled labourers, transportation network and the quantity and quality of natural resources for industrial exploitation. These four factors are thus worth some detailed discussion. As it stands today, Arunachal

Pradesh appears to have some disadvantages with regard to the first three of the four factors.

### Market and Access

Locally the size of the markets is limited by small and dispersed population with not particularly high levels of income.<sup>7</sup> The fact that the small scale industry sector is doing relatively better in the more urbanised and prosperous Papum Pare district, makes the point that, had the markets in general been bigger, there would have been more support for industrial activity to thrive. The linkage with markets outside is difficult for the North-east region as a whole because of its relative isolation from the mainland and the weak economic conditions in the neighbouring countries of Myanmar and Bangladesh. This difficulty is more severe for Arunachal Pradesh because of its location within the region and also its mountainous terrain. The mountainous and landslide prone nature of the terrain makes travel and transportation within the State uncertain and costly in terms of both time and money. This creates a hindrance for gathering bulky natural resources at central locations for industrial use. Transportation problems also weigh against locating industries in the State if the finished products are to be

7. This point was made in the industrial potential survey report of the State prepared by the Industrial Development Bank of India (1972: 39) also.

disposed of mostly in markets outside the State. Indeed the third SSI survey found that out of the total sick industrial units in the State, 46 per cent reported lack of demand as the main reason of sickness. Marketing of the products and non-availability of raw materials were cited as the second and the third most important reasons of sickness.

### *Industrial Workforce*

Non-availability of ready industrial workforce can also be a disincentive for locating industrial units in the State. If labour has to be brought from outside, obviously it would be costlier to locate an industry in the State than to locate it near the source of labour supply. Moreover, if industrialisation has to depend primarily on in-migrant workers, the participation of the local population in the process of industrial development will be concomitantly reduced. Hence, the contribution of industrialisation towards achieving development goals will be limited.

### *Resource Base*

On paper the State definitely has significant advantage for industrial location in terms of availability of natural resources.

### **Minerals**

The chapter on natural resource management (Chapter 7) in this report gives an account of 11 different mineral deposits which have been identified in various locations of Arunachal Pradesh. The estimated reserves of many of these are however, yet to be ascertained.<sup>8</sup> Obviously there is scope for further exploration and more detailed estimation exercise. From the figures in Table 7.1 of that chapter, the limestone deposit appears to be most substantial and prospective. Significantly, the larger part of the identified limestone deposit is located in three contiguous districts of East Siang, Dibang Valley and Lohit in the north-eastern bend of the State. This limestone belt running across these three districts thus can become a seat for a prospective cement industry. Critical factors here of course will be the specific locations and their accessibility, and the quality of the deposits. Moreover, if the finished product is to be marketed outside, transportation from the industrial site to the market will also be a crucial factor for the viability of the industrial units.

Even if the amount of deposits of the rest of the minerals are not adequate for feeding viable industrial units within the State, mining of these deposits should be started to the extent that the minerals can be traded profitably. Emergence of modernised mining activities, besides generating income and employment directly, can turn conditions favourable for emergence of modern industrial activities in the State.

### **Forests**

In view of the extensive forest cover<sup>9</sup> of the State it is natural to expect that the State has prospect for development of forest-based industries. The closure of the plywood mills and other timber processing units and resultant displacement of employees is still a sensitive issue in Arunachal Pradesh. *Prima facie* there is a case for compensation to the State for this restriction imposed on using forest resources for economic gains. But at the same time it is imperative to recognise the hazard of unrestricted commercial exploitation of forest. Forests, besides providing raw materials for industrial use, perform various other economic roles including providing firewood and other livelihood support to the poorer sections. Since these additional social benefits are usually not internalised in the commercial profit calculation of forest-based industrial units, the social cost of destroying forests for industrial exploitation is generally underestimated. Social cost-benefit analysis of forest-based industrial units need to take into account these externality benefits of forests which will be foregone if forests are degraded in course of their industrial exploitation. Since in any case, unrestricted commercial exploitation of forests cannot be sustained over a long period of time, forest-based industries will have only a short life span unless adequate care is taken for conservation of the raw material source. Hence, it is advisable that a revival of forest-based industrial activities should be encouraged to the extent that extraction of raw materials from forests does not seriously outstrip their sustainable yields.

A study by the Indian Institute of Entrepreneurship identifies paper, handmade paper, forest plantation, tea and coffee, herbal medicinal (*ayurvedic* type), saw mill, cane and bamboo furniture, wooden furniture, sports goods, bamboo ply (laminated bamboo), wooden electrical

8. In fact, the National Council of Applied Economic Research (1967) report was of the view that mineral resources as known at that time were insufficient to start any worthwhile industrial development programme.

9. As per the Basic Statistics of North Eastern Region 2002 Arunachal Pradesh has about 51.5 thousand sq. km. i.e., 82 per cent of its total geographical area under forest. (Government of India, 2002, pp. 44-45).



accessories, particle board, etc., as prospective forest-based industries in the State.<sup>10</sup>

### Agriculture

In view of the predominance of agriculture in the economy of the State, the case of agro-processing as a prospective modern manufacturing activity is worth some discussion here. Because of its strong backward linkage<sup>11</sup> with the agriculture sector and its potentials to contribute to the growth of rural income and employment, agro-processing has received serious attention of policymakers in recent years and special fiscal incentives have been provided by the Central government for its expansion. Commissioned studies by a number of agencies such as the Tata Consultancy Service, Indian Institute of Entrepreneurship and NEDFi<sup>12</sup> on industrial potentials of the State have highlighted potential of this sector. Some of the specific agro-based industrial activities identified are: tapioca processing for production of sago and starch, brewing of fruit-based alcoholic beverages, ginger processing/dehydration, apple cultivation and processing, processing of citrus fruits, cold storages, multipurpose fruits and vegetables processing. Notwithstanding the potentials, the emergence of the agro-processing industry will be conditional upon the growth and development of the agriculture sector. The existing subsistence-oriented agriculture obviously cannot provide the input base for such processing activity. But as agriculture gets increasingly commercialised and marketable surpluses appear in sizeable quantities to feed viable modern agro-processing plants, the industry can come up. Indeed agriculture and agro-processing industry can then mutually reinforce each other's growth.

### Government Policy Incentives

"Because governments structure so much of our lives, they have tremendous influence over industrial location. They exercise these influence in regulation of markets, maintenance of macroeconomic conditions, the location of their own activities, their procurement policies and in their deliberate attempts to manage the location of private investment." (Harrington and Warf, 1995: 195)

In this context it is pertinent to examine whether government interventions, especially the measures and

policies to promote industrial development, have succeeded in mitigating disadvantages and/or enhancing advantages of Arunachal Pradesh as a destination for investment in resource-based and modern industries.

#### *Initiative of the Central Government in the Pre-Liberalisation Period*

To counter some of the locational disadvantages for setting up of industries in Arunachal Pradesh, the Central and the state governments have adopted various measures and offered incentive packages from time to time. Reviewing the reports of the different committees set up by the Central government that had gone into the problems of industrialisation of backward and hilly regions, Chobin (2002: 44) concludes, "Though the need to promote industrial development in backward areas of the country was felt from the very inception of national planning, concrete measures were awaited till the early seventies...The Fourth Five Year plan noticed that the cost of providing necessary infrastructure for the further expansion of existing large urban and industrial centres was often much larger than what it might be, if development was purposefully directed to occur in smaller country and rural areas." Financially, such purposefully directed efforts consisted of provision of concessional borrowing facilities from All-India Term Lending Institutions and a Central Investment Subsidy Scheme. The measures had, if at all, very limited results. Despite the absence of visible result the policy of investment subsidy was continued uninterrupted for 15 years. The policy was reviewed in the Seventh Plan and subsequently phased out and finally withdrawn in 1989 but without any alternative package of programmes for the development of industries in backward and hilly areas.

#### *Post-Liberalisation Incentives*

In the post-liberalisation period, a package of incentive measures was brought in under Industrial Policy and Other Concession in the North-eastern region<sup>13</sup> which has now been available for about a decade. These include transport subsidy to mitigate high cost of movement of materials, tax holiday for first 10 years of production to balance initial cost disadvantage, capital subsidy as well as interest subsidy on working capital credit. The impact of these measures is yet to be visible in Arunachal Pradesh.

10. "Arunachal Pradesh : Its Resources and Industrial Prospects", study conducted by IIE, July 1996, accessed from NEDFi Data Bank, Bottom of Form North Eastern Development Finance Corporation Ltd. 2002.

11. Analysing data from survey of unorganised industries of 2000-01, Sarkar and Karan (2005) found that the direct backward production linkage of village level agro industry is much higher (0.5813) than that of non-agro industry.

12. As reported in the website maintained by National Informatics Centre, Assam, North Eastern Development Finance Corporation Ltd. Can be availed by email to [neidatabank@hub.nic.in](mailto:neidatabank@hub.nic.in)

13. New Industrial Policy and Other Concession in the North-eastern region., EA/1/2/96-IPO, Government of India, Ministry of Industry, Department of Industrial Policy and Promotion, 24th December 1997.

### *Initiatives of the State Government*

The Government of Arunachal Pradesh on its part came out with an industrial policy in 1994. There have been some efforts to boost the growth of small scale industries by setting up industrial estates and industrial growth centres. Tata Consultancy Service (1997) in its study for a master plan for industries sector in Arunachal Pradesh recommended marketing of the State as an investment destination to investors in other parts of India and abroad. A reflection of this suggestion is found in the New Industrial Policy of 2001 of the Government of Arunachal Pradesh (2001), which explicitly mentions that investors from outside will be encouraged to invest in the state. However, the conditionality attached to such offer can impart a negative signal to the potential investors from outside.<sup>14</sup>

From the present status of the manufacturing sector in Arunachal Pradesh, as portrayed by the statistics presented above in the present chapter, it is obvious that governmental efforts and policies have so far not succeeded in giving any noticeable impetus to the development of recourse-based and modern industries in the State. Perhaps, as Chobin (2002: 74) puts it, “locational, topographical and economic disadvantages in industrialising the State appears to be many times higher than advantages offered by both Centre and State Governments”. In that event a more comprehensive policy package, addressing also the fundamental issues of the problems of connectivity and factor market imperfections may be required.

### **Resource-based and Modern Industries in the Dynamics for Economic Development of Arunachal Pradesh**

In view of the above discussion it is perhaps safe to conclude that Arunachal Pradesh cannot bank on resource-based and modern industries to kick start the process of accelerated economic development. Such a development process has to be unleashed by growth of sectors such as hydro-power, tourism, plantation and horticulture. This is however not to suggest that resource-based and modern industries will have no role in the dynamics of development in the State. Indeed as the development process is set in motion by the growth of a few key activities, the ground conditions will change and the economic environment is likely to be favourably

turned for industrialisation to be turned on and then add momentum to the development process.

For illustration let us take the case of complementarities between hydro-power sector and the cement industry. As indicated above, in spite of the substantial limestone deposits in the north-eastern belt of the state, the cement industry may not automatically come up there because of the high transport cost to the markets outside. But setting up of hydro-power plants will create a ready and large enough local market for a cement industry to thrive. Once power generation picks up, availability of cheap power will make the cement and other industrial units cost effective cancelling out some of the disadvantage of high transport cost. Meanwhile, growth of the lead sectors will impart experience and skill to the workers in handling modern industrial activities. This can address the problem of absence of a ready industrial workforce within the State.

In this context a few more factors, which can potentially work to enhance the prospect of industries playing a significant role in the process of development of Arunachal Pradesh, are worth mentioning.

1. Though as of now manufacturing industry is a rather insignificant component of the economy of Arunachal Pradesh, the Economic Census Report of 1998 reveals that there is no dearth of enterprise and entrepreneurial skill at the grassroots (Table 14.4). Nearly 10 per cent of these enterprises are engaged in manufacturing. Though the percentage may not seem to be large, it is significant compared to the much lower share of manufacturing in the net state domestic product. Once industrialisation process gets underway this latent entrepreneurial base can come handy for reaping fuller benefits of industrialisation by locally setting up units for harnessing spin off economic activities.
2. Elsewhere in this report, prospect of Arunachal Pradesh benefiting from cross border trade is being discussed. If such trade becomes vibrant that will provide Arunachal Pradesh significant market linkage for growth of economic activities in general and industrial expansion in particular. Of course such trade can be a double-edged sword as this can bring in more competition from industries across the border.

14. The policy states, "Investors from outside the state will be encouraged to invest in the state. Hundred per cent equity ownership of an industrial unit by entrepreneurs will be allowed for a maximum period of 30 years by the end of which period such equity holding will be reduced to 49 per cent, the remaining 51 per cent will be held by a local Arunachal Tribal entrepreneur or a group of local tribal entrepreneurs or the state government, if it considers necessary to do so."

3. Last but not the least, as late comer to the industrialisation process, the state will enjoy the advantage of learning from the experience of others and using the latest technological know-how which can give its industries an edge in technical efficiency.

TABLE 14.4

**Type and Sector-wise Number of Enterprises  
in Arunachal Pradesh in 1998**

Sl. No.	Sector	Own Account	Establishments	All Enterprises
1	Agricultural	109	92	201 (0.97)
2	Non-Agricultural	10068	10425	20493 (99.03)
3	Manufacturing	1371	640	2011 (9.72)
4	Total	10177	10517	20694 (100.00)

*Note:* (1) An enterprise is defined as a unit engaged in production or distribution of goods or services not for the sole purpose of self-consumption. Own account enterprise refers to an entrepreneurial unit without any hired labour. An enterprise with at least one hired labourer is counted as an establishment.

(2) Figures with parentheses are percentages of the total.

*Source:* Report on Fourth Economic Census of Arunachal Pradesh, Directorate of Economics and Statistics, Government of Arunachal Pradesh.

### Policy Suggestions

In light of the above discussion the following policy measures are suggested for facilitating growth of resource based and modern industries in Arunachal Pradesh:

- a. Development of a few large industries with strong mutual inter-linkage should be planned. Simultaneous development of industries with

mutual inter-linkage will take care of the marketing constraint to a good extent. There will be gains in terms of cost reduction which in turn will improve viability of industrial projects.

- b. The plan for expansion of road network should take into account the industrial development plan along with the proposed locations of industrial units. Resulting improvement of connectivity will further brighten the viability of industrialisation programme.
- c. In view of ambiguity of land ownership, government will have to play a proactive role in making land available for setting up of industries. Long term leasing of land should be arranged if outright purchase is not possible.
- d. Local entrepreneurs should be supported to participate in developing ancillary and downstream industries. This will prepare a class of local entrepreneurs to carry forward the industrialisation process.
- e. Industrial workers including managerial and technical personnel may have to be brought from outside at least in the initial years. They should be given proper work permits which should clearly state the extent of their rights. To attract the best of talent they should enjoy all civil rights. But to avoid apprehension of indigenous communities of being outnumbered and overwhelmed, the right to acquire landed property should not be extended to the permit holders.

## Chapter 15

# Environment

### Introduction

Arunachal Pradesh is endowed with an abundant forest cover, mineral reserves, and water resources. Over 85 per cent of the land cover of the State is covered by various types of forests.

This chapter examines the interaction of various socio-economic factors with nature highlighting their impact on the state of the environment—air, water and land. In the absence of data on environmental monitoring, several estimations have been made to assess the status of pollution load in the State. The chapter also reviews relevant initiatives taken at the Central and state levels to address environmental concerns and recommends remedial measures.

### Pressures on the Environment

Intensification of agricultural practices, low levels of sanitation facilities, a high rate of urbanisation, vehicular growth and waste generation are some of the main pressures on the environmental quality in the State, compounding the stress imposed by natural conditions. Indoor environments, especially in rural areas, continue to suffer from the adverse effects of the use of traditional fuels for cooking and space heating. Some of these pressures are discussed in this section.

The size of population as well as density is no doubt low, but the lack of adequate services such as sewage and sanitation, especially in growing urban centres requires attention. A large section of the population has access to safe drinking water facilities, though access to sanitation facilities is poor. Under the drinking water supply scheme

of Arunachal Pradesh, a total of 2,12,615 sources have been enumerated for distribution of drinking water to households. These sources cover all the 17 towns, however, out of a total of 4298 villages, 3293 habitations are fully covered while 742 are partially covered. About 263 villages were still not covered under the scheme till 2004 (Ministry of Finance, 2004).

Arunachal Pradesh ranks 9th amongst 35 states and union territories in terms of percentage of households having a tap as the source of drinking water. About 68 per cent of the households use tap as a drinking water source, as compared to a national average of about 3 per cent. However, in terms of percentage of households with source of drinking water within premises, with a figure of 32 per cent, Arunachal Pradesh stands lower than the national average of 39 per cent. In the case of sanitation services, the percentage of households with open drainage for waste water outlet is 29 per cent as compared to the national figure of 34 per cent. A meagre 11 per cent of households are equipped with water closet latrine systems. Inadequate sewerage network and improper sanitation facilities lead to the degradation of environment in the catchments of natural drains. Besides polluting water bodies, this has a detrimental effect on the aquatic life.

It is estimated that the total domestic BOD load generated across the State is 10936 kg/day.<sup>1</sup> Papum Pare district is estimated to be the largest contributor (1086 kg/day), and Upper Siang district the lowest (224 Kg/day).<sup>2</sup>

One of the clear signs of urbanisation in the State is the growth in the number of vehicles. According to

1. The estimate is made assuming a normative BOD generation per capita per day of 45 gm and that on an average, 80 per cent of the water supplied to the domestic sector ends up as waste water.

2. Since the data on the water quality of the rivers in the State is not available, the quantum of impact on the water resources could not be assessed.



*Economic Review 2003-04*, the total number of vehicles of all types registered in the State during 2003-04 was 5703 (excluding Dibang Valley) as against 3586 vehicles registered during 1999-2000, an increase of 55 per cent over four years. Two wheelers accounted for almost 72.5 per cent of the total vehicles. Though the estimated vehicular density (37) in 2001 was lower than the national average of 53, vehicular air pollution is expected to become an issue of concern due to high estimated vehicular growth rate. As per the auto fuel policy, 2003 Bharat Stage II emission norms are applicable for all vehicles in the country from April 1, 2005. However, interactions with concerned departments revealed that the degree of enforcement of these norms in the State is weak. Vehicular pollution usually leads to greater incidence of respiratory health problems.

The other environmental issue associated with urbanisation and inadequate infrastructure is poor waste management. Given limited information, it is difficult to assess the amount or constitution of waste generated in the State. The daily per capita generation of municipal solid waste (MSW) in India ranges from about 100g in small towns to 500g in large towns (Central Pollution Control Board (CPCB), 1999). It is estimated that the total municipal solid waste generation in Arunachal Pradesh is about 230 tonnes/day.<sup>3</sup> Estimates of the Central Pollution Control Board suggest that about 12 tonnes/day MSW is generated in Itanagar city alone (CPCB, 2005). However, in view of the rich endowment of tropical rain forest and dominance of agriculture as an economic activity, organic waste is likely to be a significant share of the total waste in the State. Biodegradable waste can be easily decomposed and used as compost in agriculture. If properly managed, it can hence bring benefits in terms of environmental improvement and resource recovery.

Another category of waste that needs to be effectively managed is health care waste. There are about 580 government health care facilities, 17 family welfare clinics and 1 private hospital in Arunachal Pradesh with a total bed strength of approximately 2218. In the absence of any legislation and lack of awareness, waste generated from hospitals, nursing homes, blood banks and dispensaries, which include infectious items like amputated body parts, body fluids, bandages, scalpels are being disposed along with municipal waste in dumpsites. Estimated infectious waste from health care facilities of Arunachal Pradesh is about 555 kg/day or 0.55 tonnes per day.<sup>4</sup> Although this

category of waste forms a negligible share of the total solid waste, it needs special attention due to its hazardous nature and its potential to contaminate municipal waste if not properly segregated. Estimates show that Papume Pare has the highest hospital waste generation in the State.

The above analysis indicates that Papum Pare has the highest pollution load in the State. Lohit, Changlang and Papum Pare are also tourist attractions with hotels and lodges adding to the waste generation.

## Economic Activity

Economic activity in the State, especially agriculture is, to a large extent, a function of the natural landscape. Four main features of land use/land cover patterns emerge in the natural landscape of Arunachal Pradesh: (i) the land under barren, rocky, sloppy including snow covered areas of the conical hills and steep slopes of mountain ridges and escarpments of the Greater Himalayas, (ii) the land under forest cover in most parts of the Lesser Himalayas including denudational Siwalik areas, (iii) the moderate slopes of main river valley tracts which cover the land under degraded forests and shifting cultivation, and (iv) the alluvial plains of Siang, Dibang and Lohit rivers under settled cultivation (Singh, 1999). The land cover of Arunachal Pradesh is 'forest dominated' as a major share of land (85.3 per cent) is under various types of forests.

In general, the land use/land cover features of forests *versus* cultivation are directly influenced and controlled by the physiographic conditions. There is no record on the changes in the conversion of land from one category to the other over time. However, the processes of land use intensification have been operating and a gradual shift can be observed in the reduced cycle. The farming intensity has also been rising in fertile alluvial plains of the State. A brief outline of the district level land cover is presented in Table 15.1.

An area of about 2705 sq km of the State (i.e., 3.2 per cent) is under the practice of shifting cultivation. There is association between the soil degradation and shifting cultivation. It is found that the areas of severe erosion are dominated by this practice. The districts in which *jhumming* is the main agricultural practice are East Kameng, Upper Subansiri, Upper Siang and Tirap.

While industrial activity in the State is modest, the state government has drafted a new Industrial Policy in 2001, which aims at the development of all industries with

3. Assuming per capita waste generation in small urban cities to be 0.21 kg/day (NEERI, 1996).

4. Infectious waste generation from health care facilities in Arunachal Pradesh has been estimated using a generation factor of 250 g/bed/day of infectious waste, reported by CPCB (2000) estimates.



**TABLE 15.1**  
**Land Use by Districts in Arunachal Pradesh (1995 Area in Hectares)**

District	Total Area	Land under Cultivation				Forest Cover				Land under Barren/ Rocky Snow Cover		Other Uses**	
		Settled Agriculture*		Shifting Cultivation		Evergreen Forests		Degraded & Deciduous		Area	%	Area	%
		Area	%	Area	%	Area	%	Area	%				
Tawang	208500	784	0.38	0	0.00	87028	41.74	58252	27.94	42529	20.40	2646	1.27
West Kameng	513400	0	0.00	0	0.00	357175	69.57	141101	27.48	14421	2.81	310	0.06
East Kameng	642203	0	0.00	0	0.00	506703	78.90	94974	14.79	15570	2.42	8947	1.39
Papumpare	343000	390	0.11	13437	3.92	278830	81.29	24273	7.08	0	0.00	26080	7.60
Lower Subansiri	966700	0	0.00	84486	8.74	723205	74.81	60114	6.22	60610	6.27	13306	1.38
Upper Subansiri	703200	0	0.00	18951	2.69	576680	82.01	31939	4.54	72040	10.24	3390	0.48
West Siang	764400	31165	4.08	46861	6.13	554440	72.53	95340	12.47	25442	3.33	11145	1.46
East Siang	404210	56881	14.07	9399	2.33	314007	77.68	25335	6.27	0	0.00	6089	1.51
Upper Siang	683300	5646	0.83	15684	2.30	491486	71.93	96372	14.10	65266	9.55	6247	0.91
Dibang Valley	1302900	31387	2.41	6813	0.52	926909	71.14	86222	6.62	250015	19.19	5171	0.40
Lohit	1140200	30955	2.71	72569	6.36	763006	66.92	106482	9.34	138217	12.12	5679	0.50
Changlang	466170	22234	4.77	1248	0.27	364746	78.24	70437	15.11	3533	0.76	4009	0.86
Tirap	236200	0	0.00	0	0.00	157889	66.85	73347	31.05	0	0.00	2460	1.04

Note: \* Settled agriculture includes Rabi, Kharif and Double cropping land.

\*\* Category of other uses includes land under water bodies, lakes, streams and built-up areas.

Source: Data generated from the maps supplied by National Remote Sensing Agency, Hyderabad as cited in Singh, 1999.

special emphasis on textile, handicrafts, electronics, tourism and industries based on non-timber forest produce. Presently, there are about 30 industries in the medium scale and 2526 small scale industries, which fall primarily in the category of arts and crafts, weaving, cane and bamboo. Agro-based industries usually generate biodegradable solid waste. Sawdust is the largest fraction of waste from saw mills and wood processing industries but certain wood preservatives, chemicals, oils, sludge, etc. used in wood processing industries may contain hazardous/toxic substances, which need to be treated before disposal. Thermal power generation (using diesel sets) is another potential source of air pollution, however, it accounts for only 20 per cent of the total power generation in the State with a decreasing trend over the years.

Though CPCB has not identified any polluting industry in the State yet, an inventorisation of industries can give a better picture of industrial waste generation. Further, it is

necessary that environmental safeguards are built into the industrial expansion plans for the State.

### Use of Traditional Fuels for Domestic Use in Rural Areas

In rural areas of Arunachal Pradesh, firewood is the main fuel used for cooking even though its consumption has been on the decline in the last 15 years—while 94 per cent of the households in rural areas used it as the primary fuel for cooking in 1991, the proportion came down to 87 per cent in 2001. At the same time, the share of households using LPG as the primary source of cooking fuel went up from 1.6 to 9.7 per cent during this period (Table 15.2). The dominance of fuel wood as a cooking fuel has implications for indoor environment and health of inhabitants.

In poorly ventilated dwellings, smoke from firewood can exceed acceptable levels for small particles in indoor

**TABLE 15.2**  
**Percentage Distribution of Households based on Fuel Consumption for Cooking**

		Cow-dung	Electricity	Coal	LPG	Fuelwood	Biogas	Kerosene	Crop Residue	Others
1991	Rural	0.05	0.17	0.13	1.66	94.31	0.03	3.06	0.00	0.60
	Urban	0.16	0.53	0.07	20.36	52.09	0.42	25.43	0.00	0.95
2001	Rural	0.02	0.38	0.10	9.71	87.31	0.13	1.45	0.87	0.03
	Urban	0.03	0.15	0.05	57.08	32.80	0.40	8.37	1.02	0.11

Source: Census of India (1991 and 2001).

air by 100-fold. Exposure to indoor air smoke is particularly high among women and children, who spend most of their time near the domestic hearth. There is consistent evidence that exposure to indoor air pollution increases the risk of lung cancer, asthma, cataracts and tuberculosis. Women exposed to indoor smoke are three times as likely to suffer from chronic obstructive pulmonary disease, such as chronic bronchitis, than women who cook and heat with electricity, gas and other cleaner fuels (WHO, 2005).

## Natural Factors

Arunachal Pradesh falls within Zone-V in the seismic map of India, indicating the highest seismic hazard zone (Gopalakrishnan, 1994). Earthquakes are a common phenomenon in the State. They occur several times in a year but are usually low in magnitude. This makes the State prone to severe landslides and floods.

In the wet tropical and sub-tropical climate which prevails in most parts of the State, there is the usual phenomenon of erosion and land degradation by the action of water. The severity and extent of erosion are dependent on various climatic and geomorphological factors of the physical landscape notably the amount, intensity and duration of rainfall; amount and velocity of surface run-off influenced by the nature of slopes, drainage systems and its density, surface roughness, the nature of soils and land cover. The intensity and extent of these factors also define the type of erosion like splash erosion, sheet erosion, gully erosions, stream erosion of landslides (Singh, 1999).

## State of the Environment

It is difficult to comment on the status of environment in the absence of adequate pollution monitoring. The ambient air quality in the State is not being monitored currently, though there is a proposal to establish two monitoring stations in the State under National Ambient Air Quality Monitoring Program (NAMP) and CPCB.<sup>5</sup> The emission load from the industrial sector in Arunachal Pradesh, however, is expected to be low because of its negligible density. The emissions from saw mill and plywood industries may contribute to particulate matter and volatile organic compounds (VOC). There may be local impacts in the immediate vicinity, especially, if proper environment protection measures are not taken.

Likewise, the monitoring dataset for surface and groundwater is not adequate to arrive at a conclusion. However, some studies done by the Central Ground Water Board (CGWB) and other agencies suggest that the water quality of groundwater sources is well within the prescribed requirements for domestic, industrial and agricultural uses.<sup>6</sup> No toxic elements have been reported so far from any part of the State (CGWB, 2005). While water quality of most rivers in different districts of Arunachal Pradesh is not available, water quality of the Brahmaputra that traverses through the region has been reported to exceed the required bacteriological quality. Dissolved oxygen and biological oxygen demand concentration are observed within water quality criteria limit of desired class throughout the stretch (CPCB, 2003).

On land degradation and soil quality, different kinds of soils are identified in Arunachal Pradesh due to the wide variability in climate, physiography, geology and vegetation that influence the ecosystem. The State Landuse Board (SLB) has identified the soils and mapped, described, analysed, characterised and classified them under the following ecozones:

1. Soils of warm per-humid, Eastern Himalaya Ecosystem.
2. Soils of warm per-humid, Siwalik Hill Ecosystem.
3. Soils of warm per-humid, Purvanchal Ecosystem.
4. Soils of hot humid, plain ecosystems (Brahmaputra Valley).

Excessive precipitation, steep hill slopes and tectonically disturbed rocks in conjunction with human interference on vegetative cover result in severe landslides and floods in all these ecozones. The rapid runoff on the steep slopes causes heavy soil losses as well as siltation in the river bed which ultimately leads to flood hazards in the plains of Arunachal Pradesh and Assam. These factors affect the soils in terms of low cation exchange capacity (C.E.C.), poor base status, graveliness, etc. Shifting cultivation, one of the most common cultivating practices of Siwalik hill ecosystem, also contributes to the process of soil erosion. It is estimated that about 669.35 million tonnes of soil is eroded annually in the State with an average rate of 91 tonnes/ha/year. The river catchments located in the Siwaliks and foothills of the denudational hills including the interflaves of the main rivers

5. The National Physical Laboratory (NPL), New Delhi conducted some air quality monitoring only for seven weeks (January-March), 2005 in Itanagar. The parameters measured were SPM, RSPM, Ozone, SO<sub>2</sub>, NO<sub>x</sub>, CO and CH<sub>4</sub>. The data is not published yet.

6. Recently, an attempt has been made towards bio-monitoring of some important perennial rivers of Arunachal Pradesh, however, the study report was not available at the time of preparation of this document.

experience a moderate to severe rate of soil erosion (50-150 tonnes/ha/year). These categories cover more than 60 per cent of the area of the State (Table 15.3). A few river catchments in this belt are characterised by extremely high rate of soil erosion (more than 200 tonnes/ha/year). The severity of erosion and very high rate of soil loss in these areas is due to the high intensity of rainfall and deep soils on the steep slopes with their loamy and sandy texture. The western and north western parts of the State, especially the upper catchment areas of the main river basins where the intensity and amount of rainfall is low and climatic conditions are dry and cold, the rate of soil loss is estimated as slight to moderate (10-100 tonnes/ha/year).

**TABLE 15.3**  
**Number of River Basins and Area under Different Soil Loss Categories**

Sl. No.	Soil Loss Categories	(Soil Loss in t/ha/yr)	No. of Catchment	Area Extent	
				Total (in sq.km)	%
1	Extremely Severe	(>150)	6	5744.1	6.75
2	Severe	(150-100)	11	17095.6	20.09
3	Moderate	(100-50)	16	34155.9	40.14
4	Sight	(50>)	13	28094.1	33.02
	Total		46	85089.7*	100.00

*Note:* The figures are inclusive of areas from outside the State because the boundaries of river-basins do not exactly match the State boundary in its southern border.

*Source:* Singh S. (1999).

## Initiatives to Address Environmental Concerns

The Central and state governments have formulated and executed a number of legislations, policies and programmes for protecting the environment. Some of the major Central government initiatives which are applicable to all states are summarised in Box 15.1.

The state government has also taken measures to protect the environment and conserve natural resources, especially with respect to management of soils. Since the topography of the state provides ideal conditions for development of hydropower projects, the government is taking several initiatives to tap this relatively clean form of energy for self-consumption and export to other parts of the country.

The State Pollution Control Board has been set-up recently to monitor environmental quality and take steps for environmental protection. While it has developed

### BOX 15.1

#### Major Central Government Acts and Initiatives Relevant to Arunachal Pradesh

##### Vehicular emission norms

As per the Auto fuel policy, 2003 the applicable emission norms for all new vehicles in Arunachal Pradesh should be Bharat Stage II, implemented from April 1, 2005. These emissions norms will have to be upgraded to Euro III equivalent from April 1, 2010 for all vehicles except 2 and 3 wheelers and to Bharat stage III for 2 and 3 wheelers from April 1, 2008.

##### National ambient air quality standards

Ambient air quality standards (both short-term, i.e., 24 hourly and long-term, i.e., annual) have been laid down for industrial, residential/rural/other and sensitive areas with respect to pollutants such as SO<sub>2</sub>, NO<sub>x</sub>, SPM, RSPM, Pb, NH<sub>3</sub> and CO.

##### Municipal solid waste (Management and Handling) Rules, 2000

For management of solid waste, the Government of India has notified the Municipal solid waste (Management and Handling) Rules, 2000. These rules cover aspects such as responsibility of municipal authority, State Government, CPCB and SPCB/PCCs and management of municipal solid wastes; specifications for landfill sites; standards for composting, treated leachate and incineration.

##### Biomedical Waste (Management and Handling) Rules, 1998

The Biomedical Waste (Management & Handling) Rules, 1998 have been notified for the management and safe disposal of biomedical wastes in India. These Rules specify the categories of wastes along with specifications such as treatment and disposal options, colour coding, labelling, and type of container. In 2003, CPCB published guidelines for biomedical waste management that include guidelines for common biomedical waste treatment facility (CBWTF), and design and construction of biomedical waste incinerators.

several proposals for monitoring and management of air and water quality and waste, it is currently constrained by the limited availability of financial and technical resources and adequate manpower. The Department of Urban Development is the nodal agency in the management of waste. It has a programme for garbage clearing in all urban and selected habitations of rural areas. However, effective waste management is constrained by limited resources.<sup>7</sup>

The state government has taken several initiatives through policies and programmes for the management of

7. Recently, the Department has submitted a project proposal for a municipal solid and hazardous waste disposal facility in Itanagar to the Central Pollution Control Board, Ministry of Environment and Forests for necessary sanction and release of funds.

land. Programmes relating to control of soil erosion, water conservation and irrigation in the State were initiated in the Fourth Five Year Plan. As part of rural development works programme, the problems of soil erosion and water conservation have been incorporated in initiatives on watershed management and protection/treatment of land for soil conservation. Large-scale afforestation programmes have been taken up and carried out through social forestry programmes, reserved plantation of trees and so on. Almost 2664 ha of land were brought under artificial plantation and 350 ha through afforestation. Since 1986, social forestry initiatives also incorporated soil and water conservation, maintenance of local ecosystems through strip plantation along the slopes, mass plantation in *jhum* lands, etc. Box 15.2 provides the details of a recent centrally sponsored scheme towards soil conservation.

#### BOX 15.2

##### Soil Conservation for Enhancing Productivity of Degraded Land in the Catchment of a River Valley Project and Flood Prone River

This project is a centrally sponsored scheme under macro management of agriculture, sanctioned by the government of Arunachal Pradesh in March 2005. Soil conservation measures are being taken up on a watershed basis and include:

- Drainage line treatment of upper, middle and lower reaches.
- Contour staggered trenching.
- Afforestation.
- Silvi-pastoral development.
- Horticulture.
- Construction of water harvesting structure, percolation tank, and silt detention tank.
- Establishment of hydrology and sediment monitoring station.

The Department of Agriculture is the nodal department of macro management, while the Rural Works Department is the executing agency. The projects are spread over three locations—Khondakhowa, No-bonga and Tareso. Already, 30 hectares of land has been brought under horticulture and 24 drainage lines have been established.

Source: Personal communication, Department of Soil Conservation, Arunachal Pradesh.

The New Agricultural Policy gives special emphasis to shifting cultivation, ensuring better land management, introducing improved cultivation in sloppy land through agro-forestry, horticulture and encouraging other

household activities. The programme is to be designed in such a way that there would be simultaneous thrust in weaning the *Jhum* farmers towards better cultivation.<sup>8</sup>

Considering that floods are a major problem in the region, the Ministry of Water Resources, Government of India is seeking to address related issues in the Brahmaputra through the NIH (National Institute of Hydrology) Centre for Flood Management Studies for the Brahmaputra Basin. A Regional Centre at Guwahati has been set-up to address the hydrological problems of North East Region. As per the five-year action plan, the Regional Centre is focusing on the following areas:

- Structural and non-structural measures for flood management.
- Integrated watershed management for flood control.
- Hydrological data base management system.
- Drainage congestion and erosion problems.
- Water quality problems.
- Socio-economic aspects of flood disaster.
- Technology transfer.

#### Concerns and Recommendations

Although environmental pollution may not be perceived as a major issue in the State at present, a proactive approach towards integrating environmental management while planning for the development of the State is required. Some aspects, which need consideration, are noted below.

##### *Institutional Measures*

It is noteworthy that the State Pollution Control Board has been recently set-up in the State. However, it is reportedly constrained by the scarcity of manpower and resources, which in turn has adversely affected its environmental monitoring and management activities. Similarly, while emission norms, fuel quality and vehicle inspection practices as laid down by the Auto Fuel Policy are applicable to the State, enforcement by the relevant transport department is inadequate. The technical and financial requirements of the concerned departments need to be assessed and addressed to enable their efficient functioning including the enforcement of Central and state level legislation. Secondly, environmental concerns such as land and soil conservation need to be addressed in an integrated manner across all relevant government agencies.

8. <http://arunachalpradesh.nic.in/nap.htm>, Accessed on 15 February 2006.



### *Policy Initiatives*

Several policies are required to address environmental concerns as the State charts out its strategy for economic development. The New Industrial Policy of the State should, for instance, also emphasise the need for the integration of environmental management through environmental impact assessments, emission standards for industries and environmental audits etc., which are prescribed by CPCB and need to be followed in all states. Likewise, appropriate policies are needed in the transport sector to ensure phase out of old polluting vehicles and adequate inspection and maintenance of vehicles on road. Policies are needed to ensure the management of municipal, industrial and health care waste through appropriate segregation, collection, treatment and recycling. Where possible, the collection and conversion of organic waste into useful compost on a small scale could be undertaken with the involvement of private entrepreneurs and NGOs.

Inadequate access to basic needs such as clean cooking fuels, water and sanitation pose a threat to the

environment and health of people and must be addressed on a priority basis.

### *Infrastructure Development*

Development of infrastructure is a prerequisite for effective implementation of policies. For instance, there is a need to construct treatment and disposal facilities for municipal solid waste, biomedical waste and industrial waste. Sanitation infrastructure needs to be augmented as a priority. Environment friendly concepts such as eco industrial parks should be implemented while planning the industrial development of the State.

### *Data Inventory*

An updated data inventory of environmental status is a useful guide to policy making and improving awareness on environmental issues. It is essential that a regular data inventory is maintained for a range of environmental parameters and relevant indicators of environment through regular monitoring. For instance, a waste inventory needs to be developed on the sources, quantity, quality, treatment and disposal options.



## Chapter 16

# Border Trade and its Prospects

### Introduction

Border trade can be defined as the transactions of local products, at certain convenient points, across the border by the inhabitants living near the international boundary. Such trade is usually based on barter system having no cash and credit transactions. It flourishes because of lack of infrastructure, both internal and cross-border. As it is informal, no national and international laws are valid in such trade and governments do not keep any formal records on it. It exists irrespective of political and diplomatic relations between the governments of the bordering countries because it is a traditional way of life of the border people.

When internal and cross-border infrastructure develops, border trade becomes formal trade with all modern characteristics of trade between bordering countries. Many of the formal trade points of today were earlier informal border trade points (Ghanashyam, 2001). The present chapter deals mainly with the formal version of border trade and partly with its informal version.

Experience has shown that every country enjoys higher real income by specialising in production according to its comparative advantage and trading with others. Trade optimises production on the production possibility schedule, it results in a more efficient allocation of productive resources, it gives vent to surpluses, widens the market, induces innovations, increases savings and capital accumulation, instills new wants and taste, and encourages technology transfer, skills and entrepreneurship development. Thus, trade and investment become an engine of growth in developing economies. These advantages of trade have become much more significant and relevant in the context of ongoing globalisation process. This chapter makes an attempt to identify the

prospects of both border and formal trade of Arunachal Pradesh. The specific objectives of the paper are to provide answers to the following questions:

- (i) How can the instrument of border trade (formal) contribute in strengthening the State's development process?
- (ii) How can the State emerge as a gateway for entrepreneurs from the rest of India to increase trade with the eastern border nations?

The rationales of border trade for land-locked Arunachal Pradesh sharing border with China, Myanmar and Bhutan are many, such as:

- To speed-up the process of development and structural transformation by way of opening new market opportunities for local producers and service providers resulting in income and employment generations;
- To provide avenues for division of labour and strengthening linkages with the existing production bases in the State;
- To infuse new technological inputs for price and non-price competitiveness;
- Development of distribution networks with or without linkages with the rest of the country;
- To reduce transportation cost because of geographical proximity;
- To overcome disadvantages associated with landlocked setting of the State;
- To join hands with other North-eastern states including mainland India and extend the trade with Bangladesh and Nepal.

## **Recent Developments in Regional Cooperation (both Bilateral and Multilateral) and Prospects of Border Trade for North-Eastern States of India**

In the context of globalisation and liberalisation and the emerging 'Look East Policy' of the Government of India, the issue of border trade across the eastern borders of India has attracted the attention of the governments, planners, development agencies and the academics in India. Considering the geographical proximity and huge potentialities, the existing value and volume of bilateral trade between the neighbouring countries like China, Myanmar and Bangladesh on the one hand and India on the other, appear to be too small. It is because trading between these countries has been quite difficult due to transport bottlenecks and the protectionist policy followed in the pre-globalisation period. However, in recent years all the governments have shown keen interest in removing these bottlenecks by establishing regional cooperation, both at bilateral and multilateral levels which has raised the hope of opening border trade among China, Myanmar, Bhutan, Bangladesh and India in near future.

At multilateral level, such regional cooperation has been manifested in the form of initiatives and agreements for economic cooperation and trade, such as, the Mekong-Ganga Cooperation (MGC) consisting of India, Myanmar, Thailand, Cambodia, Laos and Vietnam; the Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC), a sub-regional group consisting of countries around the Bay of Bengal; the South Asian Free Trade Agreement (SAFTA); the India-ASEAN Vision: 2020—a roadmap of cooperation; the South Asian Association on Regional Cooperation (SAARC); the Bangladesh-China-India-Myanmar (BCIM) Forum, etc., which will help in strengthening the growing trade relationship between India and the neighbouring countries. Several other initiatives by many South-east Asian countries have also brightened the prospect of growth of sub-regional cooperation among them. Some of such major initiatives are, the East Asian Growth Area (EAGA) comprising the Philippines, Malaysia, Indonesia and Brunei, the Singapore-Johor (Malaysia)-Riau (Indonesia)-Growth Triangle (SIJORI), etc. Success of these initiatives and agreements would not only increase the scope of trade but would also extend Arunachal Pradesh's reach, deep into South-east Asia and the Mekong basin region.

At bilateral level India has already signed several agreements for economic cooperation and trade with the countries of its eastern border, and many more such

agreements are in the pipeline. A few major such agreements signed in recent years are stated below.

### *Indo-China Cooperation and Trade*

The rapid economic growth of China in recent years has opened the possibilities of expanding trade relationship with India. China's huge population and growing per capita income and rapid infrastructural development have created opportunities for exporting several new products from India. The joint declaration between the Prime Ministers of India and China in June 2003, signing of a memorandum on expanding border trade through Nathula Pass on the Indo-China boundary, China recognising Sikkim as a part of India and India recognising Tibet as a part of China, the bilateral military exchanges for mutual understanding including the joint naval exercise off the coast of Shanghai in the east China Sea in 2003, the formation of a joint study group to examine the potential complementarities and also to draw up a programme for development of India-China Trade and Economic Cooperation for 2003-2008, etc., have opened up new vistas for border trade between India and China.

China is emerging as a major trading partner of India. The major items of China's imports from India in 2002-03 are semi-finished iron and steel (24.78 per cent of total imports of China from India), iron ore (20.41 per cent), plastic and linoleum products (8.44 per cent), other ores and minerals (6.31 per cent), and marine products (5.35 per cent). Similarly, major items of China's exports to India in 2002-03 are electrical goods (27.82 per cent of total exports of China to India), organic chemicals (10.95 per cent), coal coke and briquettes (6.03 per cent), and medicinal and pharmaceutical products (5.18 per cent) (CMIE, 2003).

### *Indo-Myanmar Cooperation and Trade*

Myanmar's entry into Association of South East Asian Nations (ASEAN) Block, its signing of MoU with India in 1994, recognising certain border trading points viz., Tamu (Myanmar)-Moreh (Manipur, India) and Rhi (Myanmar)-Changphai (Mizoram, India), the opening of 160 km Tamu-Kalewakalemy Road in February 2001, the opening of the Myanmar-India Friendship Centre at Yangon and signing of a bilateral trade agreement between India and Myanmar in October 2003. The trade agreements between India, China and ASEAN Block in October 2003, are likely to play a major role in improving regional economic cooperation between these countries.

The signing of an MoU between Myanmar and India, on 25<sup>th</sup> October 2004 at New Delhi, for cooperation on economic and security issues, is a landmark in the process of their bilateral cooperation. In addition to the issues like terrorism, drug-trafficking, smuggling, money laundering, international economic crimes, cyber crimes, etc., the MoU covers several economic issues as well. India has agreed to upgrade the Yangon-Mandalay rail link, help in laying fibre-optic network in Myanmar and conduct a feasibility study of deep water port and cooperate in energy sector. Both the governments have agreed to upgrade Mizoram-Chin State Road and Kaladan Multi-Model Transportation System. The India-Myanmar Joint Task Force constituted by the Confederation of Indian Industries (CII) and the United Myanmar Federation of Chamber of Commerce and Industry has submitted its reports to both the governments on 25<sup>th</sup> October 2004. The Report predicted that the value of the bilateral trade between India and Myanmar would be worth \$1 billion by 2006, if the suggestions are implemented by both the governments.

In 2002-03, the major items of Myanmar's exports to India were pulses (59.95 per cent of the total Myanmar's exports to India), wood and wood products (27.39 per cent). Similarly, the major items of Myanmar's imports from India are machinery and apparatus, dairy products, textile yarns, pharmaceutical products, rubber manufactures, base metals etc. The total value of Myanmar's formal imports from India was about \$75 million worth in 2002-03. However, informal segment of trade between Myanmar and India is several times higher than the formal segment of the trade. A wide range of goods produced in India are exported to Myanmar through informal channels. These include bicycle, motor vehicle accessories, tyres, chemical and chemical compounds, drugs and pharmaceuticals, cotton yarn and textiles, branded fruits, edible oils, electrical products, construction materials, paints, sewing machines, alcoholic beverages, cosmetics, etc. Similarly, several third country products are exported by Myanmar to India through informal channels which include electronic goods, consumer durables, telephone instruments, blankets, high quality textile products, tobacco products, toiletries, etc. In addition, Myanmar also exports through informal channels certain local produce such as agricultural, marine, forest products, betel nuts, pulses, teak, groundnuts, etc.

#### *Indo-Bhutan Cooperation and Trade*

India's North-eastern region shares a common border of about 650 km with Bhutan out of which 450 km is

with Assam, 140 km with Arunachal Pradesh, and 60 km with Sikkim. Bhutan is one of the least developed nations of the world. There is completely free trade between India and Bhutan, and the official Indo-Bhutan trade has been governed by the Indian Trade and Commerce Agreement. There are as many as 12 exit and entry points in India for trade with Bhutan. In addition to these official trading points, there are several other trading points on the Indo-Bhutan borders through which unofficial trade takes place. It is estimated that the value of the unofficial trade between India and Bhutan was about \$33 million in 1993-1994, the official component of the same is about one-third of the unofficial trade (Baruah, 2000). India is having a trade surplus with Bhutan on both official and unofficial accounts. The major items of imports of Bhutan from India in 1999 were machinery and mechanical equipments (18.7 per cent of total imports from India), mineral products (14.4 per cent), base metal and base metal products (13.1 per cent), cereals, vegetables, fruits, etc. (11.9 per cent), and transport equipments (9.9 per cent). Similarly, the major items of exports of Bhutan to India in the same year were electricity (43.0 per cent of total exports of Bhutan to India), mineral products (14.8 per cent), products of chemical industries (12.1 per cent), and base metal and base metal products (11.4 per cent) (Royal Government of Bhutan, 2001-02).

In the context of the above developments, the question of opening of borders of Arunachal Pradesh for trade with its neighbouring countries (Myanmar, China and Bhutan) has attained a special significance for its economy in recent years, as it can convert the present locational disadvantages of the State into economic advantages in near future.

#### **Indo-Bangladesh Cooperation and Trade**

Bangladesh has a long border of 4,100 km with the North-eastern region of India. Since the creation of Bangladesh, India has been exporting several items through its border points. The Border Trade Agreement between India and Bangladesh was first signed in 1972 to meet the day to day requirements of the people. Trade between India and Bangladesh takes place through the North-eastern border points like Dawki and Bholaganj (in Meghalaya), Karimganj, Steamerghat and Suterkandi (in Assam), Agartala, Kailash Sahar, Bilonia and Sonamua (in Tripura), etc. The Indo-Bangladesh Trade Agreement (1980), the Indo-Bangla Joint Economic Commission, the Indo-Bangla Free Trade Agreement and other trade agreements between them can go a long way in accelerating economic growth through trade in both the countries.

The major items of imports of Bangladesh from India in 2002-03 through official channels were cotton yarn (13.65 per cent of total Bangladesh imports from India), non-*basmati* rice (9.85 per cent), and wheat (8.79 per cent). Other minor imports of Bangladesh from India are sugar, primary and semi-finished iron and steel, transport equipments, etc. Among the major informal imports of Bangladesh from India through the North-eastern trade routes are orange, pineapples, jackfruits, potatoes, ginger, spices, rice, betel, petroleum products, bicycles, tyres, papers, milk products, cattle, pulses, timber, etc. (CMIE, 2003).

The formal exports of Bangladesh to India are too small resulting into a huge trade deficit with India to the extent of \$1 billion. However, the informal segment of exports of Bangladesh to India is quite significant. Through the border points articles like electronic goods, coconut oil, synthetic fibre, high quality clothes, etc., which are third country products and jute, poultry products, etc., which are Bangladesh products, are smuggled into India.

### **Border Trade of Arunachal Pradesh through Various Trade Routes in Retrospect**

The entire North-east India had a long tradition of trade relations with eastern Himalayan sub-region comprising Bhutan, Tibet, China and Myanmar (Burma). It is more so in case of Arunachal Pradesh, because most of the tribes of Arunachal Pradesh migrated from these countries. Therefore, they had maintained ethnic, cultural, commercial and even matrimonial relationships with their neighbouring territories through ages. The tribes of Arunachal Pradesh living along the international border had trade connections with China, Tibet, Bhutan and Myanmar through several trade routes (Pamberton, 1835). While the tribes living along the southern border of Arunachal Pradesh had trade relations with Assam, the eastern part of Arunachal Pradesh had trading relations with Burma, and the western and the northern part of Arunachal Pradesh had well developed trade links with the Tibetans. The East India Company inspired the tribes of Arunachal Pradesh to maintain these commercial relations with the neighbouring countries with a view to exporting British goods to China, Bhutan and Tibet through Arunachal Pradesh but without much success due to hostile attitude of the Tibetan and Burmese rulers towards the British. After the annexation of Burma (Myanmar), the British found it more convenient to export their products to China through Burma. Therefore, the British lost interest in Arunachal Pradesh as a trading outlet.

History has recorded a number of trade routes between Arunachal Pradesh and its neighbouring countries. As many as 27 trade routes (passes) including the famous Tawang route which passed via Tawang and Tsona Dzong have been identified between Arunachal Pradesh and Tibet (Choudhuri, 1971-72 and Phukan, 2002). Local goods of Tibet and Bhutan were brought through these trade routes to be exchanged for local goods of Arunachal and Assam at different trade fairs (*Mela*) held annually coinciding with certain religious festivals in the foothills.

The Bhutanese and Tibetans came down to the foothills in Assam during winter loading their ponies, mules with merchandise like rock-salt, gold-dust, musk, woolen clothes and blankets, yak-tails (*Chowar*), ponies, dogs, Chinese silk including *Gomcheng*, chillies, oranges and local fruits, asafetida (*Hing*), herbal medicines, cinnamon, *jabrang*, borax, Tibetan sword, etc., to barter for clothes, raw silk, rice, dried fish, salt, perfumes, incenses, etc. Such annual fairs were held at Udalguri, Daimara, Dewangiri, Sadiya and other places in the bordering areas of Assam. As a means of transport for carrying the merchandise both ways mules and ponies were used in addition to carrying on their back. Several tribal communities like Monpas, Akas, Sherdukans, Mijis, Nyishis, Sulungs, Banghis, Apatanis, etc., acted as intermediaries between the groups of traders (Goswami, 2002).

On the eastern border of Arunachal Pradesh four trade routes have been identified including the famous Pangsu Pass between Arunachal Pradesh and Burma (Phukan, 2002). A large number of hill tribes from the present Tirap district of Arunachal Pradesh used to carry on trade in tea, blankets, matches, etc., at various places in Burma including in Bhamo, the most important trading centre on the bank of river Irrawaddy in Burma. The major articles from Burma side were amber (*Jangphi*), gum, *nora* cloth, silver, etc. (Phukan, 2002). Quoting from Wilcox's, *Memories of a Survey of Assam*, Elwin wrote that every Mishmi was a petty merchant (Elwin, 1959).

From the later part of the nineteenth century, imports coming to Arunachal Pradesh and Assam through the northern and eastern border points had to face steep competition from those coming from England and the mainland British India. Moreover, Western Indian businessmen who came to do business in Assam were granted Inner Line Permit (introduced in 1873, isolating the people of hill-tracts from the rest of British Subjects) to establish centres beyond the line. Indian and British industrial goods were sold to the hill people who sold their handlooms, handicrafts, cash-crops and forest products to the merchants.



After Independence, the integration of Arunachal Pradesh's economy with the national market network eroded the traditional base of cross border trade of the State. In addition to this integration, two other factors were also responsible for eliminating the traditional base of cross border trade of the Arunachalees. One of these factors is the decline in demand for Arunachal Pradesh's items of trade with neighbouring countries due to emergence of alternative products. For example, the availability of chemical dyes competed out the herbal dyes that had been the principal export item of Arunachal Pradesh's trade with Tibet. Similarly, chemical rubber competed out Arunachal Pradesh's natural rubber in the Burmese market. The Arunachalee's demand for imports from Burma and Tibet had also decreased owing to large scale imports of Indian products through Assam into Arunachal Pradesh following the improvement in transport and communication system (Das, 2002). These developments led to the breakdown of the Trans-Himalayan trade of Arunachal Pradesh. Gradually the traditional trade routes between Tibet and India being untrodden for a long period have almost disappeared and the entire 1030 km border is now almost inaccessible. In the absence of an export market and the presence of a small internal market, the natural resources of Arunachal Pradesh could not be exploited commercially except in the case of timber, coal and oil.

Therefore, the development strategy for Arunachal Pradesh should identify certain locally available resources which, when processed, could attract both national and international markets.

### **The Present Status of Arunachal Pradesh's Economy**

Territorially Arunachal Pradesh is the largest unit of the North-eastern region of India with 83,743 sq km of area. Geographically, it is situated in a disadvantageous position as it is not only a land-locked State, but is also surrounded on its three sides by foreign countries with total international boundary of 1628 km—1030 km in the North with China, 157 km in the West with Bhutan, and 441 km in the East with Myanmar. The states of Assam and Nagaland lie in its South. Like the other states of North-east, it is commercially integrated with the mainstream economy of the country.

In a study based on composite index of 20 major development parameters it was found that Arunachal Pradesh occupies the last position (under very low category) among the states of India (Goswami and Gogoi,

2001). In terms of Human Development Index (HDI) also, the position of Arunachal Pradesh has been at the lower level. The State's HDI is only 0.501, a value which stands significantly below the national average of 0.577. Out of the 16 major states of the country whose HDI are available (HDR Report, Arunachal Pradesh, 2005), Arunachal Pradesh's position was 14<sup>th</sup> only above Bihar (0.449) and Uttar Pradesh (0.489).

To speed up the process of development in the State, the present 'inward looking' paradigms of developmental policy is to be supplemented by an 'outward looking' approach based on market and trade. The changing scenario in international trade under WTO regime, India's emphasis on signing trade agreements with several foreign countries including the South and South-east Asian countries (a few of which share common border with Arunachal Pradesh) and the 'Look East' policy of India can be of great help for Arunachal Pradesh in its efforts to introduce this 'outward looking' development strategy. 'The global pattern of agrarian transformation initiated by GATT/WTO suggests that the major portion of third world peasantries have no future simply as subsistence cultivators' (Brass, 1995).

### **Prospects of Trade with Neighbouring Countries—Exploring New Frontiers**

The locational advantage of Arunachal Pradesh having common border with three foreign countries, viz., China, Bhutan and Myanmar can be of great help in following its trade-based and market-led 'outward looking' development strategy. China with its 9 to 10 per cent annual growth rate can alone provide good markets for several potential products of Arunachal Pradesh. In the past 25 years of expansion, China has lifted an estimated 300 million people out of poverty (less than 668 Yuan or about \$60 a year). It is predicted by the Chinese Academy of Sciences that by 2050 nobody will remain below poverty line in China. The middle class will enjoy all affluent lifestyle. Arunachal Pradesh with a huge resource base can be one of the important providers of many of the items to be demanded by the emerging affluent middle class of China. Moreover, the rapid prosperity in the ASEAN region is also going to offer prospects for border trade of Arunachal Pradesh.

Arunachal Pradesh has potentials for producing some of the goods which currently India is exporting to various countries including those bordering Arunachal Pradesh. Table 16.1 shows the value in million dollars of India's export goods which have potential in Arunachal Pradesh.



TABLE 16.1  
List of India's Exports (with value) having  
Potentials for Arunachal Pradesh  
(Values in Million Dollars)

Sl. No	Commodity	2001-02	2004-05
1	Coffee	259.78	224.79
2	Floricultural Products	25.86	45.77
3	Fresh Fruits	101.18	181.45
4	Fresh Vegetables	13.72	14.03
5	Processed Fruits	122.09	77.18
6	Spices	354.69	400.11
7	Tea	392.17	397.90
8	Carpet Handmade	447.65	570.22

Source: CMIE, Foreign Trade 2006.

China, the ASEAN region, Bangladesh and other SAARC countries which are geographically close to Arunachal Pradesh import substantial portion of each of the above items in which Arunachal Pradesh has export potential. At present, Arunachal Pradesh is not in a position to exploit these potentials because of lack of awareness among the prospective entrepreneurs, cross-border transport bottlenecks due to closed border, absence of adequate investment for large scale production of these items for export purpose, etc. An illustration of the areas in which Arunachal Pradesh has been found to have export potentials is given below:

**Biodiversity:** Arunachal Pradesh is one of the 18 hot spot areas of the world in view of the richness of biological and habitat diversity (*Arunachal Forest News*, 2001). Arunachal Pradesh with 2.54 per cent of country's geographical area is custodian of more than 23.52 per cent of the flowering plants of India. It is one of the richest botanical treasure houses of the country. A few valuable items of such rich biodiversity of the State, identified on the basis of market demand, could be commercially exploited for economic benefit of the State.

**Orchids:** Out of 925 varieties of orchids available in India, more than 500 varieties are found in Arunachal Pradesh due to its favourable soil and climatic conditions. In fact, approximately 200 varieties are unique to the State and 60 per cent of these are ornamental in nature with high demands in international markets. Thus, Arunachal Pradesh can be a major exporter of orchids.

**Horticultural Crops:** Arunachal Pradesh is famous for production of apple, orange, pineapple, banana, walnut, kiwi and several spices (cardamom, black-pepper, ginger, etc.) including 4500 species of flowering plants. Nearly

55,000 hectares of land is under horticultural crops including spices. At present, Arunachal Pradesh is selling some of these fruit crops only to Assam and neighbouring North-eastern states, but its soil and climate are so rich for flower and fruit crop plantation that it can be a major exporter of flowers, fruits and fruit products even to the neighbouring countries.

**Major Forest Products:** The vast area of forests of Arunachal Pradesh covering 51,540 sq km, which forms about 62 per cent of the total geographical area of the State, are full of valuable timber trees like *hollock*, pine, *chir*, teak, etc., which grow naturally. The commercial use of these trees along with its scientific captive plantation can earn substantial revenue for the State. Value added products from such trees can also be exported to the neighbouring countries.

The State's forests are the natural habitat of several species of wild animals some of which are of endangered category. Arunachal Pradesh has two national parks and ten wildlife sanctuaries which preserve and showcase many endangered wild animals, birds and flowers. In these parks and sanctuaries valuable wild animals and birds, viz., tiger, hoolock gibbon, musk deer, *serow*, black bear, *takin*, elephants, bison, hog, deer, hare, red panda, capped langur, clouded leopard, hornbill, small cats, etc., are protected. If properly developed, these parks and sanctuaries can attract tourists from all over the world.

#### Minor Forest Products (MFP)

(i) **Herbal Plants:** Arunachal Pradesh has a rich tradition of herbal health care. The tribes have so far identified over 500 species of plants, having medicinal properties. However, some of these 'medicinal' plants are yet to be authenticated by appropriate scientific testing. Due to lack of awareness, the State is yet to harness the full potentials of this wealth (*State Forest Research Institute Bulletin*, 2003). Farming/plantation of these plants would give a lot of advantages over their present wild growth. Herbal medicines produced from these plants could capture the world market and compete out the chemical medicines currently available in the world market because there is an increasing international trend towards herbal medicines from chemical ones.

(ii) **Aromatic Plants:** Arunachal Pradesh's forests offer a vast array of aromatic plants such as citronella, lemon-grass, vanilla, *patcholi*, *agaroo*, etc., which can be used in aromatic industry for the manufacture of perfumes, incenses, etc., for export purposes. The

increasing international demand for natural perfumes and room fresheners will facilitate the export promotion of aromatic products from Arunachal Pradesh.

- (iii) *Other Minor Forest Products (MFP)*: In addition to herbal and aromatic plants Arunachal Pradesh is rich in several other MFP which include bamboo, cane, reeds, thatching-grass, sun-grass, rubber, honey, lac, shellac, tendu leaf, charcoal, pole, etc. Dependence on MFP for meeting their subsistence consumption and income needs is commonly found in tribal societies. India's MFP exports are presently to the tune of \$362 million, comprising four per cent of the global trade. Emerging global markets in South Asia and some Western countries are yet to be tapped for these products.

### **Economic Mineral Resources of Arunachal Pradesh**

Although a number of valuable economic minerals have been recorded from several areas by the Geological Survey of India (GSI), the mineral resources of Arunachal Pradesh have not yet been properly assessed. Among the valuable minerals spotted in Arunachal Pradesh are petroleum, limestone, marble coal, dolomite, fuller's earth and natural gas reserves are worth mentioning. The total reserves (proved + probable + possible) are coal—90.23 million tonnes, dolomite—58.36 million tonnes, fuller's earth—14.01 million tonnes, and limestone/marble—125.47 million tonnes and huge amount of graphite (*Indian Minerals Year Book, 1996*). If properly assessed and explored with required infrastructural development, the products of some of these minerals can be used for making several value-added products locally in small and medium scale industries. Some of the value-added products can be exported to the neighbouring countries.

### **Tourism Products**

The State's unique natural beauty, different species of wildlife, religious places, historical and heritage sites, diverse attractive tribal cultures, friendly and hospitable people could make Arunachal Pradesh, the Switzerland of the East. The sites which can be developed into world class tourist spots are Tawang for religious, adventure and eco tourists; Parusuramkunda and Malini *Than*, for religious and eco tourists; Namdapha Tiger Project, Mowling National Park, and ten wildlife sanctuaries of the State for wildlife tourists; 'Lake of No Return' on the border of Arunachal Pradesh and Myanmar near Phangso Pass, Bhismark Nagar, Itafort, Second World War Cemetery at Jairampur, Bomdila (Chinese aggression in

1962) for historical tourists, etc., are worth mentioning. The multi-coloured seasonal festivals of the major tribes of Arunachal Pradesh can also attract cultural tourists from different parts of the world.

In spite of this vast tourism potential, inflow of tourists in the State is not encouraging mainly due to: (i) absence of value-added tourism products, (ii) lack of transport and communication facilities, (iii) poor infrastructure in and around the tourist spots, (iv) the inner line permit system to enter Arunachal Pradesh, and (v) lack of publicity/marketing.

However, to attract both domestic and foreign tourists in large scale, these bottlenecks are to be removed. For example, Tawang which is at present attracting a few religious tourists for its famous Buddhist monastery can be developed as a world class tourist resort attracting all classes of tourists including health and adventure tourists. For adventure sports all modern and state of the art facilities, including skiing and gliding in Tawang slopes should be built up. This will encourage adventure tourists to visit Tawang (Goswami, 2002). The establishment of an Institute of Indigenous Herbal Medicine and Research, and modern medicare facilities can attract health-tourists to these resorts. Another spot for adventure tourism can be developed in the Lohit and other rivers of Arunachal Pradesh. The steep gradients in this part of their courses have made them excellent spots for water sports and adventure tourism. The virgin environment of Arunachal Pradesh can attract more tourists than the polluted tourist spots like Shimla, Darjeeling, etc., for both domestic and foreign tourists, provided proper development of infrastructure and other facilities including new tourism products are created for the tourists. To do so, the multinational companies dealing in tourism, can be invited. In a study made in Assam, it was found that nearly 55 per cent of the foreign tourists visiting Assam are adventure tourists. In the same study, the foreign tourists are found to have preference for economy and semi-deluxe accommodation rather than luxurious accommodation and more than 60 per cent of them like to travel by train (Sharma, 2006). Similar studies can also be done in Arunachal Pradesh to assess the requirements of tourists visiting the State. "If the vast tourism potential of the North-East India is fully tapped and developed, within 20 years the region will receive more tourists than Singapore or Bangkok" (Coopers and Lybrand, 1995).

### **Tea, Coffee, Rubber and Black Pepper**

Tea cultivation in Arunachal Pradesh was started in 1978-79 by the Arunachal Pradesh Forest Corporation.

Being encouraged by the success of the Corporation, many big and small private tea gardens have come up in recent years. Besides tea, the Arunachal Pradesh Forest Corporation is also growing coffee, rubber, and black pepper in Tirap, Lohit and Changlang districts with success. Considering the suitability of soil and climate of the State, the cultivation of these crops is expected to increase in near future. In that case these four products can have an important place in the export items of Arunachal Pradesh's border trade with neighbouring countries.

## Hydro-electric Power

Arunachal Pradesh possesses immense potential of powers, primarily in the form of hydel. But the progress of this sector has not taken place on a scale proportionate to resource availability. The total unexploited hydel potential of the State is estimated to be 49000 MW. The National Hydro Power Corporation (NHPC) has undertaken survey and investigation works of Siang and Subansiri basins for establishing mega hydro power project with an installed capacity of 20700 MW. When this project will be completed, Arunachal Pradesh can be a major exporter of cheap hydel power not only to the entire North-east, but also to its neighbouring countries having power deficit like China and Myanmar.

## Strategy

In spite of its high potentialities Arunachal Pradesh has so far failed to derive the benefits as a producer of exportable surplus. In order to facilitate the conduct of cross-border trade the State as well as the Centre has to overcome several impediments.

### *Physical Infrastructure Development*

The border areas of Arunachal Pradesh on all sides, except the south, lie in inaccessible mountains, dense forests and turbulent rivers which stand in the way of smooth conduct of border trade with the neighbouring countries. Moreover, the internal transport and communication network in the State is not at all conducive for speedy growth of the State economy. This calls for massive infrastructural development by way of constructing all weather motorable roads including bridges for uninterrupted movement of men and materials. In this connection, the following border roads having significant importance for border trade of Arunachal Pradesh with China and Myanmar can be developed.

- |   |                     |
|---|---------------------|
| (i) Tezpur-Bomdila-Tawang-Bum La                | (China)             |
| (ii) Lakhimpur-Daparijo-Nacho                   | (China)             |
| (iii) Jonai-Sadiya-Mekha-Malvinil-Tajobum       | (China)             |
| (iv) Sadiya-Tezu-Chirangal-Kahao                | (China)             |
| (v) Tinsukia-Winstong-Mogung                    | (Myanmar)           |
| (vi) Khonsa-Wakha                               | (Myanmar)           |
| (vii) Ledo-Pangsou Pass-Myitkyina-Bhamo-Kunming | (Myanmar and China) |

Out of these seven old border trade routes of Arunachal Pradesh, the most useful and economic route is the Ledo-Pangsou Pass-Myitkyina-Bhamo-Kunming route, popularly known as StilWell Road. This road which was constructed during the Second World War, connects Arunachal Pradesh not only with Myanmar and China but also the South-east Asian countries. Out of its total length of 1700 km between Ledo (Assam) and Kunming (China) only a stretch of about 160 to 200 km between Ledo and Myitkyina needs rebuilding. If this part of the road is reconstructed, then in near future, Arunachal Pradesh, for that matter the entire nation could have direct access by road to the South-east Asian region. From the border point of Arunachal Pradesh in the east, exports of Arunachal could reach Kunming in South China within two and a half days, Yangon in Myanmar within three days, Bangkok in four days and Singapore in five/six days. This land route of trade would be shorter and cheaper in comparison to the existing sea routes. India's trade would take a diametrically opposite direction from the West to the East and with much more gains since the buyers and sellers of these markets of the East are culturally and racially more akin to the buyers and sellers of North-east India (Goswami and Gogoi, 2004). This route will also encourage the tourists visiting ASEAN region to extend their tour programmes to Arunachal Pradesh/North-east India, a few hundred miles away, for visiting the region's exotic biodiversity, heritage sites and for enjoying its adventurous sporting events.

Besides development of road network, there are many other infrastructures that need development for the growth of border trade, such as, power, railway, ropeway, telecommunication, cold-storages, weigh-bridges, warehousing, customs clearing centres, currency exchange centres, banking, hotels and restaurants, motels, etc. (Alam, 2002).

Such developments in infrastructure require a huge amount of fund. For this purpose, efforts must be made to attract foreign direct investment (FDI) in certain

specific areas like tourism development, in addition to approaching the World Bank and the Asian Development Bank for investment in the development of transport and communication of the State. To attract such investments, the State and the Centre may engage well known international consultancy firm for preparing project reports.

### *Development of Social Infrastructure*

The removal of bottlenecks in physical infrastructure alone cannot encourage outward looking policy of development through border trade in a subsistence tribal economy. Several institutional arrangements are also necessary of which four are the most important: (i) The creation and recognition of well defined private property rights as the exiting system of social ownership of land cannot operate successfully in a market-oriented system. (ii) An effective contract enforcement mechanism, by the Government is essential as farmers are to be drawn into contractual relation to ensure the timing homogeneity and quality required by industrial users. It will lead to flexible specialisation through employing footloose labourers (Mishra, 2002). (iii) Development of knowledge industries based on indigenous resources so that products, process and patent could be exported. State-of-the-art R&D Institutions are to be established to initiate research on the efficacy and effectiveness of the locally available medicinal and aromatic plants for production of life saving drugs and perfumes respectively. (iv) In exploring economic opportunities through external trade, utmost caution needs to be taken to avoid harmful effects of trade on the existing agrarian structure and food security scenario of the State. Creation of a buffer stock of staple food is necessary as the market-led and export-based economy may lead to decline of availability of staple food grains. The surplus crops produced by the big farmers will be sold in the market and there will be no redistribution of grain from the surplus to deficit farmers as found in a peasant tribal society (Patnaik, 1996).

### *Techno-Economic Survey*

A macro level techno-economic survey is necessary before venturing into any major structural change in the economy. The potentiality, technical feasibility, economic viability and sustainability including cost and benefit of each area of development are to be studied by professional and competent agencies. Nothing should be done on the basis of hypotheses.

### **Conclusion**

Since the emergence of globalisation, India's trade relations with China, Myanmar and other ASEAN countries have been growing at rapid strides. The potentialities of further growth in India's trade with these countries are also immense. Arunachal Pradesh, a resourceful State, can also be a partner of this emerging trade scenario. The major impediment towards the growth of border trade with India's eastern neighbours is the absence of efficient transport and communication networks. To achieve benefits from border trade, the physical linkages among the trading partners in the form of trans-national highways, railways, waterways and airways, wherever possible, are essential. A huge amount of capital expenditure would be necessary to build such infrastructural facilities in Arunachal Pradesh. It is possible only through financial assistance from international financial institutions and the participation of multinational corporations. It is true that along with bringing in lot of benefits, the outward looking development strategy of Arunachal Pradesh, as suggested, may also import a few vices such as erosion in social bond in tribal society, emergence of economic inequality in the initial stage, spread of HIV, drug addiction, women trafficking, etc. These are the costs of development, one has to bear with grace. What is necessary is to find out a trade-off. The economic benefits of the market-oriented, trade-led, outward looking economic strategy would definitely outweigh the cost in the form of importation of vices, imaginary or real.



## Chapter 17

# Tourism



### Introduction

Arunachal Pradesh is well known for its vast forest resources and rich biodiversity. As per the estimate of Forest Survey of India, based on satellite imagery, forest area in this State constitutes around 81.9 per cent of the total area of the State, which is one of the highest among the states of North-east India. The dense forest and rich biodiversity of the State presents huge opportunities and challenges. The conflict between development process and protecting the biodiversity of the State is becoming increasingly more apparent. Arunachal Pradesh has the unique opportunity to map out a development path that is sustainable and ecologically sound. In this background, the promotion of nature-based tourism appears to be one of the best ways of generating internal revenue, employment and accelerating development. In addition, the nature-based eco-tourism can play an important role in the State's strategy to conserve the rich forest resources as well as cultural heritage.

Arunachal Pradesh has an enormous potential for tourism and the tourists can enjoy its picturesque hills, dales and seasonal climate, and meet its people with their beautiful arts, crafts and colourful festivals. There are 11 identified tourist spots in the State (Annexure Table A-17.1). These can be grouped as:

#### *Heritage Tourism*

Tawang, Bhismaknagar and Itanagar are historical and heritage tourist spots. Tawang has more than 300-year-old Buddhist monastery, which is one of the oldest monasteries in Asia. So, Tawang can be developed as a Buddhist tourist centre, which can attract Buddhist tourists from Thailand, Japan, Korea, Sri Lanka, etc. The Itafort of Itanagar, was built in the 14<sup>th</sup> century A.D. and

is a historical site as also Bhismaknagar in Dibang Valley district.

#### *Pilgrimage Tourism*

Malinithan and Parasuram Kund are pilgrim centres. In fact, Malinithan is a unique site developed between the 10<sup>th</sup> and 12<sup>th</sup> centuries A.D. It has an ancient temple housing sculptures of gods and goddesses. Parasuram Kund is a place where Parasuram is believed to have washed away his sin of matricide. During Makar Sankranti thousands of pilgrims from all over the country come here for a holy dip.

#### *Nature-based Tourism*

The rest of the tourist spots like Bomdila, Dirang, Ziro, Along, etc., can be regarded as mountain resorts which comprise natural beauty like valleys, snow-clad mountains, plateaus on top of the hills, green forests, etc.

#### *Cultural Tourism*

Arunachal Pradesh is home to 26 major and numerous minor tribes with rich cultural traditions. The added attractions are the colourful festivals, which form an essential aspect of the socio-cultural life of the people of the State. Thus, Arunachal Pradesh is a wonderful destination for the cultural tourists.

#### *Adventure Tourism*

Arunachal Pradesh has a rich potential to develop adventure tourism. Tourist services like trekking, river rafting and angling can be made available of and developed in most of the tourist sports at the foothill regions of the State. The interesting trek routes are given in Annexure Table A-17.2.



## BOX 17.1

**Namdapha National Park—Wildlife Tourism**

Namdapha National Park is located in the Changlang district of Arunachal Pradesh. It is adjacent to Myanmar in the east and south. It is spread over an area of 1,985 sq km, consisting of 1,808 sq km of the core zone and 177 sq km of the buffer zone. It was declared a wildlife sanctuary in 1972 and subsequently was declared as a tiger reserve as well as a national park in 1983. The elevation of this unique national park ranges from 200 metres to 4,500 metres. Rich in flora and fauna, the park has 73 species of lichens, 59 species of bryophytes, 801 species of angiosperms, 50 species of reptiles, 453 species of birds and 96 species of mammals (Singh *et al.*, 2000). Hence, in addition to natural beauty, the unique composition of flora and fauna of the park also attracts the tourists.

**Constraints to Tourism Development**

The State has, no doubt, an enormous potential for attracting tourists, but the inflow of tourists in the State is very limited as compared with the other states of India. The reasons are as follows:

*Infrastructural Constraints*

The first problem lies with the remoteness and inaccessibility of tourist spots due to a lack of infrastructural facilities. The whole north-eastern region is backward from the infrastructural point of view, but Arunachal Pradesh appears to be the most backward among the states of North-east India. For example, Arunachal Pradesh is among the two states of India which does not have functional airport. The status of railways has been at stand still having negligible of 12 km metre gauge line. Hence, roads constitute the principal mode of access and communication in the State. However, the State has the lowest road development index in the country. For example, the road density in 2004 is only 18 km per 100 sq km against the Indian average of 75 km per 100 sq km and north-eastern regional average of 52 km per 100 sq km.

It is found that average distance of the nearest railway station and airport from the identified tourist spots of Arunachal Pradesh is more than 100 km and 200 km, respectively. Hence, road is the basic means of communication but both public transport and intermediate forms of transport are inadequate. Accommodation is another requirement for tourism. However, in Arunachal Pradesh the identified tourist spots lack proper private accommodation facilities except Itanagar, Ziro, Bomdila and Tawang.

*Institutional Constraints*

All the domestic tourists are required to obtain Inner Line Permits for visiting Arunachal Pradesh which can be obtained from limited places like Delhi, Kolkata, Shillong, Guwahati, Dibrugarh, etc.

All the foreign tourists intending to visit Arunachal Pradesh require Restricted Area Permit from the Ministry of Home Affairs, Government of India. However, recently the Central government has delegated power to the State government to issue Protected Area Permit to visiting foreign tourists in a group of three or more persons for a maximum period of 30 days.

*Marketing Constraints*

Arunachal Pradesh's tourism industry was poorly developed because of lack of coordination by government agencies and virtual absence of information and marketing of the State's attractions.

It is to be noted that success of Singapore and China in tourism industry would suggest that the marketing of tourism product is just as important as its nature and quality for promoting the tourism industry.

*Other Constraints*

The growing violence and insurgent activities as well as number of *bandhs* in Assam have disputed the development of tourism in North-east India in general and Arunachal Pradesh in particular. There may be some grievances of the local people but it may have acted as a psychological obstacle that is faced by potential tourists. Tourism as an industry is highly sensitive to potential disturbances.

## BOX 17.2

**Contribution of Trade, Hotel and Restaurant to NSDP of Arunachal Pradesh**

Tourism is intimately linked to hotel industry. In fact, the 'trade hotel and restaurant' is the resource base of tourism because a well placed hotel may enhance the attractiveness to the tourists. Since it is not possible to estimate the contribution of tourism in State economy except the revenue earned, an attempt is made to estimate the contribution of 'trade, hotel and restaurant' component (as a proxy of tourism) to the State income for the last three decades. The contribution of trade, hotel etc., to the NSDP of Arunachal Pradesh increased steadily from 1.96 per cent in 1970-71 to 4.95 per cent in 1990-91 and finally to 5.64 per cent in 2003-04. In fact, 'trade, hotel, restaurant' grew at an average rate of around 9 per cent from 1970-71 to 2003-04.

## Structure of Tourist's Demand and its Sectoral Linkages

Since there are a growing number of visitors recently, an attempt was made to study the nature and structure of tourist demand in Arunachal Pradesh in relation to the tourist income, occupation, level and pattern of expenditure, purpose of visit, demographic characteristics such as age, based on the field survey which was undertaken in 2002-03.

From the surveyed tourists it is found that around 88.49 per cent of the tourists of Arunachal Pradesh were between ages 20 to 50. The average age of domestic tourist was calculated at 35 years and that of foreign tourists at 36 years. This fact emphasises the need to organise more and more challenging adventures and thrilling activities to attract energetic youthful tourists. This calls for greater investment in activities like mountaineering, trekking, hiking, river rafting and allied sports along with fascinating cultural activities. In fact, in order to develop tourism, there is need for more investment i.e., capital expenditure. However, in the budgets of Government of Arunachal Pradesh, the revenue expenditure in tourism is found to be much higher than that of capital expenditure.

An attempt is also made to identify the different heads under which the tourists expenditures are made especially in the selected tourist spots of Arunachal Pradesh. It is found that 39.92 per cent of the total expenditure was made on accommodation, followed by food and beverage (30.06 per cent), and shopping (15.84 per cent). Relatively, a low percentage (12.90 per cent) was spent on local transport, which reflects the fact that the tourists hired transport from outside the State since the local transport system was not much developed and relatively costly. This is supported by the fact that around 77.87 per cent of the surveyed tourists are of the opinion that there is need to improve the mode of transportation for developing tourism in Arunachal Pradesh.

Regarding accommodation, it was found that the majority of domestic tourists looked for cheaper accommodation with reasonable comforts whereas luxury accommodation in posh hotels were the privilege of the rich domestic tourists and the majority of the foreign tourists. Therefore, the planning for tourism development should reflect the behaviour of tourists particularly while formulating the investment programme for hotel industry.

Although the tourists spent a significant percentage of their income on food and beverages yet a majority of them

were not satisfied with the quality of food available. Around 78 per cent of the surveyed tourists were of the opinion that the quality of food should be improved and the price was relatively high. A good number of tourists were also of the opinion that the local food should be readily available in the hotels and tourist lodges. Around one-sixth of the total expenditure was spent on shopping, particularly the purchase of handicrafts, showing that there is a good potential market for indigenous handicraft products and this strengthens the case for their further expansion.

The propensity to enjoy natural beauty was highly pronounced in case of both domestic and foreign tourists. As high as 75.72 per cent of the surveyed tourists came to Arunachal Pradesh to enjoy natural beauty and recreation. While some (15.15 per cent) came to know more about the people and their culture, yet enjoyment of natural beauty was also high on their agenda. Only 7.10 per cent came for educational and other purposes. The operational significance of these observations is that greater emphasis should be laid upon the creation and motivation of the tourism product to suit the needs and tastes of those tourists whose purpose of visit is recreation and enjoying natural beauty but not at the expense of other purposes of tourist visit.

Furthermore, it was revealed that viewing natural beauty was a satisfying experience and most of the respondents (98.11 per cent) wanted to return to Arunachal Pradesh provided transportation facilities and institutional facilities were improved. At the same time, a high proportion of respondents (98.75 per cent) informed that they would talk to their friends and relatives about their experience in Arunachal Pradesh and presumably advise a visit to these places. This is also supported by the fact that the recommendations of friends and relatives have induced 79.4 per cent of the tourists to visit the State as against the other factors such as publicity in newspapers, TV, Internet, etc.

These factors demonstrate the existence of a large market, particularly for eco-tourism in the State and also strengthen the case for its further expansion and development. However, the present publicity efforts were found to be less effective in taking advantage of the market. Hence, there is a need for strengthening the publicity for marketing of the State's tourism product.

## Policy Implications

The following policies as well as action plan were suggested for maintaining sustainable tourism:

- Tourism needs a proper organisational support for coordination. It should give priority in total planning of the State. Institutional arrangements for proper coordination at the State level may be evolved.
- A tourism master plan and identification of more circuits may be prepared. The circuits should be developed in terms of two primary categories. The first category circuits should cover some of the locally important attractions. Secondly, the circuits which have more local importance may be linked to other tourist centres of north-eastern region. More specifically, the circuits of north-eastern region may be divided into different categories like pilgrimage, historical, cultural, recreation, wildlife etc., and the identified tourist spots of Arunachal Pradesh may be linked to those circuits accordingly. For example, for wildlife tourism, the circuits in north-eastern region may be like Manas National Park-Kaziranga National Park-Namdapha National Park etc. Tourism development will be more productive if it is a part of north-east scenario. Detailed circuit routes and location-specific recommendations should be drawn with a phased approach. Commercial viability and competitive advantage of each route should be found out.
- Public-private partnership should be treated as an essential ingredient of the policy for the development of tourism in the State. The State government can build up the infrastructural facilities for tourism like tourist lodges and huts, restaurants etc., but the private sector is best suited for the management and delivering of the services. The tourist lodges are not only few in number but also are scattered in different parts of the State. Tourist lodges will be basically constructed to attract the economy class tourists. Hence, it is proposed to construct tourist lodges in the selected places like Itanagar, Ziro, Malinithan, Sela Pass, Tipi, Yingkiong, Pasighat, Tuting, Anini, Daporijo, Hayuliang, etc. At the same time, the State government should also provide road, land, water and electricity to private entrepreneurs for constructing private hotels in different tourist spots of the State.
- Air connectivity is a cost-intensive option but it needs to be developed for promoting tourism. Airports may be built up or developed in Itanagar, Pasighat, Ziro and Tezu. In hilly places like Bomdila, Tawang, Mechuka etc., the government can build short landing facilities for small air crafts.
- Tourist clusters, especially in orange and apple orchard areas, with landscaped huts strewn across hill sides should be promoted which can be taken up by private entrepreneurs.
- The State government should incorporate at least one aerial passenger rope-way company with a number of rope-ways at selected tourist spots of Arunachal Pradesh like Ziro, Bomdila, Dirang, Yingkiong, etc. However, the proposal for rope-way should be based on economic viability.
- The government should also encourage adventure tourism by building necessary infrastructure for angling, river rafting, winter sports, etc. The angling and river rafting can be developed in West Kameng, Lower Subansiri, West Siang and East Siang districts of Arunachal Pradesh. The winter sports can be developed in Tawang, West Kameng and Upper Siang districts.
- The tourism department should liaise with industries department and set up shops for selling handicrafts and local products for serving tourists in the selected tourist spots.
- The participation of local people should be encouraged. Local management skills must be built so that local people can maintain their culture and also improve tourist sites. For example, the tourist destination has to be developed in consonance with the local communities. It may be possible to provide a unique experience to tourists by building low cost infrastructure in the villages (with proper hygiene, sanitation facilities and electricity) in adjoining district headquarters, by using local materials and local design inputs. There may also be arrangements for showing the local cultural festivals, dances etc. This will create employment opportunities. However, the participation of local people should be systematic and continuous. At the same time, guest-host relationship needs to be well researched before an appropriate policy can be evolved.
- One of the most crucial needs for tourism development in the State is human resource development. It should emphasise schemes for capacity generation of local community, 'training of trainers', etc., so that the well trained local manpower can adequately serve the tourism demands in future.

- All the developmental activities, particularly infrastructure, for facilitating tourism in the selected tourist spots should be planned with a vision on environmental sustainability.
- A watchdog committee should be set up to monitor the impacts of tourism on the physical, chemical and biological entities as well as its socio-economic implications. The committee can be constituted of experts of various disciplines from academic and research institutions and NGOs working on environment to update the monitoring from time to time.
- The government should develop an interactive and properly managed website which should have links with national websites, websites of private industries, service providers etc. In fact, through the website, intending travellers could not only get information but also be able to make all arrangements for the journey.
- The simplifying of the entry formalities can lead to more tourists' arrivals throughout the year. The government may think seriously about simplifying the entry formalities for tourists to Arunachal Pradesh, so that more tourists can be attracted. For example, the tourists may obtain the Inner Line Permits for short duration at the various entry points by doing the necessary formalities, there itself, instead of facing the bureaucratic hazards outside the State. In this connection it should be noted that recently the Government of India has allowed group A and B Central government employees to travel by air from the place of posting or nearest airport to a city in the north-eastern region or nearest airport on LTC. Other categories of employees will be entitled to travel by air to a city in the north-eastern region from Guwahati or Kolkata who intend to visit to north-eastern region.

All the Central government employees are allowed conversion of one block of hometown LTC into LTC destination in north-eastern region for a period of 2 years. The policy of Central government will definitely help the development of tourism in Arunachal Pradesh.

Thus, the study shows that sustainable policies and guidelines for tourism could make Arunachal Pradesh one of the most frequently visited tourist states in the entire north-east region of India. This could provide a very significant and much needed revenue and employment source for Arunachal Pradesh in future. However, the tourism development of the State must be integrated with that of the north-eastern region.

### BOX 17.3

#### **Specific Objectives of the Recent Tourism Policy of Arunachal Pradesh**

The policy has the following objectives:

- (1) Suitable planning for sustainable development of tourism.
- (2) Protection of its heritage (natural, cultural as well as traditions and values of the people of the State).
- (3) Reduction of poverty by income generating facilities.
- (4) Capacity building and creation of mechanisms in support of small and medium enterprises.
- (5) Formulation of strategies that will exploit opportunities and potentialities of the State.
- (6) Ensuring development policies (including public works and transportation, bus and road networks) that support and promote the various attractions of the State.
- (7) Securing involvement of the largest number of stakeholders in the decision-making and resource allocation and utilisation.

Source: Government of Arunachal Pradesh, Tourism Policy (Undated).



ANNEXURE TABLE A-17.1

## Identified Tourist Spots in Arunachal Pradesh

<i>Name of the Tourist Spot</i>	<i>District</i>	<i>Distance from the State Capital (in km)</i>
Itanagar	Papum Pare	0
Tawang	Tawang	540
Bomdila	West Kameng	360
Dirang	West Kameng	403
Tipi	West Kameng	210
Ziro	Lower Subansiri	168
Malinithan	West Siang	162
Along	West Siang	335
Pasiaghat	East Siang	280
Parasuram Kund	Lohit	795
Namdapha National Park	Changlang	640

Source: North East India Data Bank-Tourism, pp.5-6.

ANNEXURE TABLE A-17.2

## Interesting Trek Routes in Arunachal Pradesh

<i>Route</i>	<i>Approximate Distance (in km)</i>	<i>Expected Duration (in days)</i>	<i>Favourable Time</i>
Bomdila-Daimara	100	6	September-October
Bomdila-Seppa	120	8	September-October
Along-Mechuka	85	7	September-October
Daporijo-Taksing	250	25	September-October
Pasiaghat-Tuting	80	7	December-January
Pasiaghat-Mariang	80	7	December-January

Source: North East India Data Bank-Tourism, p.13.

ANNEXURE TABLE A-17.3

## Accommodation Capacity of Different Hotels/Guest Houses, etc., in Tourist Spots of Arunachal Pradesh

<i>Sl. No.</i>	<i>Name of Hotel/Guest House and Location</i>	<i>Rooms</i>		<i>Dormitory</i>
		<i>Single</i>	<i>Double</i>	
01	Donyi-Polo Ashoka, Itanagar	7 rooms with A/C	13 rooms with A/C	
02	Hotel Blue Pine, Itanagar	08	17	6 beds @ Rs.75 per bed
03	Hotel Bomdila, Itanagar	10	10	
04	Hotel Arun Subansiri, Itanagar	-	14	
05	Hotel Kameng, Itanagar	-	16	
06	Hotel Himalyan, Itanagar	01	10	
07	Hotel Itafort, Itanagar	06	06	
08	Hotel Alpine, Itanagar	10	05	
09	Hotel Anne, Itanagar	04	12	
10	Hotel Kosing, Itanagar	03	09	
11	Hotel Jimsy, Itanagar	03	10	
12	Hotel Hemika, Itanagar	03	04	
13	Circuit House (PWD) Itanagar	-	12	
14	Hotel Arunachal, Naharlagun	10	13	
15	Hotel Rajhans, Naharlagun	03	10	
16	Hotel Simang, Naharlagun	05	06	
17	Hotel Alena, Naharlagun	02	06	
18	Hotel Ganesh, Naharlagun	04	05	
19	Hotel Mummy, Naharlagun	04	04	
20	Hotel Laxmi, Naharlagun	04	09	
21	Hotel Chandni, Naharlagun	04	22	
22	State Guest House, Naharlagun	03	02	
23	Youth Hostel, Naharlagun	-	04	
24	Circuit House (PWD), Ziro	-	05	
25	Hotel Blue Pine, Ziro	01	13	
26	Hotel Green View, Ziro	-	10	
27	Hotel Pine Ridge, Ziro	-	03	
28	Hotel Santanu, Ziro	-	-	
29	Hotel Kanchanajanga, Ziro	-	-	
30	Circuit House (PWD), Likhabali	-	06	

contd...



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Sl. No.	Name of Hotel/Guest House and Location	Rooms		Dormitory
		Single	Double	
31	Forest Guest House, Likhali	-	04	
32	Siang Guest House/Circuit House, Pasighat	-	08	
33	Hotel Donyi-Polo, Pasighat	06	14	
34	Hotel Siang, Pasighat	03	07	
35	Hotel East, Pasighat	04	04	
36	Hotel Oman, Pasighat	04	04	
37	Hotel Sangpho, Pasighat	01	03	
38	Hotel Arun, Pasighat	09	07	
39	Park Hotel, Pasighat	03	02	
40	Tourist Lodge, Bomdila	-	08	
41	Circuit House, Bomdila	-	07	
42	Hotel Shipyang Pong, Bomdila	10	12	
43	Hotel Dawa, Bomdila	-	05	
44	Hotel Bomdila, Bomdila	01	06	
45	Hotel Pasang, Bomdila	01	05	
46	Hotel Potola, Bomdila	01	04	
47	LA Hotel, Bomdila	04	06	
48	Sangrilla Hotel, Bomdila	-	05	
49	Tourist Lodge, Dirang	-	04	
50	Hotel Pemaling, Dirang	-	04	
51	IB (PWD)	-	04	
52	Tourist Lodge, Tawang	-	16	
53	Circuit House (PWD)	-	05	
54	Hotel Buddha, Tawang	-	08	8 bedded @ Rs.100 per bed
55	Shangrila Hotel	-	15	
56	Hotel Paradise, Tawang	-	05	
57	Hotel NEFA, Tawang	-	03	8 bedded @ Rs.160 per bed
58	Hotel Osen, Tezu	-	08	
59	Tourist Lodge, Tezu	-	08	
60	Hotel Mother, Tezu	-	04	

Source: North East India Data Bank-Tourism, pp.5-6.

## ANNEXURE TABLE A-17.4

## Annual Allocation of Tourism Sector in State Annual Plan (Rs. in lakh)

	Annual Plan			
	2002-03	2003-04	2004-05	2005-06
Direction and Administration	107.00	115.00	135.00	138.00
Tourist Information, Promotion and Publicity	120.00	104.00	100.00	20.00
Development of Tourist Centres/Infrastructures	160.00	153.00	118.00	195.00
Development of Adventure Tourism	15.00	2.00	6.00	20.00
Building	1.00	10.00	55.00	50.00
Fairs and Festival	30.00	50.00	50.00	10.00
Training Programme	5.00	12.00	14.00	12.00
Hospitality	6.00	8.00	12.00	10.00
Total	444.00	454.00	490.00	455.00

Source: Department of Planning, Government of Arunachal Pradesh.

**ANNEXURE TABLE A-17.5**  
**Allocation of Eleventh Finance Commission**  
**(EFC) Upgradation Grant during 2000-01**  
**to 2001-05 (Rs. in lakh)**

<i>Head of Allocation</i>	<i>2000-2005</i>	<i>2000-01</i>	<i>2001-02</i>	<i>2002-03</i>	<i>2003-04</i>	<i>2004-05</i>
Tourism	75.65	40.43	15.00	20.22	—	—
Tawang Monastery	30.43	20.43	—	10.00	—	—
Parusuram Kund	20.00	10.00	10.00	—	—	—
Gorsan Chorten	10.00	10.00	—	—	—	—
Lhagelah Gumpa at Morshi	10.00	—	5.00	5.00	—	—
Theda Veta, Itanagar	5.22	—	—	5.22	—	—

Source: Department of Planning, Government of Arunachal Pradesh.

**ANNEXURE TABLE A-17.6**  
**Sanction Received For Projects under Centrally Sponsored Schemes, 2000-01 to 2005-06 (Rs. in lakh)**

<i>Heads(1)</i>	<i>Amount Sanctioned(2)</i>	<i>Amount Spent(3)</i>	<i>Status(4)</i>
<b>2000-01</b>			
Arunachal Festival	0.92	0.46	Completed
Beatification of Sela lake at Tawang	25.00	7.50	On going. UC submitted
C/o Trekkers Huts at Table Valley	2.11	0.60	Dropped
C/o Tourist Dormitory at Malithan	12.24	3.60	Dropped (Rs.1.31 lakhs adjusted against C/o M/Hall Tawang)
C/o Cafeteria at Bitk Falls	4.48	3.58	On going. UC submitted
C/o CC steps, CC Footpath with Ms Railing at Menga Cave, Daporijo	5.00	4.00	Ongoing
<b>2001-02</b>			
Dev. of Angling facilities centre at Bodak	7.39	5.91	Completed UC/CC submitted
Procurement of angling facilities at Bodak	3.23	1.30	Completed. UC/CC submitted
IT for Noth-East	4.39	18.29	Completed
Brahmaputra Darshan at Pasighat	20.00	10.00	Completed
Purchase of Computers	7.00	3.50	Completed
Development of Website	7.79	7.01	Completed
Aero Sports Tourism at Pasighat	97.00	80.00	Panel of experts constituted. Work being undertaken
T/Lodge at Boleng	16.00	4.80	Site changed to Sangam UC to be submitted
Yatri Niwas at Roing	56.00	16.89	Completed. UC/CC submitted
Publicity Materials and Advt. Support	56.00	44.25	Completed
Solung Festival 2001 of Adi Festival	5.00	2.50	Completed
Buddha Mahotsava at Tawang	5.00	5.00	Completed
River Rafting Equipment	7.10	7.05	Completed. UC/CC
T/Lodge at Mebo	10.00	8.00	Submitted
<b>2002-03</b>			
Buddha Mahotsava	10.00	8.00	Completed
Tawang Festival	10.00	5.00	Completed
Buddha Purnima	12.30	12.30	Completed
Solung Festival	4.00	3.20	Completed

contd...

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<i>Heads(1)</i>	<i>Amount Sanctioned(2)</i>	<i>Amount Spent(3)</i>	<i>Status(4)</i>
Publicity Literature	58.90	44.30	Completed
Angling Festival	5.00	4.00	Completed
<b>2003-04</b>			
Solung Festival	5.00	5.00	Completed
Integrated dev. of Bhalukpong, Bomdila— Tawang Circuit	638.00	500.00	Work partially progress. Implemented by ITDC, New Delhi
WSA at Kharsingsha	47.54	14.00	Completed
Dev. Of Ganga Lake	244.06	8.00	Completed
Ext.T/Lodge at Tawang	100.00	100.00	90% physical progress
<b>2004-05</b>			
Const. of WSA at Kuporijo	65.40	52.32	90% physical progress
Dev. of Ganga Lake	243.00	243.00	Completed
Tourism Hut, Changlang	83.24	66.00	Completed UC/CC to be submitted
Destination dev. of Along, West Siang	266.00	213.00	90% physical progress
Destination dev. of Zemithang	384.00	307.20	60% physical progress
<b>2005-06</b>			
Destination dev. of Hot Spring, Jia at Lower Dibang Valley	262.00	209.00	Work under progress
Celebration of Brahmaputra Darshan	15.00	12.00	Completed
Destination dev. of Geara Laketaraso	373.00	298.00	80% physical progress
Circuit dev. of Dibrugarh, Pasighat, D-Ering Wildlife Sanctuary	299.00	239.20	Work under progress
Intregated dev. of Siang Circuit	778.94	623.00	Work under progress
Celebration of Festival of Arunachal 2006	10.00	8.00	Completed
Const. of multipurpose hall at Pasighat Tourist Lodge at Deomali/WSA at Deomali entry gate, Tirap	161.00	128.80	Work under progress

Source: Department of Planning, Government of Arunachal Pradesh.

## Chapter 18

# Power Sector Development

### Introduction

A reliable, efficient and universal access to electricity is vital for socio-economic transformation of any region. It not only stimulates commercial and industrial activities but also facilitates a better living for the people. In this sense, electricity consumption has a cascading multiplier effect on the development process by way of boosting income and employment generation, as also providing more investible funds in the hands of government through sale of power and other charges.

As such, power sector needs to be developed not only on priority basis but also to be linked with the broader development and welfare goals in the background of local settings. It needs to set its objectives around peoples' aspirations for uninterrupted and adequate power supply at an affordable price while exporting the surplus, if any, to generating financial resources for development purposes. While doing so, it should take into account the financial as well as social cost of exploiting power potential through alternative technologies. With the benefits flowing in to the people, their participation and support to the sectoral initiatives would be more generously forthcoming, ensuring rapid socio-economic transformation of the region.

In this background, the chapter reviews state of power sector in Arunachal Pradesh and explore policy options facilitating better utilisation of the power potential for socio-economic transformation in long-term perspective. The chapter has been organised in three sections. The first section focuses on current scenario and performance of the sector in terms of key indicators, viz., consumption,

generation, potential, transmission and distribution (T&D), losses and institutional set-up. In this process, it also attempt to identify constraints faced by the sector in the State. The second section reviews State's policies and reforms relating to power sector in the recent past. Finally, the last section attempts to highlight the challenges ahead and makes policy recommendations for it.

With regard to data, it may be pointed out that both the Department of Power of Arunachal Pradesh government, as well as the Ministry of Power/Central Electricity Authority (CEA) of Government of India provide data relating to the State's power sector. However, there is a considerable inconsistency in the two sources. For the sake of uniformity, the State sources have been broadly followed, unless otherwise specified in the chapter.

### Current Scenario and Performance of Power Sector in Arunachal Pradesh

#### Key Performance Indicators

The development of power sector in Arunachal Pradesh is a highly challenging task. The State is not only characterised by underdevelopment and low per capita income (Rs.10266 in 2004-05 at 1993-94 prices<sup>1</sup>) but also by difficult geographical and ecological conditions, low population density and scattered load all across the State. It has mountainous landscape with several pockets which are not easily accessible.

At the same time, the State enjoys huge hydropower potential, which is assessed to be in the tune of 50328 MW as on 30<sup>th</sup> April 2006 by the CEA<sup>2</sup> while the

1. *Statistical Abstract of Arunachal Pradesh*, 2006.

2. As a matter of fact, the State witnessed the largest hydropower potential among all the north-eastern states. As per the CEA estimate, the total hydropower potential of the north-eastern region is 63257 MW, of which only 1011 MW is developed so far.

Department of Hydropower Development of the Government of Arunachal Pradesh has estimated such potential at 49126 MW.<sup>3</sup>

Prevailing key performance indicators of the sector, as discussed below, are to be viewed in this background.

### *Consumption and Energy Deficit*

The aggregate maximum demand for electricity in the State was estimated at around 105 MW.<sup>4</sup> The per capita consumption of electricity, excluding T&D losses, was only 76.2 MU in 2004-05 as against 75.2 MU in 2001-02. But, it rose sharply subsequently to 139 MU in 2006-07 (Table 18.1).

It may be pointed out here that the local power consumption in the State was far smaller as compared to its exports to other states. In the year 2004-05, for example, the former was only 16.7 per cent of the latter (455.9 MU). This shows that the State could not consume a major chunk of power available. This was mainly due to inadequate T&D infrastructure, as discussed below, within the State.

Table 18.1 further shows category-wise power consumption in the State since 2001-02. It reveals considerable fluctuation in the consumption pattern in the early years of the decade. This might be because of the fact that a large portion of supply in the State was

unmetered and wherever the meters were installed, majority of them were defective. This would have made gathering reliable consumption data difficult.<sup>5</sup> However, some improvement in metering in the last few years might have improved data quality and their reliability.

The available data show that in the year 2006-07 largest consumption was in domestic sector (34.7 per cent), which was followed by bulk users (33.9 per cent) and commercial and industrial establishments (20.3 per cent). Given a low level of industrial development of the State, however, the share of industry was a mere 8.7 per cent of the total. Incidentally, one may also note the declining share of domestic sector in the power consumption, which was a little more than one-third of the total in 2006-07, as against a little less than two-thirds (63.4 per cent) in 2001-02.

Despite low level of power consumption, the State did not suffer from any energy deficit in the recent years<sup>6</sup> as against a deficit as high as 70 per cent in 1996-97. This reflects upon underdevelopment of the State economy balancing demand-supply of power at a lower level. Given this, the State has sold increasingly more power to other states: 455.9 MU in 2004-05 as compared to 210.6 MU in 2003-04.

As the availability of power in the State is likely to increase considerably in coming years, many hydro

TABLE 18.1  
Category-wise Power Consumption in Arunachal Pradesh over the Years

Year	Domestic	Public Lighting	Commercial	Public Water Works and Irrigation	Industry	Bulk/Other	Total
2001-02	47.67	4.7	5.29	2.8	1.72	12.99	75.17
%	63.4	6.3	7.0	3.7	2.3	17.3	100.0
2002-03	34.72	4.37	6.17	2.77	1.67	29.51	79.21
%	43.8	5.5	7.8	3.5	2.1	37.3	100.0
2003-04	36.3	2.51	9.47	2.86	2	32.67	85.81
%	42.3	2.9	11.0	3.3	2.3	38.1	100.0
2004-05 (RE)	37.34	2.97	10.32	3.31	2.26	20	76.2
%	49.0	3.9	13.5	4.3	3.0	26.2	100.0
2005-06	43.36	6.95	16.82	6.25	11.11	45.53	130.02
%	33.3	5.3	12.9	4.8	8.5	35.0	100.0
2006-07	48	7.15	17.5	6.85	12	47	138.5
%	34.7	5.2	12.6	4.9	8.7	33.9	100.0

Source: Resources Discussions Annual Plan 2005-06 and subsequent updates.

3. Department of Hydropower Development, Government of Arunachal Pradesh (vide letter no. CE/HPD/W-III/07/2005-06/6989-90 dated January 4, 2006).

4. *Ibid*

5. A possible inconsistency is reflected in the share of domestic sector: 63.4 per cent in 2001-02 and 43.8 per cent in 2002-03 and, that of bulk users, 38.1 per cent in 2003-04 and 26.2 per cent in 2004-05.

6. This was the case in the year 2005-06. However, a marginal peak level deficit (1.6 per cent) was noticed in 2004-05. For details, see, [www.cea.nic.in](http://www.cea.nic.in)



projects being under execution and planning, such exports can be expected to grow further generating increasingly more investible funds in the hands of government. It is widely acknowledged that the State's free power entitlement would be more than sufficient to meet its own demand leaving a significant surplus for trading.

### *Rural Electrification*

Despite low level of domestic consumption, the State has made a noticeable progress towards rural electrification. It succeeded in electrifying 48.3 per cent of the inhabited villages (1867 out of 3863, as per 2001 census) by 2006.<sup>7</sup> In terms of households, 44.5 per cent of rural households (73250 out of 1,64,501, as per 2001 census) have been electrified, as on 31 March 2005.

Of the 1528 unelectrified villages, 1328 in 13 districts and 56 blocks were to be electrified with a total cost of Rs.19.48 crore under the Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY) <sup>8</sup> and would benefit almost one lakh (91251) rural households. Still, there would be 300 unelectrified villages.<sup>9</sup>

It needs to be highlighted here that despite noticeable progress in rural electrification, the required quantum of power could not be delivered to the villages and rural households. This was mainly due to lack of necessary distribution infrastructure. As a result, success achieved in rural electrification could not produce the desired economic gains to the society.

This limitation has also been addressed under the RGGVY, which has proposed to strengthen rural power distribution infrastructure by way of envisaging,

1. Establishment of rural electricity distribution backbone with at least a 33/11KV sub-station,
2. Village electrification infrastructure with at least a distribution transformer in a village or hamlet, and
3. Standalone grids with generation where grid supply is not feasible.

Such infrastructure would go a long way in satisfying the requirements of agriculture and other rural activities

including irrigation pump-sets, small and medium industries, *khadi* and village industries, cold chains, health care, education and information technology.

Again for rural electrification, some efforts were also initiated by way of tapping non-conventional energy sources. This has been taken up by the Arunachal Pradesh Energy Development Agency (APEDA), which works under the aegis of the Ministry of Non-conventional Energy Sources (MNES). It has introduced a Remote Village Electrification Programme<sup>10</sup>, under which 18 remote villages have already been electrified through installing Solar Home Lighting Systems. Additional 51 villages have been sanctioned and were under progress. Further, biomass gasifier systems in the range of 10 to 100 KW were also installed in 8 out of a target of 15 villages.

Recently, the Prime Minister's Economic Package (January-February 2008) for Arunachal Pradesh has provided Rs. 550 crore for providing electricity through solar power as well as small hydropower projects to all villages along the State border within a span of two years. Towards this, the MNRE has already started interaction with the State authorities for collecting detailed information about sites, size of systems, implementation strategy etc., for the decentralised small hydro projects and solar lighting systems.

### *Installed Generation Capacity*

The installed generation capacity under the State sector during 1997-98 to 2005-06 has been presented in Table 18.2. The table reveals that the capacity has remained almost static at around 60 MW over the years, as no significant capacity addition was made. It was mainly due to inadequate investment by the State government in view of severe resource crunch.<sup>11</sup> Even in recent past, a very small sum, only Rs.23 crores in 2006-07, was allocated for development of hydropower. It was, though, raised to Rs. 48.6 crores in 2007-08 but nowhere close to the requirement of the sectoral development (Table 18.3).

As such, the State has increasingly relied upon the capacity allocations in the central sector generating

7. Source : Rajya Sabha Unstarred Question No. 1863, dated 09.03.2006 and *Statistical Abstract of Arunachal Pradesh*, 2006.

8. The RGGVY was launched in April 2005 by the Government of India. It replaced the existing schemes like, Kutir Jyoti Programme and AREP to speed up rural electrification. The scheme aims at providing access to electricity to all villages and habitations in four years. Under the scheme, subsidy towards capital expenditure to the tune of 90 per cent will be provided through Rural Electrification Corporation Limited, which is a nodal agency for implementing the scheme. Electrification of unelectrified Below Poverty Line (BPL) households will be financed with 100 per cent capital subsidy at Rs.1500 per connection in all rural habitations. The Management of Rural Distribution is mandated through franchisees. The services of Central Public Sector Undertakings (CPSU) are also available to the states for assisting them in the execution of Rural Electrification projects.

9. [http://powermin.nic.in/rural\\_electrification/states\\_unelectrified.htm](http://powermin.nic.in/rural_electrification/states_unelectrified.htm) (as accessed on 18 November 2005).

10. Under it, solar photo voltaic plants of varying capacity, 4.5 kW, 2.5 kW or 2.2 kW, are installed as per local conditions.

11. *Economic Review of Arunachal Pradesh*, 2004, Directorate of Economic Statistics, Government of Arunachal Pradesh.

TABLE 18.2  
Total Installed Capacity (MW) of the State

Year	Hydro (MW)	Diesel (MW)	Total (MW)
1997-98	23.83	30.05	53.88
1998-99	30.73	24.78	55.50
1999-2000	30.57	35.00	65.57
2000-01	31.83	27.12	58.95
2001-02	32.48	27.12	59.60
2002-03	32.28	27.12	59.40
2003-04	32.48	27.12	59.60
2004-05	33.00	27.12	60.12
2005-06	32.66	25.00	57.66

Source: Government of Arunachal Pradesh, *Statistical Abstract of Arunachal Pradesh 2006*, Directorate of Economics and Statistics, Itanagar.

TABLE 18.2A  
Key Timeline: Ongoing Small Hydel Projects (42 projects)

Sl.No.	Item	No. of Projects	Start	Finish
1	Completion of SHP projects where the work is completed up to 90%	13 projects	Already started	31.12.2008
2	Completion of SHP projects where the work is completed up to 80%	9 projects+ 3 R&M projects	Already started	30.06.2009
3	Completion of SHP projects where the work is completed up to 70%	17 projects	Already started	31.12.2010
4	SHP projects on Indo-China border where the work is completed up to 50%	4 projects	Already started	31.12.2010
5	Project on "Decentralized micro hydel projects and solar lighting systems"		01.06.2008	31.12.2010

Source: Department of Power, Government of Arunachal Pradesh (Unpublished).

TABLE 18.3  
Power Sector Allotment by the State Government

Sl. No.	Sub-head	2006-07	2007-08
1	Hydel Generation	2299.07	4863.07
2	Building	121.54	104.7
3	Survey & Investigation	1.00	0.30
4	Improvement	51.09	209.5
5	Maintenance of Assets	720.01	779.73
6	Direction & Administration	414.29	458.7
	Total	3607	6416

Source: Information supplied by the Department of Hydro Power Development, Government of Arunachal Pradesh on 17-06-2008.

Stations (CGS) by the Ministry of Power from time to time. Such allocations were 118.5 MW in 2004-05, as shown in Table 18.4, as against 43 MW in 2001-02, recording an increase of 175 per cent.<sup>12</sup> This has, thus, become a major source of power for meeting internal demand.

TABLE 18.4  
State's Share in the Central Sector  
Generating Stations: 2004-05

Plant	Ownership	% Share	MW Share
<b>Hydro Power Plants</b>			
Loktak	NHPC	4.76	5.00
Kopili	NEEPCO	4.00	6.00
Kopili Extension	NEEPCO	6.00	6.00
Doyang	NEEPCO	6.70	5.00
Ranganadi	NEEPCO	18.30	74.00
Kopili II	NEEPCO	6.00	1.50
<b>Thermal Power Plants</b>			
Kathalguri CCGT	NEEPCO	5.50	16.00
Agartala GT	NEEPCO	6.00	5.00
Total			118.5 MW

Source: Planning Commission (2005).

Incidentally, it may be pointed out that the central sector generation in the State is largely through mega hydro projects while the State sector by mini and micro projects and by diesel generating sets. At the aggregate, 85 per cent of generation in the State sector was from hydro sources while the rest from diesel gen-sets.

Private sectors contribution to power generation capacity in the State was minimal: 0.18 MW as on May 31, 2005.<sup>13</sup> There is no captive generation capacity of over 1 MW.<sup>14</sup>

### Energy Availability

Given the low and static installed generation capacity in the State sector, it could produce just 53.7 MW of power in 2001-02 which increased marginally to 65 MW by 2004-05 but again came down to 55 MW by 2006-07 (Table 18.5). In contrast, the State's share from CGS rose exponentially from 101 MW in 2001-02 to 511 MW by 2004-05<sup>15</sup> but downed to 320 MW by 2006-07. Such fluctuation is attributable to the varying amount of power generated by those plants, which depend upon, *inter alia*, water availability.

12. Ministry of Power, *Annual Report 2001/02*.

13. Source: *Indian Electricity Scenario*, Ministry of Power.

14. All India Electricity Statistics, *General Review 2005*, CEA.

15. The State has also started receiving its free power share from the Ranganadi hydro electric project (RHEP) since August 2004.

TABLE 18.4A

## Key Timelines for Dibang Power Project

S.No.	Activity	Likely Date of Completion	Remarks
1	DPR submitted by NHPC to CEA	29.12.2005	Completed
2	EIA & EMP reports finalised	01.11.2006	Completed
3	Implementation agreement signed between GoAP & NHPC	24.06.2007	Completed
4	TEC accorded by CEA	23.01.2008	Completed
5	PIB meeting held	28.01.2008	Completed
6	Public hearing at project site	12.3.2008	By SPCB
7	Submission of report on public hearing by State Pollution Control Board	April 2008	By SPCB
8	Submission of proposal for environment clearance to MoE&F	June 2008	By NHPC
9	Consideration of environment proposal by EAC	July 2008	By MoE&F.
10	Accord of environment clearance by MoE&F	Aug. 2008	By MoE&F.
11	Formulation of forest proposal by concerned DFOs	April 2008	By GoAP
12	Identification of land for compensatory afforestation	May 2008	By GoAP
13	Consolidation and submission of forest proposal by State Forest Dept. to MoE&F	June 2008	By GoAP
14	Site inspection by representatives of MoE&F	July 2008	By MoE&F
15	Consideration of forest proposal by FAC	Sept. 2008	By MoE&F
16	Permission by Hon'ble Supreme Court	Jan. 2009	-
17	Accord of in principle forest clearance by MoE&F	Feb. 2009	By MoE&F
18	CCEA Clearance	April 2009	-
19	Award of major works	April 2009	By NHPC
20	Construction of roads and bridges of project area	March 2011	By NHPC
21	River diversion	Nov. 2011	By NHPC
22	Completion of HRT	Mar. 2016	By NHPC
23	Completion of power house concreting	Sept. 2016	By NHPC
24	Completion of dam concreting	Aug. 2017	By NHPC
25	Commissioning of 1st and 2nd Units	Oct. 2017	By NHPC
26	Commissioning of IIIrd and IVth Units.	Nov. 2017	By NHPC
27	Commissioning of Vth and VIth Units	Dec. 2017	By NHPC
28	Commissioning of VIIth and VIIIth Units	Jan. 2018	By NHPC
29	Commissioning of IX and X Units	Feb. 2018	By NHPC
30	Commissioning of XIth and XIIth Units	Mar. 2018	By NHPC

Source: Department of Power, Government of Arunachal Pradesh (Unpublished).

TABLE 18.5

## Energy Availability: 2001-02 to 2006-07

Year	States Net Generation (MU)	Free Power from RHEP (MU)	Share from CGS (MU)	Total Energy Availability (MU)
2001-02	53.66	-	101.32	154.98
2002-03	57.89	-	104.20	162.09
2003-04	59.04	112.00	302.00	473.04
2004-05	65.01	169.78	510.70	745.49
2005-06	45.00	168.78	333.47	547.25
2006-07	54.57	112.53	319.63	468.73

Source: Resources Discussions Annual Plan 2005-06 and information supplied by the Department of Power, Government of Arunachal Pradesh on 17-06-2008.

TABLE 18.5A

## Key Time Lines for Para H.E Project

S.No.	Activity	Likely Date of Completion	Remarks
1	DPR submitted by NEEPCO to CEA	26.12.2005	Completed
2	Accord of environmental clearance by MoE&F	13.09.2006	Completed
3	Implementation agreement signed between Government of Arunachal Pradesh and NEEPCO	21.09.2006	Completed
4	TEC accorded by CEA	24.09.2007	Completed
5	Accord of in principle forest clearance by MoE&F	11.01.2008	Completed
6	PIB Meeting held	28.01.2008	Completed
7	Construction of approach roads in and around project site	April 2008	By NEEPCO
8	CCEA clearance	June 2008	By MOP
9	Award of major works	June 2008	By NEEPCO
10	River of diversion	Feb. 2009	By NEEPCO
11	Completion of HRT	April 2011	By NEEPCO
12	Completion of dam concreting	April 2011	By NEEPCO
13	Completion of power house concreting	Sept. 2011	By NEEPCO
14	Completion of EM works	Dec. 2011	By NEEPCO
15	Commissioning of Unit-I	Jan. 2012	By NEEPCO
16	Commissioning of Unit-II	Feb. 2012	By NEEPCO

## Transmission and Distribution Network

Strengthening transmission and distribution networks in Arunachal Pradesh is a very challenging task in view of its difficult terrain. As such, not much attention is paid towards this so far. The development of intra-state grid is yet not taken up in a big way as the State could not allocate funds from its own budgetary sources in view of resource scarcity. Some actions on this front has,

however, been taken with the help of non-lapsable central pool of fund.

Further, the prevailing T&D networks do not work efficiently: while the maximum system voltage in the State is 33 kV, long distribution lines at 11 kV, and 415 volts are unable to efficiently transmit power to the consumers. It results into huge energy losses.

Thus, there is an urgent need to develop efficient T&D networks (i.e., the intra-state grid) across the State. In the absence of the state grid, the State has to export surplus power to other states rather than utilising it locally. For example, free power entitlement from Ranganadi Hydro Electric Project (RHEP), which was available since August 2004, has to be exported despite being needed by electrified villages.

So far the high tension T&D networks is concern, some initiatives has been taken up by the Power Grid Corporation but they were at the planning stage. Once developed, it would facilitate evacuation of power to the load centres outside the State by way of providing necessary corridors for power export. It would generate significant amount of revenue for the State through power trading.

### *Investment in Power Sector*

Investment in power sector in the State largely came from the Central pool, both in hydropower generation as well as in erecting transmission networks. The State government has made a marginal contribution in it in view of budgetary constraints.

Even private entrepreneurs took least interest, at least up until 2005. This was partly due to difficult geographical conditions, low population density and scattered load and, partly due to the State's power policy, which envisaged private investment only in mega projects.<sup>16</sup> The private developers were less keen in mega projects because of large investment requirement and long gestation period. Further, additionally large investment was also required for setting high voltage transmission lines for power evacuation. The policy did not allow them in mini/micro projects despite low financial and time requirements of such projects and less dependence on T&D networks. Moreover, they were eco-friendly, renewable and ideally suitable for the local requirement.

### *Growing Private Sector Participation*

Of late, however, the government perception towards private investment has changed drastically. Not only private developers are allowed in the smaller hydro projects but the State government has also announced a separate policy, the Small Hydro Power Policy-2007, opening newer investment avenues for them. The policy has been discussed later in the chapter.

As a result, many private developers have negotiated MoAs with the State government for participating in the hydropower development. As per latest information (June 2008) available from the department of hydropower development, as many as 65 projects have been signed during February 2006 to March 2008 with 22 private developers, in the range of one (D.S. Construction Ltd. & GMR Energy Ltd.) to nine (KSK Electricity Financing India Pvt. Ltd.) projects each (Table 18.6).<sup>17</sup>

The probable installed generation capacity of all these 65 projects taken together was 15492.5 MW. Of them, 6 were mega projects of 1000 MW or more of individual capacity, 10 were of medium sized projects with 100 to 700 MW of individual capacity each while the remaining 49 were of individual capacities below 100 MW. Of them, 12 were of the capacities below even 25 MW. The smallest capacity was just 7 MW of Saskang project in Kameng basin to be developed by Patel Engineering Ltd.

This shows that the majority of private developers have shown interest in the smaller to medium capacity projects, which can be expected to cater mostly to the local demand, rural or urban.

No doubt, the six mega projects still accounted for as much as three-fifths of the total probable installed capacity by all the private developers and, the 10 medium sized projects for another almost one-fourth. This means that smaller projects, though large in number, would add just 16 per cent of total capacity by all the private developers.

This development has marked the beginning of a new era of private investment in the power sector in Arunachal Pradesh.

### *Hydropower Potential and its Exploitation*

In the backdrop of huge hydropower potential, as noted above, it is often argued that Arunachal Pradesh can

16. Other factors that adversely affected private investment include the security concerns and local hostile environment.

17. They also include projects which were earlier with the CPUs but later on taken over by the private developers like the GMR Group (160 MW Talong hydel project) and the KSK Ventures (125 MW Dibbin hydel project and the 600 MW Kameng Dam hydel project).



emerge as a 'Power House' of the country, if its hydro-potential is appropriately tapped.<sup>18</sup>

However, the hydro potential of the State has largely remained untapped. As of now, less than one per cent of the potential, i.e., 435 MW, has been developed<sup>19</sup>, while another 2600 MW was under execution. This is also true in case of mini/micro hydel potential—a mere 2.13 per cent (34 out of 1600 MW) of which has been developed<sup>20</sup> even though it is expected to provide an efficient solution<sup>21</sup> for local energy needs in many pockets of the State.

In this background, the State government has set ambitious targets, as detailed out in Table 18.7, to add as much as 38800 MW of generation capacity by 2022. Almost three-fifths of it shall be added in the Central sector, around one-fifth in the private sector and the rest in the State sector.

For realising such targets, several efforts have been made, of late, to tap the hydro potential, mega as well as smaller, of the State in a big way. For example, 42 projects involving 27293 MW, as stated in Table 18.13, have been identified for development in Arunachal Pradesh under the initiative launched by the Prime Minister of India in May 2003.<sup>22</sup> These included projects ranging from 4000 MW to 30 MW. In addition, the recent Prime Minister's Economic Package has provided Rs.69.11 crore in 2007-08 for timely completion of the ongoing 42 small hydro projects (see Box 18.1).

Further, during February 2006 to March 2008, as many as 72 MoAs were signed for the development of 25722 MW of hydro potential at various locations in the State (Table 18.6). While 65 of them, involving 15492.5 MW of probable generation capacity, were with private developers, remaining seven, involving 10230 MW of capacity, were with the Central Power Utilities (CPUs) (See Table 18.8 for more details on these seven projects).<sup>23</sup> While the projects with CPUs were mostly mega projects<sup>24</sup>, those with private developers, as analysed

### BOX 18.1

#### Prime Minister's Economic Package

<i>Item/Project</i>	<i>Current status</i>
Our Government is taking a programme of electrification of all the houses in the State. An amount of Rs. 550.00 crores will be spent to provide electricity through solar power as well as small hydropower project to all villages along the State border. Our effort will be to provide electricity to these villages within a span of 'two years.'	1) Planning Commission has approved additional allocation of Rs.69.11 crore for the year 2007-2008 for Arunachal Pradesh for power generation from on going Small Hydro projects. 2) MNRE has started interaction with the State to collect detailed information about sites, size of systems, implementation strategy etc., for decentralised SHP projects and solar lighting systems. (As on 3/3/2008)

above, were mixed ones ranging from 3000 MW to just 7 MW.

In total, execution of these 72 projects would result into exploitation of more than half (42.2 per cent) of the total identified power potential of the State (Figure 18.1). In the process, power potentials of the three basins, viz., Lohit, Dibang and Kameng, would be exploited to the extent of 77.7 to 85.4 per cent but only 36.2 per cent in case of Siang basin and a mere 0.8 per cent in case of Subansiri basin. A considerable amount of capacity addition (4982 MW) would also come from Tawang region, at the bank of the river Tawang Tru (Table 18.9).

#### Energy Losses

The T&D losses in most Indian states were quite high in the pre-reform era, in which power sector assets were mainly owned by public utilities. Such losses were attributable to lack of proper distribution, planning,

18. Development of hydropower is all the more important for being a clean and renewable source of energy. For this, even the Central government has accorded a high priority to it and aimed at raising its share in total generation in the country from current 25 per cent to 40 per cent in next 20 years.

19. As the hydropower potential of the State has largely remained untapped, the installed generation capacity remained low.

20. Department of Hydropower Development, Government of Arunachal Pradesh (vide letter no. CE/HPD/W-III/07/2005-06/6989-90 dated January 4, 2006).

21. Exploiting such potential requires low investment and lesser dependence on state wide transmission network, which is yet to come up. Local distribution network may be developed at a smaller cost to distribute power from such smaller projects.

22. The initiative in total has identified 162 hydroelectric projects across 16 states involving 27293 MW of generation capacity.

23. They collectively involve an estimated cost of around Rs. 42,242.66 crores and expected to produce 42 thousand MU of electricity annually. Of them, the Dibang Multipurpose Project is a joint venture between NHPC and the State government while all others were under the BOO (Build, own and operate) arrangement.

24. Of them, the foundation stone of Dibang and Para Power Projects has been laid down by the Prime Minister during his visit to Arunachal Pradesh in Jan.-Feb. 2008. The six units of Dibang project of the NHPC shall be commissioned during Oct.-Dec. 2017 while the remaining six units by March 2018. Each unit shall have a capacity of 250 MW. In case of Para project of NEEPCO, both the units shall be commissioned during Jan.-Feb. 2012.



TABLE 18.6

## MOUs Signed by Private Developers and CPUs in Arunachal's Power Sector

Sl. No.	Name of the Developer	Name of Project	Basin	Probable Installed Capacity
1	Abir Construction Pvt. Ltd.	Yamne Stage I	Siang	60
		Yamne Stage II	Siang	60
2	Adishankar Power Private Ltd.	Simang-I	Siang	67
		Simang-II	Siang	39
		Simang-III	Siang	44
		Khuitam	Kameng	29
3	Athena Energy Venture	Dermwe	Lohit	3000
		Emra-II	Dibang	390
		Emra-I	Dibang	275
4	Bhilwara Energy Ltd.	Nycharongchu State I	Tawang	98
		Nycharongchu State II	Tawang	97
		Nycharongchu State III	Tawang	95
5	D.S. Construction Ltd.	Naying	Siang	1000
6	ECI Engineering & Construction Company Ltd.	Turu	Dikrong	90
		Tenga	Kameng	8
7	Energy Development Company Ltd.	Pakke Bung I	Kameng	15
		Pakke Bung II	Kameng	15
		Pachuk I	Kameng	60
		Pachuk II	Kameng	60
		Majingla	Kameng	60
8	GMR Energy Ltd.	Talong	Kameng	160
9	Indiabulls Real Estate Ltd.	Phanchung	Kameng	60
		Pichang	Kameng	31
		Tarang Warang	Kameng	30
		Sepla	Kameng	46
10	Jai Prakesh Associates Ltd.	Siang Lower Hirong	Siang	1600
			Siang	500
11	KSK Electricity Financing India Pvt. Ltd.	Kameng Dam	Kameng	600
		Utung	Kameng	100
		Nazong	Kameng	60
		Dibbin	Kameng	125
		Jameri	Kameng	50
		Dimijin	Kameng	20
		Dinchang	Kameng	90
		Dinen	Kameng	10
		Dikhri	Kameng	15
12	KVR Energy and Infrastructure Ltd.	Par	Subansiri	65
		Dardu	Subansiri	60
13	Mountain Fall India Pvt. Ltd.	Hutong-II	Lohit	1250
		Kalai-I	Lohit	1450
		Bhareli II (Kameng II)	Kameng	600
14	Patel Engineering Ltd.	Gongri	Kameng	90
		Saskang	Kameng	7
15	Raajratna Metal Industries Ltd.	Barpu	Siang	70
		Kangtangshiri	Siang	35
		Ropum	Siang	40
16	Reliance Energy Ltd.	Tato-II	Siang	700
		Siang Middle (Siyom)	Siang	1000

contd...

...contd...

Sl. No.	Name of the Developer	Name of Project	Basin	Probable Installed Capacity
17	Sai Krishnodaya Industries (P) Ltd.	Gimliang	Lohit	31
		Raigam	Lohit	32
		Tidding-I	Lohit	31
		Kamlang	Lohit	22.5
18	Satyam (North East) Hydro Power Ltd.	Simen	Siang	21
		Dengzi	Kameng	18
		Lower Ngorgum	Kameng	18
		Upper Ngorgum	Kameng	9
19	SEW Energy	Nafra	Kameng	96
		Nycharongchu	Tawang	96
		Mago Chu	Tawang	96
20	Soma Enterprise Ltd.	Sissiri	Dibang	222
21	Tuff Power Private Ltd.	Rego	Siang	70
22	Velcane Energy Ltd.	Pauk	Siang	50
		Heo	Siang	90
		Tato-I	Siang	80
		Hirit	Siang	84
<b>Total Private Developers (22)</b>				<b>15492.5</b>
1	NHPC Ltd.	Tawang I HEP	Tawang	750
		Tawang II HEP	Tawang	750
		Dibang Multipurpose Project	Tawang	3000
2	NEEPCO Ltd.	Kameng I HEP	Kameng	1120
		Pare HEP	Dikrong	110
3	NTPC Ltd.	Etaln HEP	Dikrong	4000
		Attunli HEP	Dikrong	500
<b>Total PSUs (3)</b>				<b>10230</b>
<b>Total all developers (25)</b>				<b>25722.5</b>

Source: Information supplied by Government of Arunachal Pradesh, Department of Hydro Power Development, vide Letter No CE/HPD/W-III/7/2008-09/1447, dated 17<sup>th</sup> June 2008.

inadequate investments in T&D networks, particularly in sub-transmission and distribution, defective metering, unmetered supply and pilferage. With the reforms, such losses declined to a varying extent in majority of the states and became 32.53 per cent of the total availability in 2003-04 at all India level.<sup>25</sup> For the North-east, it was 38.64 per cent.

In case of Arunachal Pradesh, such losses, excluding those in energy exported/traded, were as high as 52 per cent in 2001-02 but declined to 33.5 per cent in 2004-05. It, however, increased significantly up to 43.2 per cent in 2006-07 (Table 18.10).<sup>26</sup> The estimates for recent years are expected to be more reliable owing to improvement in metering of the power consumption.

25. All India Electricity Statistics, General Review of various years, CEA

26. Data are from the Department of Power, Govt. of Arunachal Pradesh. It, however, differ significantly from those published by the CEA.

FIGURE 18.1

**Power Potential by Basins and Probable Installed Capacity under the MoAs Signed**

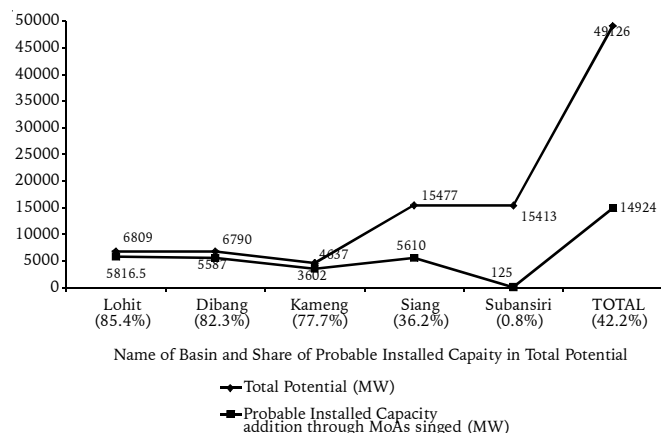


TABLE 18.7

**Capacity Addition Targets with Respect to Hydro Generation**

Plan Period	State Sector (MW)	Central Sector (MW)	Private Sector (MW)	Captive Power (MW)	Total (MW)
10th Plan (2004-2007)	38.63	-	-	-	38.63
11th Plan (2007-2012)	500.00	5000	2000	100	7600.00
12th Plan (2012-2017)	2000.00	8000	2000	200	12200.00
13th Plan (2017-2022)	5000.00	10000	3500	500	19000.00
Total	7538.60	23000	7500	800	38838.63

Source: Government of Arunachal Pradesh, Draft Master Power Plan.

The situation becomes more alarming if the commercial losses are also added to it. The Aggregate Technical and Commercial losses (AT&C) were estimated at 70.16 per cent in 2004-05 by the State source<sup>27</sup>, factoring in the collection efficiency that was less than 60 per cent. In contrast, the Ministry of Development of North Eastern Region reported such losses at 63 per cent in 2003-04, which came down to 61 per cent in 2005-06.<sup>28</sup>

Whichever of them may be considered, the level of AT&C losses in the State are quite high. As such, it is not surprising to note that the average cost of supply in the State was Rs.3.25/kWh whereas the average revenue realised was only Rs. 0.93/kWh.<sup>29</sup> The high level of energy losses further explain why the Department of Power has been losing a major chunk of its revenues which, in turn, affecting its finances severely<sup>30</sup> endangering viability of the electricity supply business in the State.

As mentioned above, low level of metering, both at the feeder as well as at the consumer level, is one important reason for the huge energy losses. While the feeders are by and large completely unmetered, around 59 per cent of the consumers are yet to be metered. What is more, a large portion of installed meters at the consumers' end are defective. Such a state of affairs not only made the correct assessment of energy losses difficult but also promoted inefficient usages of the electricity.

To reduce the level of energy losses, the State has received central support under the Accelerated Power

TABLE 18.8

**MoU between State Government and CPUs**

Sr. No.	Project	Installed Capacity (mw)	Annual Energy Generation (in MU)	Location (District)	Implementing Agency	Basis of Funding
I	Tawang - I Hydro Electric Project	750	3156.1	Tawang	N.H.P.C	BOO
II	Tawang - II Hydro Electric Project	750	3480.4	Tawang	N.H.P.C	BOO
III	Dibang Multipurpose Project	3000	12270	Lower Dibang Valley	N.H.P.C	JV between State Government & NHPC
IV	Kameng - I (Bharali - I) Hydroelectric Project	1120	4112.4	East Kameng	NEEPCO	BOO
V	Pare Hydro Electric Project	110	491.74	Papum Pare	NEEPCO	BOO
VI	Etilin Hydro Electric Project	4000	16071.6	Dibang Valley	NTPC	BOO
VII	Atunli Hydro Electric Project	500	2247.32	Dibang Valley	NTPC	BOO
	Total	10230	41829.56			

Note: NEEPCO: North Eastern Electric Power Corporation Ltd., N.H.P.C: National Hydroelectric Power Corporation Limited, NTPC: National Thermal Power Corporation Ltd., BOO: Build, Own and Operate.

27. Draft Master Plan (Power), 2005-2022 and Beyond, Department of Power, Government of Arunachal Pradesh.

28. <http://www.mdoner.gov.in/writerreaddata/eventimages/16.pdf>, as accessed on 26 June 2008.

29. [http://www.apdrp.apdrp/projects/revenue\\_gap\\_of\\_seb\\_utilities.htm](http://www.apdrp.apdrp/projects/revenue_gap_of_seb_utilities.htm) <accessed on 6th October 2005>

30. This is evident from the fact that the return on assets (Profit After tax/Net Fixed Assets) has been estimated at -0.082 per cent in 2004-05.

TABLE 18.9  
Exploitation of Power Potential by Basins

Sl. No.	Basin	Total Potential	Capacity Addition by MoAs Signed	Share Out of Total Potential
1	Dibang	6790	5587	82.28
2	Kameng	4637	3602	77.68
3	Lohit	6809	5816.5	85.42
4	Siang	15477	5610	36.25
5	Subansiri	15413	125	0.81
	TOTAL	49126	20740.5	42.22
	Tawang	n.a.	4982	
	G. Total		25722.5	

TABLE 18.10  
Transmission and Distribution Losses  
in Arunachal Pradesh

Year	T&D loss (%)
2001-02	52.00
2002-03	51.00
2003-04	44.23
2004-05	33.54
2005-06	39.18
2006-07	43.21

Source: Resources Discussions Annual Plan, 2005-06 and Information supplied by the Department of Power, Government of Arunachal Pradesh on 16-06-2008.

Development and Reform Programme (APDRP).<sup>31</sup> Being a special category state, it is entitled to receive 90 per cent of the total sanctioned amount as grants and remaining 10 per cent as loans. Under the programme, four schemes were sanctioned at the cost of Rs. 82.69 crores. Of this, Rs. 43 crores has been released and Rs. 24.88 crores has already been spent by November 2006. All the four schemes were expected to be completed by April 2008.<sup>32</sup>

### *Institutional Setup*

Currently, electricity in Arunachal Pradesh is supplied by the Department of Power, which is a part of the State government and is funded from the State budgetary sources. The department also manages the T&D assets of the State. It is also a key agency for undertaking power sector reforms in the State. A separate department, namely Department of Hydro Power Development, has been set up recently in order to oversee, coordinate and

monitor the activities relating to hydropower development in the State. Besides, there is also the Arunachal Pradesh Energy Development Agency (APEDA) which is the nodal agency to deal with all the programmes and schemes relating to renewable and non-conventional energy sources. It also contributes to the State's share of centrally sponsored schemes of MNES.

At the same time, several central power utilities are also engaged in a big way in the State. They include North Eastern Electric Power Corporation (NEEPCO), National Hydroelectric Power Corporation (NHPC), National Thermal Power Corporation Ltd. (NTPC), and Power Grid Corporation of India Ltd. (PGCIL). The projects taken up by NHPC in the State, for example, include the 2000 MW Subansiri Lower Project, 750 MW each Tawang-I and Tawang-II projects, 1600 MW Subansiri Middle and 2000 MW Subansiri Upper Projects. These projects are in various stages of development. Of late, it has also taken up the 3000 MW Dibang Multipurpose project at a cost Rs. 16425 crore.

### *Overview*

The above review of the power sector in Arunachal Pradesh shows that the sector at present is not only underdeveloped but the pace of development is also slow, at least up until 2005. Despite of the fact, the demand for power and its availability was in equilibrium with no visible energy deficit, which is a case of a sub-optimal equilibrium. As such, several pockets of the State could not get power despite being electrified. Even the AT&C losses were alarmingly high as the T&D networks were grossly underdeveloped.

Of late, however, tempo of development in the sector rose significantly, especially with regard to exploiting its immense hydro-potential. Unlike past, private sector is found to have taken a keen interest in it. But, with regard to T&D assets, as also the energy losses, not much development was witnessed. This is often attributable to difficult topographical characteristics of the State.

The recent changes in the sectoral policies and reforms are, thus, to be viewed in this background.

## **Power Policy of the State and Sectoral Reform**

### *Power Policy of the State*

The Hydro Electric Power Policy of the State has

31. The APDRP is a redesigned version of Accelerated Power Development Programme (APDP). It was introduced in 2002 for assisting states to restore and sustain viability of the power sector by way of reducing energy losses. The strategy under the programme involves technical, commercial, financial and IT interventions.

32. <http://www.mdoner.gov.in/writereaddata/eventimages/16.pdf>, as accessed on 26 June 2008.

maintained that the topography of the State is ideally suitable for development of run-of-the-river projects. Accordingly, to the extent possible, storage projects involving high dams would be avoided.

The policy allowed private participation in the hydro, as also in the gas-based, power projects but with active State involvement at various stages of project formulation. This has been envisaged in the following forms;

- The preliminary feasibility report (PFR) has to be prepared by the State Nodal Agency;
- Approval of the State Forest and Environment Department has to be sought;
- The Detailed Project Report, to be prepared by the potential developer, has to be approved by the State Nodal Agency;
- A formal Memorandum of Agreement (MoA) has to be signed between the potential developer and the State government for implementation of the project.<sup>33</sup> The State government has, however, promised to assist the private entities in obtaining due statutory approvals for installation of power plants.

In addition, as per the policy, the potential developers have to comply with the statutory regulations of the Central and the state governments inclusive of the forest conservation rules, the labour laws and the Electricity Act, 2003. The potential developers have also to pay the cost of raising the compensatory afforestation including payment of the Net Present Value of the forest land being diverted for non-forest purposes. The policy also provided for incentives to the potential developers, as per the MNES guidelines.

The policy entitles the State a 12 per cent free power from all the projects as water royalty etc.<sup>34</sup> The State also reserved the first right, after providing a payment guarantee, to purchase electricity, if required, over and above the royalty through Power Purchase Agreements (PPAs) with the developer.

As per the policy, developers would have to make appropriate arrangements for power evacuation. For this, they have to liaison with the relevant authorities. In the

event of utilising State infrastructure, the necessary charges, as mutually agreed upon between the developer and the State government, would be paid by the developers to the State government.

The policy barred the developer to sell and transfer the power plant to any other party without the consent of the State government.

Of late, the State government has announced a new policy, the Small Hydro Power Policy 2007. A need for it was felt for providing power to remote villages at a lower transmission cost. It has accorded due priority to small hydro potential ranging from 1kW to 25 MW.

### *Small Hydro Power Policy 2007*

The Small Hydro Power Policy, while continued many of the earlier provisions, provided additional investment opportunities to private and non-governmental organisations in the power sector development. This was by way of opening projects of smaller capacities to them. The government has, however, reserved the right of equity participation with the developers in such projects.

It proposed to offer power projects to non-governmental bodies on the basis of BOOT (Build, Own, Operate and Transfer). Towards this, it has classified all the projects into three categories based on nature and capacity. As such, it incorporated projects of all size and both in grid and isolation mode, i.e., those supplying grid quality power as well as those dedicated to a village or cluster with or without connectivity to grid.<sup>35</sup>

Further, the policy identified three kinds of producers: Independent Power Producers (IPPs), producing and selling power to State utilities on the basis of Power Purchase Agreement (PPA), Merchant Power Producers (MPPs), producing and selling power to limited number of permitted pre-determined third parties (e.g., bulk users), and Captive Power Producers (CAPs), producing power for own consumption.

It also offers concessions and incentives to them. For timely completion of smaller hydro projects, the policy offered a moratorium on free power from the schedule commercial operation date (COD), and concessional rate thereafter, as shown in Table 18.11. The policy also offers

33. For bringing transparency and easy understanding of the terms and conditions, a model MoA has been appended in the policy.

34. As per the Central government guidelines, the state is entitled to 12 per cent of the total generation by the developer free of charge from such projects as a royalty to use its water resources, as also because such projects entail large-scale relief and rehabilitation efforts and costs to the local environment.

35. Category I (1 to 25 MW): They can operate in both grid and isolation mode. They shall have all the components and features of projects providing grid quality power; category II (more than 100 to 1000 MW): They shall operate in stand alone mode providing dedicated power to a village or a cluster with or without connectivity to grid. The supply to the consumers shall be provided either at high or low voltage systems; and category III (up to 100 MW): stand alone mode dedicated to a village or cluster directly distributed power to the households without high tension system. For details, see, The Small Hydro Power Policy 2007, *The Arunchal Pradesh Gazette*, Feb. 15, 2008, Part-I, p. 22-23.



a special treatment to local developers: indigenous tribal entrepreneurs are exempted from supplying free power to the State for projects up to 5 MW capacities. Such provisions shall enhance employment opportunities for local population.

TABLE 18.11

**Moratorium Period and Concessional Rate of Free Power**

Sl. No.	Category	Moratorium Period from Scheduled COD	Rate of free Power after Moratorium Period upto 50th Year
1	Projects up to 1000 KW	Nil	Nil
2	Projects above 1MW to 5 MW	3 Years	5%
3	Projects above 5MW to 10 MW	2 Years	8%
4	Projects above 10 MW to 25 MW	1 Years	10%

Source: The Small Hydro Power Policy 2007, The Arunachal Pradesh Gazette, Feb. 15, 2008, Part-I, p. 26.

For selecting private developer, it proposed a single window selection system under a high level selection committee. The committee examines proposals of the prospective developers and make recommendations to the State government. In the process, the committee takes into consideration, among others, the employment opportunities provided to bonafide Arunachalees and employment offered to local ITI certificate holders. On its recommendation, government signs MoAs with the recommended developers. Subsequently, the developer has to complete all the statutory clearances and take up project development.

### *Strategies to Strengthen Transmission and Distribution Networks*

The State's draft master plan for power sector (2005-2022) includes strategies to strengthen T&D networks.<sup>36</sup> It provided for:

- Developing adequate transmission systems to evacuate power from generating stations to the load centres and to provide necessary corridors for export of power to outside the region;
- Developing state grid to meet the local demand;
- Setting up new sub-transmission and distribution infrastructure within the State to interface between rural and urban connectivity;

- Setting up distribution backbone for rural electrification works;
- Strengthening existing networks and building necessary system improvement to reduce T&D losses; and
- Investing in for 100 per cent metering of all systems and consumers with latest computerised billing and accounting systems.

These measures would go a long way in improving the T&D networks and, in turn, the overall health of power system of the State, subject to their timely implementation.

### *Status of Power Sector Reforms*

Power sector reforms have been initiated across Indian states to address the various constraints plaguing the sector.<sup>37</sup> As a result, the structure, ownership patterns, and regulatory set-up relating to the sector have witnessed radical changes with the establishment of independent regulators, corporatisation, unbundling and privatisation in many states.

As a part of its commitment, the Government of Arunachal Pradesh had signed a MoA with the Ministry of Power, Government of India in July 2002 to introduce power sector reforms. However, the state could not achieve any of the targets specified in the MoA. A review on power sector reforms by the Ministry of Development of North Eastern Region, as summarised in Table 18.12, indicates no visible progress towards reforms.

The State government has however, outlined a strategy for restructuring and reforming its power sector in its Draft Master Plan for 2005-2022 and beyond. It includes:

- Conversion of the Electricity Department into a corporate entity in 2005-06 (but, could not be implemented so far),
- Unbundling of the Corporation into separate entities handling generation, transmission and distribution in the year 2012.
- Privatising distribution function in two stages at an appropriate time in future. Distribution below 11 kV to be privatised in the first stage while the systems up to 33 kV would be privatised subsequently, after the 11th Plan (2007-2012). The State Government would announce a separate policy for this.

36. For details, see, the Draft Master Plan (Power) 2005-2022 and beyond.

37. They include: financial deterioration of State Electricity Boards, growing peaking and energy shortages, poor operational efficiency, irrational tariff structure and under investments in the sector.



**TABLE 18.12**  
**Reform Status in Arunachal Pradesh**  
**with Respect to the MoA**

<i>Provision</i>	<i>Status</i>
Constitution of State Electricity Regulatory Commission (SERC)	Not yet constituted. Accordingly, the tariff fixation is done by the Electricity Department, Government of Arunachal Pradesh.
Restructuring/ Corporatisation	Not Yet
Formation of Reform Committee	Yes
Metering up to 11 kV feeder level	Out of total of 201 million feeders in the State, only 1 million feeders have been metered by June 2005 [1] . But there were 219 works were in progress.
Consumer metering	In total 1.45 lakh consumers, 41 per cent of the total, have been metered so far
New connection with meter	Yes
AT&C losses (Aggregate Technical & Commercial Losses)	The level of AT&C losses 61 per cent in FY 2005-06
Franchising of billing/collection, Consumer indexing, Computerised billing	Not yet started

*Source:* <http://www.mdoner.gov.in/writereaddata/eventimages/16.pdf>, as accessed on 26 June 2008 and [http://www.apdrp.com/apdrp/projects/metering\\_status.htm](http://www.apdrp.com/apdrp/projects/metering_status.htm), Accessed on 10 June 2005.

## Challenges Ahead and Policy Suggestions

### *Developing Hydropower Potential*

As discussed above, Government of Arunachal Pradesh has, of late, taken several steps to tap its enormous hydropower potential aggressively. Both private developers and CPUs are to play an important role in this endeavour. As such, hydro generation in the State is likely to grow considerably in years to come. In this regard, efforts would be needed to avoid delays and cost escalations, which has been a common occurrence in the past, because of which capacity addition has slipped from one plan to the other. Realising the importance of timely completion of the projects, as mentioned above, the State's power policy has provided incentive to developers. But the incentives restricted to projects of smaller capacity only. Some incentives are also required for mega projects, especially those in private sector, for their timely completion.

Of the total generation from such projects, the State would get 12 per cent power free in the form of water royalty. In view of infrastructural constraints, the State grid being yet not fully ready, the free power share of the State used to be sold to other states for earning revenue.

In fact, such exports have grown considerably in the recent past and the State administration has been looking forward to it as a major source of revenue in coming years as well.

For the fund starved Arunachal Pradesh, this could be an important source of development resources. The Prime Minister, while laying down the foundation stone of Dibang Multipurpose Project on 1<sup>st</sup> February 2008, has highlighted that the State could generate as much as rupees three to four thousand crore annually from big hydroelectric projects.<sup>38</sup> Given this, one cannot recommend that such projects aimed at power exports should not be taken up.

Still the fact remains that the local people at large might get marginal direct benefits from such projects, as the electricity is supplied outside the State, for whatsoever reasons, bypassing the local aspirations. What is more, while fruits of such development are siphoned out, locals may have to bear heavy social cost inclusive of environmental damage, endangering biodiversity, and displacement of people in the case of reservoir-based mega-dams. It is also feared that the mega projects could affect the socio-economic and socio-cultural identity of the region. In the background of such apprehensions, the local people, at times, felt exploited and alienated from such development. There were even reports of agitation by them.<sup>39</sup> Recognising such concerns, even the State government has stalled many such projects (around 25) in the past and even approached the Supreme Court for this purpose. All these are reflective of a feeling of discontent. One can, thus, argue that unless the local aspirations and concerns are not appropriately addressed, peoples' support for the sectoral initiatives may not be generously forthcoming.

In a nutshell, establishing a balance between local aspirations/concerns and revenue considerations is of critical importance. While mega hydropower projects may be developed to earn revenue after appropriately accounting for local concerns, local aspirations for power may be met on priority basis either through them or by way of area specific smaller projects, hydro as well as those based on alternative sources including the renewable ones.

Of late, a number of steps have been taken in this direction. For example, issues holding up hydropower projects by the State government have been resolved paving the way for signing a large number of MoAs for

38. The Dibang Multipurpose Project alone, for example, will earn Rs. 300 crore a year for the State.

39. For example, local people and students' body of Dibang basin staged a protest against Dibang Multipurpose Project at Itanagar in July 2007.

TABLE 18.13  
List of 42 Schemes in Arunachal Pradesh Under the Prime Minister's Initiative, 2003

Sl. No.	Scheme	Agency for Preparing Pre- Feasibility Report	Installed Capacity			Head (m)	Annual Energy (GWH)	Tariff (Rs./kWh)
			Nos. of Units	Size (MW)	Total (MW)			
1	Agoline	NHPC	3	125	375	163	1267.38	3.51
2	Amulin	NHPC	3	140	420	132	1761.4	0.37
3	Ashupani	NHPC	2	15	30	395	126.45	8.75
4	Attunil	NHPC	4	125	500	264	2247.32	2.35
5	Badao	NEEPCO	4	30	120	154.5	441	2.32
6	Bhareli-I	NEEPCO	8	140	1120	97	4112.4	1.85
7	Bhareli-II	NEEPCO	5	120	600	51	2345	1.67
8	Chanda	NEEPCO	4	27.5	110	175.67	401.91	2.67
9	Demwe	NHPC	12	250	3000	138	10823.82	1.97
10	Dengser	NHPC	4	138	552	120	2666.71	3.26
11	Dibbin	NEEPCO	2	50	100	151.24	335.72	2.23
12	Duimukh	NHPC	3	50	150	65	551.48	8.5
13	Elango	NHPC	3	50	150	363	583.14	5
14	Emini	NHPC	4	125	500	125	1695.45	3.51
15	Emra-I	NHPC	3	130	390	278	1648.09	3.02
16	Etabue	NHPC	3	55	165	378	683.66	3.43
17	Etalín	NHPC	16	250	4000	385	1607160	1.7
18	Hirong	NHPC	4	125	500	285	2535.8	1.62
19	Hutong	WAPCOS	12	250	3000	166.77	9901	1.28
20	Kalai	WAPCOS	10	260	2600	193.21	10608.64	1.01
21	Kameng Dam	WAPCOS	5	120	600	65	2345.55	2.29
22	Kapakleyak	WAPCOS	4	40	160	245	627.95	1.74
23	Kurungl&II	NHPC	3	110	330	151	1435.4	4.04
24	Mihumdon	NHPC	4	100	400	286	1451.75	3.6
25	Mirak	NHPC	3	47	141	136.4	748.44	3.42
26	Naba	NHPC	4	250	1000	221	3995.25	2.14
27	Nalo	NHPC	4	90	360	221	1733	3.27
28	Naying	NHPC	4	250	1000	245	5077.15	1.18
29	Niare	NHPC	4	200	800	205	3356.62	2.02
30	Oju-I	NHPC	4	175	700	257	3291.58	2.08
31	Oju-II	NHPC	4	250	1000	322	4629.93	1.46
32	Pakke	NEEPCO	2	55	110	452.5	335.26	3.33
33	Papu	NEEPCO	2	100	200	238	505	2.94
34	Phanchung	NEEPCO	2	30	60	157.13	174.83	3.24
35	Ringong	NHPC	3	50	150	166.5	659.07	3.61
36	Sebu	NEEPCO	2	40	80	123	227.53	3.71
37	Simang	NHPC	3	30	90	125	417.82	5.43
38	Talong	NEEPCO	3	100	300	171.67	915.5	2.24
39	Tarangwarang	NEEPCO	2	15	30	185.55	93.18	2.88
40	Tato-II	NHPC	4	175	700	168	3465.9	1.48
41	Tenga	NEEPCO	4	150	600	875	1046.5	3.52
42	Utung	NEEPCO	3	33.3	100	291	359.13	3.1
Total (Arunachal Pradesh)-42 Scheme			182		27293			

Source: Department of Power, Government of Arunachal Pradesh (Unpublished).

new projects since 2006. They involved development of as much 25000 MW of the potential, as discussed above. Interestingly, many of these projects are smaller to medium sized and can be used to feed local demand. At the same time, a few mega projects generating huge power, as much as 1000 to 3000 MW, are also approved that can serve the purpose of earning revenue for the State.

Further, many MoAs with private developers have taken local concerns into consideration by way of incorporated rehabilitation package for people to be affected, providing employment opportunities to the locals in C and D group jobs, in addition to setting up of schools and hospitals and, constructing roads for the locality as a part of their commitment to social obligations.

Similarly, the MoAs with the CPUs for mega projects have incorporated provisions for Local Area Development Trust, which would take up development activities for the people of affected areas. The MoAs ensured a contribution of one paise/unit of electricity generated from such projects to the trusts. For the same purpose, it has also been suggested<sup>40</sup> that the central power utilities, which are among the major operators in the State, should set up external environment advisory group so as to build greater confidence in civil society about their commitment to ecological issues and concerns.

With regards to smaller projects catering local demand, a closer association, financial or otherwise, by the local administration (such as *panchayat*), will ensure their smooth implementation and success.

At the same time, greater emphasis may also be given to alternative technologies like solar, wind and biomass, in addition to mini/micro hydro-projects. Considering the geography of the State, which includes a large number of remote and isolated villages with small-scattered loads and good availability of renewable energy resources, various decentralised options may be more suitable in meeting the local demand. Some of such options are as follows.

**Solar:** Solar energy has the potential for meeting energy requirements related to lighting, heating, cooking and power generation. Being modular in nature, these systems could be installed in varying capacities depending upon the requirement and potential of the locality. It should, however, be kept in view that this source of energy is

intermittent in nature and hence supplementary source of supply may also require for uninterrupted supply round the year. A few villages in the State have already been electrified through solar energy by the APEDA under the aegis of the MNES. More villages may be brought under it though enhancing investment.

**Biomass:** As regard to biomass, a TERI study has recommended gasifier systems of different capacities for a variety of thermal applications as well as for rural electrification, depending upon current and future demand and, availability of biomass. It recommended standalone gasifier systems for each village as the inter-village distance in the village-clusters are 3-10 km in most cases.

The study further suggested a bamboo-wood mix based gasifier as bamboo is available in plenty in almost all the village clusters. Though bamboo has yet not been tried for gasifier-based power generation, a demonstration project may be taken up in any cluster to assess the feasibility of utilising bamboo as feed material. The community should be actively involved during the planning and implementation phases of gasifier installation. Further, adequate capacity building should be provided to the community for proper management of the systems.

**Wind:** With regard to wind power, the MNES estimate did not show any major potential in Arunachal Pradesh. However, a special study, undertaken in association with APEDA, on long-term assessment of wind resource in north-eastern region has been initiated by MNES, which covers Arunachal Pradesh as well. It includes five locations in the State.

**Thermal Power:** Policymakers may also explore the possibilities of establishing thermal, both coal and gas-based power capacities in the State. This would help in reducing excessive dependence on hydropower.

In a nutshell, alternative technological options should be utilised taking local conditions into account for meeting local energy needs in different parts of the State.

### *Infrastructure for Transmission and Distribution*

Power sector development lumping towards large scale exports requires development of adequate high voltage transmission corridors for evacuation of power from generating stations to load centres in other parts of the country. In the absence of it, benefits anticipated from trading of electricity would not be realised.

40. This suggestion was made by Shri Jairam Ramesh, Minister of State for Power, on May 5, 2008 at Shillong.

But, setting up of a huge T&D network in Arunachal Pradesh would be a challenging task, economically as well as administratively, given the difficult topographical characteristics (vast hilly areas) of the state. It would not only require huge investment but the T&D losses might also be on a higher side. Further, the entire high-voltage networks have to be established through the 22 km Siliguri Corridor or the chicken's neck (area between Siliguri and Bidhan Nagar in West Bengal) stretch which might be too narrow in the opinion of technical experts. The bunching of network in the narrow band might create a strong electromagnetic field requiring evacuating people from the area. Given the high risk involved in it, major investments for this have to come from the central sources, as the private developers may not be keen and the State may not have sufficient resources for such a job.

Moreover, the State has to focus on developing intra-state grid so as to supply adequate electricity to local consumers. For this, it needs to arrange resources through exploring different financing options involving financial institutions and the Central schemes, in addition to allocating resources from its own budgetary resources. The intra-state grid should be the State government's priority while development of high voltage networks may be taken up by the Central power utilities, like the Power Grid Corporation.

### *Energy Losses*

Given that reliable and accurate estimates on energy losses in the State are still not available, there is an urgent need to institute proper system studies and circle-wise energy audits to arrive at a true picture of energy losses. For this, Geographic Information Systems (GIS) and Management of Information Systems (MIS) should be implemented for appropriate energy audits. Appropriate strategies, a mix of technological and policy interventions, for reducing energy losses could be developed only in the background of accurate and reliable estimates of the energy losses.

Keeping reliability issues aside, curtailing such losses would not only improve the viability of the organisation but would also facilitate internal resource generation. Towards this, complete metering and strict enforcement of penalty provisions, as mandated in the Electricity Act, 2003, could help in bringing down the electricity leakage

significantly. This will, in turn, also improve the collection efficiency. The Department of Power should, therefore, step up its efforts on metering both at the feeders as well as at the consumer level. The metering projects which are in progress should thus be expediently completed. For improving collection efficiency, the Department could explore the option of outsourcing. Further, in this endeavour support from the local administration would be of great importance.

### *Resource Mobilisation*

Mobilising resources for meeting the ambitious generation targets and extensive T&D networks inclusive of intra-state grid is a highly challenging task. While considerable investment has been committed by CPUs, as also by the private developers to an extent, the State has to find resources for its share in the development. Additional demand for resources would rise if the State chooses to acquire equity stakes<sup>41</sup> in the joint venture projects with the IPPs and CPUs.

In this regard, the State government is required to tap all possible options. It may consider converting 12 per cent free power into an equity share. It may also contemplate central assistance for financing such equity stakes.<sup>42</sup> Internal resource generation may be attempted by way of reducing energy losses. To the extent possible, resources may be allocated from its own budgetary sources. It may also explore possibility of project specific borrowing from financial institutions.

Appropriate incentives, wherever possible, may be extended to further step up private investment in the power sector, especially in development of T&D networks. They should be strong enough to neutralise geographical and ecological disadvantages in the State.

### *Establishment of State Electricity Regulation Commission (SERC) and Power Sector Reforms*

Despite being committed, the State government has yet not constituted the SERC. The Electricity Act, 2003, has incorporated provision for such a commission and its power. Post-issuance of the Act, important functions such as tariff determination, licensing, promotion of competition, etc., has been vested with the SERC. It is therefore, essential to expedite the establishment of SERC.

41. An equity stake of the State will not only give a sense of ownership but would also allow the state to leverage terms and conditions safeguarding the people's interests such as employment, environment etc., in the execution and operation of such projects.

42. While participating in the national workshop on hydropower development in the Himalayan Region in December 2006, the Chief Minister of Arunachal Pradesh requested Planning Commission to allocate a special grant of about Rs. 8400 crores to facilitate equity participation by the State government in the joint venture projects with the IPPs and CPSUs.

At the same time, the State should consider introducing other power sector reforms like corporatisation, unbundling and privatisation at an early date. This would help in improving the health of power sector in the State.

### **Conclusion**

To sum up, with the enormous hydropower potential at its disposal, Arunachal Pradesh in all probability will emerge as a power house of the country in the longer term perspective. To achieve such a goal smoothly, a suitable model of sectoral development, which appropriately takes local concerns/aspirations into account, needs to be adopted. Various decentralised

generation options could be of great help specifically for meeting the local demand. At the same time, T&D networks, including the intra-state grid, need to be strengthened considerably for evacuating power to the load centres without much energy losses, as also to supply power to local population. This task is also not less challenging given the difficult local terrain.

All these are indicative of the fact that huge amount of financial resources are required for the sectoral development in the State. For this, the State has to tap all possible sources, central agencies, private developers as well as its own resources. The State should also focus on sectoral reforms so as to reduce inefficiencies significantly and generate internal resources.



## Chapter 19

# Transport and Infrastructural Development

### Introduction

Access to a safe, affordable and convenient transport and communications system is not only a basic infrastructure need of the people for mobility and access to livelihood services, it is also a prerequisite for industrial development and overall economic growth, especially in a remote state like Arunachal Pradesh.

This chapter discusses the status of transport and communications (telecommunications and posts) in the State. It highlights the constraints facing these sectors and proposes strategies to overcome them. The first part of this chapter discusses the transport sector, and the second takes up the telecom and postal sectors.

### Transportation

The provision of transport infrastructure and services in Arunachal Pradesh is the responsibility of two departments—Directorate of Transport and State Transport Corporation. The former is entrusted with the responsibility of implementing the provision of Motor Vehicle Acts and Rules of State/Centre by issuing permits and licences, and collecting taxes. Inland water transportation, anti-vehicular pollution measures, and implementation of road safety programmes are some of the other functions of this department. The State Transport Corporation, on the other hand, is responsible for the provision of public transport services, which at present are limited to bus services. The following sections discuss transport sub-sectors in Arunachal Pradesh in detail.

#### Roads and Bridges

Roads constitute the principal mode of access and communication in the hilly and difficult terrains of the State. Presently, the State has the lowest road development index in the country. The road density as on

March 2004 being almost 18 km per 100 sq km of area as against the Indian average of 75 km per 100 sq km and the north-eastern regional average of 52 km per 100 sq km. Also, the lowest densities of national and state highways are found here. The levels of rural connectivity are also low as out of the total 3599 villages in Arunachal Pradesh, roads connect only 1407, i.e., roughly 40 per cent of the villages (Draft Annual Plan 2005-06). Table 19.1 gives the category-wise break-up of road lengths in the State.

**TABLE 19.1**  
**Category-wise Length of Roads in**  
**Arunachal Pradesh from 1998-2002**

<i>Length of (km)</i>	1998	1999	2000	2001	2002
Total roads	17843	18272	18322	18362	18365
Surfaced	5290	5596	5659	5699	5689
Total Highways	16749	17178	17178	17218	17218
Surfaced	5196	5502	5583	5623	5612
Total National Highways	352	352	352	392	392
Surfaced	271	271	352	392	381
Total State Highways	-	-	-	-	-
Surfaced	-	-	-	-	-
Total Other PWD Roads	11740	12169	12169	12169	12169
Surfaced	4925	5231	5231	5231	5231
Total Village Panchayat Roads	4657	4657	4657	4657	4657
Surfaced	-	-	-	-	-
Total Urban Roads	35	35	35	35	36
Surfaced	35	35	35	35	36
Total Military Engineering Surface Roads	-	-	33	33	34
Total Railway Roads	-	-	2	2	2
Total Project Roads	1059	1059	1109	1109	1111
Surfaced	59	59	41	41	41
Total Roads under Forest Department	-	-	1109	1109	1111
Surfaced	-	-	41	41	41

Source: Basic Road Statistics of India, Transport Research Wing, MoRTH, 2005, GoI, New Delhi.

Table 19.2 indicates the growth of National Highways amongst the north-eastern states of India. It can be seen that after Sikkim, Arunachal Pradesh possesses the least length of national highways (NH) in the region. Arunachal Pradesh also exhibited the lowest compound annual growth rate (CAGR) in comparison to the other states of the north-east. In terms of growth of total length of roads also, Arunachal Pradesh has exhibited a low annual growth rate, as compared to other NE states (see Table 19.3).<sup>1</sup>

TABLE 19.2

**Growth of National Highways in Arunachal Pradesh and other North-eastern States (km)**

Year	2000	2001	2002	2003	2004	CAGR (%)
Arunachal Pradesh	352	392	392	392	392	0.63
Assam	2706	2836	2836	2836	2836	-
Manipur	954	954	954	954	959	8.25
Meghalaya	717	717	717	717	810	5.96
Mizoram	857	927	927	927	927	5.06
Nagaland	369	369	369	369	494	15.90
Sikkim	62	62	62	62	62	1.58
Tripura	400	400	400	400	400	7.29

Source: [http://morth.nic.in/motorstat/brs\\_table1.htm](http://morth.nic.in/motorstat/brs_table1.htm), accessed on 11.11.2005.

TABLE 19.3

**Growth of Total and Surfaced Roads in Arunachal Pradesh and Other North-eastern States (km)**

State	Total (T)/ Surfaced (S)	1998	1999	2000	2001	2002	CAGR (%)
Arunachal Pradesh	T	17843	18272	18322	18362	18365	0.72
	S	5290	5596	5659	5699	5689	1.83
Assam	T	68523	85778	90727	87173	89486	6.90
	S	11723	12701	12753	12891	12882	2.38
Manipur	T	10911	11434	11434	11434	11434	1.18
	S	3340	3816	3863	3863	3863	3.70
Meghalaya	T	8751	9126	9360	9497	9565	2.25
	S	4439	4589	6248	6566	6560	10.26
Mizoram	T	4484	4846	4731	4970	5075	3.14
	S	4265	4632	2743	2887	2877	-9.37
Nagaland	T	19637	20337	21015	21021	21021	1.72
	S	5610	6236	6450	6451	6451	3.55
Sikkim	T	1851	1851	1911	1992	2019	2.20
	S	1544	1544	1514	1546	1546	0.03
Tripura	T	13802	15565	14801	14031	16296	4.24
	S	4320	4385	4391	4390	4393	0.42

Source: [http://morth.nic.in/motorstat/brs\\_table2.htm](http://morth.nic.in/motorstat/brs_table2.htm), accessed on 24.11.2005.

As per the National Road Development Plan, 1981-2001, the NH network should cover the whole country in grids of 100 km, ensuring no part of the nation remains more than 50 km away from a NH. As per the estimates in the Draft Annual Plan 2005-06, the minimum length of NH required in the State would be 1675 km, as against the existing less than 400 km. The present NH network touches only fringes of foothills of the State adjacent to Assam, and as a result many districts of the State have been deprived of good connectivity. Even today, the State does not have lacteal road connectivity districts, subdivisions and circle headquarters, since roads run vertically connecting places in Assam with districts or subdivisions with circle headquarters in Arunachal Pradesh. Thus, has resulted a high transportation cost (Human Development Report, Chapter 8).

The bridges in the State, mostly semi-permanent and timber are currently in weak and distressed conditions. The Department of Transport had proposed a project on weighbridges in the year 2000 along with a list of proposed locations.<sup>2</sup> The rationale of the proposal, besides preventing accident occurrences, was to raise revenue for the State government by charging weighing fee on the bridges. If successfully implemented, the system is expected to generate revenue of approximately Rs.5.6 lakh per year. Work on the project is likely to be started soon.<sup>3</sup>

According to the Draft Annual Plan (2005-06) for Arunachal Pradesh, the major problems associated with the road development in the State are:

- hilly terrain and challenging topography (roughly only 17-18 per cent of the total State area falls in the gentle-moderate slope gradient),
- young and weak geological formation of hills susceptible to erosion,
- presence of a seismologically active zone threatening the stability of slopes and safety of roads,
- presence of rocky terrain with deep valleys and gorges,
- presence of dense forest covers, and
- heavy rainfall making road maintenance difficult.

The following programmes have come up in the State recently as a part of Government of India's initiative to enhance road development in the State:

1. It is observed that wide variation exists between total road length values expressed in state data sources like *Draft Annual Plan* (2005-06) and *Economic Review* (2004) and central source like Basic Road Statistics of Ministry of Road Transport and Highways (MoRTH), the latter being much higher. Such discrepancies need to be addressed and a consistent database established. Analysis for Table 19.3 has been done based on figures furnished by source mentioned for Table 19.3.
2. Identified points for installation of weigh bridges (in Arunachal Pradesh). 2000, Naharlagun: Directorate of Transport, Government of Arunachal Pradesh
3. Information based on personal communication with the department.

## 1. Special Accelerated Road Development Programme

Recently the Government of India has initiated the Special Accelerated Road Development Programme (SARDP-NE) in the north-east region which aims at improving/upgrading over 7600 km of roads. The specific objectives of this programme are to: (i) connect all state capitals with improved/upgraded National Highways, (ii) provide connectivity to all district headquarters, (iii) improve connectivity to the neighbouring countries, and (iv) provide connectivity to backward or remote areas. SARDP-NE envisages widening of 3,251 km of national highways, improvement/widening of 2,500 km of State roads and of 1,888 km of roads of strategic importance. The programme is to be implemented in three phases. The estimated cost of the SARDP-NE is Rs.12,123 crore, with proposed budgetary support of Rs.9,952 crore and Rs.2,171 crore mobilised through private sector participation (MoF, 2006). During the year 2005-06, a budgetary allocation of Rs. 450 crore for SARDP-NE was made and further, for improvement of strategic roads in Arunachal Pradesh, an additional allocation of Rs.100 crore was provided.<sup>4</sup> Presently, improvement of the road from Lumla to Tashigong via Dudunghar, with a length of 36 km, has been entrusted with BRO as part of Phase 'A' of SARDP-NE, at an estimated cost of Rs.38 crore.

Given the rapidly increasing shift towards public-private partnerships in financing the road sector, its viability however, gets challenged in most of the north-eastern region due to relatively low traffic volumes and prospects of toll collection in the future. Yet as a part of SARDP-NE, under the NHDP Phase-III, 345 km of National Highways no. 31, 52 and 52A falling under Assam and Arunachal Pradesh, have been identified for improvement. This will be done on a Build-Operate-Transfer (BOT) basis, and the identified corridor is Baihata Chariali (on EW corridor) to Itanagar.<sup>5</sup>

## 2. Connecting the Villages

The Pradhan Mantri Gram Sadak Yojna (PMGSY), launched in December 2000, aims at providing connectivity to unconnected habitations (having population over 250 persons in the north-eastern hilly

states) in rural areas by means of all-weather roads including proper drainage features. The Government of Arunachal Pradesh completed 288.28 km road works in 2004-05 under PMGSY connecting 11 habitations. The State completed 68.56 km roads in 2005-06 with central assistance of Rs.53.81 crore.<sup>6</sup>

## 3. Bharat Nirman (2005-2009)

A 'Four Year Business Plan for Rural Connectivity', aims to bring in connectivity of 2119 km for 298 habitations in Arunachal Pradesh.<sup>7</sup>

## 4. Other Projects

Projects worth Rs. 207.21 crore have been approved under NCLPR which include: (i) Road from NH-52A Nirjuli to Sagalee (SH-Doimukh to Toru 45 km); (ii) improvement/construction road from Sagalee to Sakiang (50 Km); (iii) Construction of Motorable Suspension Bridge over river Siang at the site of Gandhi Bridge.<sup>8</sup>

## Road Transport

The total number of vehicles in the State has been on a rise. According to *Economic Review* (2004) of Arunachal Pradesh, the total number of vehicles of all types registered in the State during 2003-04 was 5703 (excluding Dibang Valley) as against 3586 vehicles registered during 1999-2000, showing an increase of 55 per cent over four years. Amongst all registered vehicles, two wheelers account for almost 72.5 per cent followed by light motor vehicles, which included vans and Tata sumos. The district-wise revenue collection from the registration fee, fines, road taxes, etc., totalled up to Rs. 1.1 crore for the year 2003-04. The total number of vehicles in Arunachal Pradesh as on 31st March 2003 is given in Table 19.4.<sup>9</sup>

As per the fuel quality norms prescribed for India by the Mashelkar Committee Report in 2002, the State should be following Bharat Stage II emission norms from 1st April 2005. Interactions with the concerned departments revealed that the same is being more or less followed, but the degree of enforcement is weak. As far as vehicle inspection and maintenance procedures are concerned, the status of compliance is negligible.

4. <http://pib.nic.in/release/release.asp?relid=9286>; accessed on 04.07.2006.

5. [http://rajyasabha.nic.in/book2/reports/t\\_and\\_t/102ndreport.htm](http://rajyasabha.nic.in/book2/reports/t_and_t/102ndreport.htm); accessed on 04.07.2006.

6. A detailed status of the ongoing and completed work in Arunachal Pradesh under the PMGSY can be found on the following PMGSY web link <http://www.pmgsy.org/citizens/en/STL/09SRP/roadwiseprogress.asp?year1=0&RoadStatus=0&Stream=0&StreamTxt=All%20Streams&State=AR&ViewType=1>

7. Details regarding the targets and achievements status of the Bharat Nirman programme district-wise can be found on the web link <http://omms.nic.in/ASPNet/citizens/NAT/12BN/BharatNirman.aspx?state=AR&district=0>

8. [http://pib.nic.in/archieve/others/2006/may2006/upa\\_gov\\_20060521/UttarPradesh.pdf](http://pib.nic.in/archieve/others/2006/may2006/upa_gov_20060521/UttarPradesh.pdf); accessed on 10.07.2006.

9. There exist certain discrepancies in the data reported in different sources on the actual numbers of vehicles, revenue collected and permits issued. This problem of inconsistency in data reporting should be addressed.

TABLE 19.4

**Total Numbers of Vehicles in Arunachal Pradesh as on 31.03.2003**

Category	Two Wheelers	Passenger Three Wheelers	Goods Three Wheelers	Cars	Jeeps	Taxis	Buses
No. of Vehicles	10605	1430	555	2340	2260	299	665
Category	Trucks and Lorries		Tractors	Trailers	Other Vehicles	Total	
No. of Vehicles	2323		333	155	179	21,144	

Source: <http://morth.nic.in/motorstat/Table%20No%202013.htm>; accessed on 24.11.2005.

Tables 19.5 and 19.6 give the total road accidents that occurred in Arunachal Pradesh in past few years. It can be observed that in the past five years, there has been a consistent increase in the number of fatalities in the State (especially on account of heavy vehicles) and this is an issue of major concern.

TABLE 19.5

**Total Road Accidents in Arunachal Pradesh**

Year	National Highway	State Highway	Other Roads	Total	Persons Killed in Road Accidents
1999-2000	8	24	31	63	86
2000-01	123	149	194	466	175
2001-02	70	78	108	256	89
2002-03	NA	NA	NA	NA	NA
2003-04	46	144	55	245	127

Source: Statistical Abstract of Arunachal Pradesh (2004).

TABLE 19.6

**Number of Persons Killed and Injured by Motor Vehicles in Arunachal Pradesh**

Motor Accidents	Persons Killed				Persons Injured			
	2000	2001	2002	2003	2000	2001	2002	2003
Arunachal Pradesh	89	71	102	127	407	381	312	374

Source: MoRTH (2005), Motor Transport Statistics of India 2002/03.

In terms of road safety initiatives, Arunachal Pradesh has set up the State Road Safety Council and District Road Safety Councils to monitor safety in road transport operations. In collaboration with the police departments, they carry out activities like training and eyesight check-ups of drivers of heavy vehicles. There are enforcement inspectors who are authorised to check vehicle

BOX 19.1

**Prime Minister's Economic Package for Arunachal Pradesh: A Big Hope for Development of Road and Transportation**

The Prime Minister announced an economic package for Arunachal Pradesh on 31<sup>st</sup> January 2008. The proposals for development of road and transportation are as follows: (i) A new Greenfield Airport will be constructed in Itanagar to operationalise Pasighat, Along, Daporijo, Ziro and Tezu airports. (ii) Defence Ministry would improve infrastructure of the advance Landing Grounds at Tuting, Mechuka, Pasighat, Vijayanagar and Walong. (iii) Daily helicopter facility between Guwahati and Tawang (iv) The Central government is going to construct a two lane Trans-Arunachal Pradesh Highways from Tawang to Mahadevpur. This 1840 kms long highway will pass through Bomdila, Nechipur, Seppa, Sagalee, Ziro, Daporijo, Along, Pasighat, Roing, Tezu, Mahadevpur, Namchik, Changlang, Khonsa and Kanubari. (v) Itanagar will be connected by four land highways within four-five years and all district headquarters will be connected with two lane roads. (vi) Under Bharat Nirman, 500 small settlements will be connected by roads.

documentation at any time and enforce penalty under the Motor Vehicles Act to non-compliant drivers. The Draft Annual Plan 2005-06 for the State provides a specific allocation for road safety programmes, including replacement/purchase of new vehicles for mobility of police personnel and traffic equipment, training programme, publicity, etc.

Road safety must be given priority in the State due to its steep hilly terrain and narrow roads which are mostly single-laned and unsurfaced. Provision of safety features like proper signage, road markings, reflectory paint markings (for night time driving) and appropriate design of roads must be ensured. High levels of precipitation in the State also call for good drainage features (road side drains, culverts, bridges, etc.) to prevent accumulation of water on roads. Road safety audits should be undertaken to identify gaps in the existing system.

**Public Transport**

The State Transport Department (STD) is officially responsible for providing public bus services in Arunachal Pradesh. Some private players (mostly Assam-based and some local companies) are also engaged in the provision of bus services though their services are limited to lucrative routes.

The total fleet strength of the STD is about 236 buses plying on 148 routes, out of which almost 30 per cent routes lie in or pass through Assam (*Economic Review*



2004). The STD also operates four railway out agencies at Along, Naharlagun, Bomdila and Yingkiong to facilitate advance reservations in long distance trains. Apart from connecting district/sub-divisional and circle headquarters of the State and extending bus services to neighbouring states like Meghalaya, Assam and Nagaland, the STD provides concessional services to certain groups of users, sometimes with very high level of subsidies. STD buses are also deployed during emergency periods like law and order situations, and natural calamities. As a consequence of various social obligations, the STD incurs huge losses. The losses of the Department have increased to Rs. 12.05 crore in 2004-05 from Rs. 10.29 crore in 2003-04.<sup>10</sup>

Table 19.7 gives the operational, financial and physical statistics of Arunachal Pradesh State Transport Department. The bus fleet utilisations appear to be more or less constant over the past few years. The average number of passengers carried daily and total passengers carried yearly have increased but the number of buses plying on roads on a given day has reduced. Also the number of passenger kilometres operated is far less than what is scheduled. The main reasons for the poor performance of the STD are as below:

- Operations are carried out under difficult terrain and climatic conditions involving high operational and maintenance costs;
- Tariff cannot be raised to neutralise losses in the absence of any cheaper alternative of travel;
- Certain uneconomical routes have to be served for the sake of providing connectivity to the rural masses scattered over the entire State;
- Severe lack of funds with STD does not allow them to upgrade;
- 34 per cent of the fleet is averaged with higher maintenance costs;
- Low fleet utilisation (average 67 per cent); and
- Increase in salary bill of employees and increase in fuel prices

The STD has identified and undertaken certain administrative measures in 2004-05 to improve operational efficiency of the department (Annual Operating Plan 2005-06). These included *inter alia*:

1. periodical meetings to review performance of the staff and achievements of targets,
2. identification of sources of revenue generation, ways to reduce operational costs and check leakages of revenue,
3. training programmes with the help of vehicle manufacturers to promote skills and driving habits,
4. bus stations to be provided with basic infrastructural facilities to undertake timely maintenance of vehicle at minimum costs, and
5. expansion of management information systems.

A well-regulated and efficient public transport system is an urgent requirement for the State. In the light of low load factors, smaller buses or shared forms of paratransit could be used as means of public transport. Old buses need to be replaced in a phased manner and can be replaced by smaller buses or lighter vehicles, which would be more fuel-efficient and economical in the long run. Efficient fare and pricing mechanisms based on low subsidy should be designed and greater focus should be placed on the improvement of quality of the services in terms of reliability, comfort and safety. New institutional initiatives such as restructuring of the existing state transport undertaking, introduction of competition and creation of public-private partnerships could go a long way in improving the efficiency and productivity of the STD.

#### *Intermediate Public Transport*

As a result of the gap between levels of services provided by the STD and the needs of the users, intermediate forms of transport have found an important place in Arunachal Pradesh. These intermediate forms of transport are in the form of private operated vans, Tata sumos and auto rickshaws, which provide a faster, more personalised and ubiquitous service than public buses. Recent years have witnessed a significant growth in the number of Tata sumos and light vehicles in the state, indicating their increasing demand and popularity.

Such modes should be integrated with the existing bus system so that both modes operate as complementary to each other. Adopting a gross cost model<sup>11</sup> for private sector participation in bus operations could achieve this. The 'informal' vehicles could be registered and recognised by the government, and the latter could set the routes to

10. Review of performance and assessment of financial resources of Arunachal Pradesh State Transport for the Annual Plan 2005-06. Transport Division, Planning Commission.

11. <http://www.codatu.org/english/publications/proceeding/conference/codatu11/Papers/deb40.pdf>; accessed on 12.07.2006.



TABLE 19.7  
Statistics on the State Transport Department of Arunachal Pradesh

Sl. No.	Indicator	Unit	Operational Statistics				
			2001-02	2002-03	2003-04	2004-05 (L.E.)	2005-06 Estimate
1	Bus Route Coverage	Nos.	147	147	148	-	-
2	Distance Bus Route Coverage	Km/bus/day	95	82	86	87	-
3	(a) Passenger kms Scheduled	Lakh km	-	157	154	153	-
	(b) Passenger kms Operated	Lakh km	67	69	73	72	74
4	Strength of Bus Fleet (at end of year)	No. of buses	226	233	236	238	242
5	(a) Occupancy Ratio	Per cent	-	47	54	48	-
	(b) Break Even Occupancy	Lakh litre	-	84	84	85	-
6	Traffic receipt	Rs. (lakh)	754	705	691	-	-
7	Bus Fleet Utilisation	Per cent	67	65	68	67	66
8	Operational Expenditure	Rs. (lakh)	1659	2600	2032	-	-
9	Working Loss	Rs. (crore)	-	14.17	26.38	20.17	-
10	Fuel Efficiency	HSD (litre)/km	3.15	3.10	3.40	3.14	3.15
11	Tyre Efficiency	km	28000	28000	35000	-	-
12	Bus Stations	Nos.	12	12	13	13	-
13	Railway Out Agency	Nos.	5	5	4	-	-
14	Average Daily Passengers Carried	Nos.	5479	5027	6275	-	-
15	Average Buses on Road on a given Day	Nos.	195	141	162	-	-
16	Total Passengers Carried	Nos. (lakhs)	21	22	22	27	23
17	Load Factor	Per cent	52	47	43	53	54
18	(a) Average Revenue	Rs. per km	-	10.91	10.92	10.34	-
	(b) Average Expenditure	Rs. per km	-	26.02	25.83	33.36	-
	(c) Loss per km	Rs. per km	-	15.83	15.54	23.02	-
19	Bus Staff Ratio (on fleet operated)		4.48	5.40	4.35	5.02	5.08
20	Accidents Occurred	Nos.	9	2	8	4	0
21	Persons Injured	Nos.	21	0	0	0	0
22	Persons Killed	Nos.	3	3	1	2	0
23	Total Staff	Nos.	853	802	802	802	812
24	Staff Productivity	Km/worker/day	21.56	24.56	24.93	24.25	33.26
25	Total Operating Revenue	Rs. (crores)	-	6.97	6.91	7.17	-
26	Total Operating Expenditure	Rs. (crores)	-	17.29	29.11	22.80	-

*Note:* The average life assumed of each of the buses is seven years and 1.35 lakhs in kilometres.

*Source:* Arunachal Pradesh State Transport Services Department, Review of Performance and assessment of financial resources of Arunachal Pradesh State Transport for the Annual Plan 2005-06, *Economic Review and Statistical Abstract of Arunachal Pradesh, 2004*.

be operated and fares charged. The fare revenue would accrue to the government, which in turn could pay the operators an agreed amount, irrespective of occupancy and ridership. This way the private operators can ply on prescribed routes without the threat of competition and losing riders. This model is somewhat similar to the kilometre scheme being practiced in Delhi and Bangalore, where private buses are hired to run services as per requirements of the State Road Transport Undertaking. While in the gross cost scheme, the operator can bid for the level of compensation based on type of route, service quality expected, etc., in the kilometre scheme,

compensation is fixed regardless of type of route, time of day, etc. Under the proposed model, the operators might be unwilling to operate on crowded routes or may compromise on ridership. This, however, could be tackled by ensuring a varying compensation based on the nature of services undertaken. Such a system would not only serve the commuters well, but also find profitability and sustenance. Designing a mutually acceptable operating schedule where the more arterial and heavy traffic routes are covered by bus services while the interior and remote routes with lesser demand are covered by intermediate public transport could achieve this. Similarly buses could

cater to peak demands, and intermediate transport to off-peak hour traffic. This would avoid duplication of routes and help in generating revenue and efficiency for both.

### *Freight Movement*

The number of trucks and lorries has nearly doubled in the past 10 years and are known to cause heavy congestion on the highway stretches resulting in both delays and safety hazards. This calls for widening of the major roads in the State and regulations allocating appropriate times and routes for plying of freight trucks.

### *Railways*

For many years now, the status of railways in Arunachal Pradesh has been at a standstill, with the state having a negligible 1.26 km of metre gauge railway line. This line forms a part of the 34.04 km Balipara-Bhalukpong metre gauge section of the North with Bhalukpong being the terminal point in Arunachal Pradesh. Table 19.8 gives a state-wise description of railways in the north-eastern region. Of the total 2453 km of railway route in the north-eastern region, almost 2392 km lies in Assam itself.

**TABLE 19.8**  
**Railways in North-eastern Region—State-wise Disposition (km)**

<i>State</i>	<i>Broad Gauge</i>	<i>Metre Gauge</i>	<i>Total</i>
<b>Arunachal Pradesh</b>	-	<b>1.26</b>	<b>1.26</b>
Assam	1061.29	1330.47	2391.76
Tripura	-	44.72	44.72
Nagaland	7.63	5.22	12.85
Manipur	-	1.35	1.35
Mizoram	-	1.50	1.50
<b>Total</b>	<b>1068.92</b>	<b>1384.52</b>	<b>2453.44</b>

*Source:* Perspective Transport Plan for North-Eastern Region (2003).

Work is currently in progress to construct new railway lines in Arunachal Pradesh, for example the alignment from Bedati to Itanagar (45 km), for which survey has already been taken up (MoR, 2004). In 2007, the Government of India decided to construct new railway lines from Harmoti to Naharlagun which the survey is being conducted and work has already been started. According to the Perspective Transport Plan for North-Eastern Region (2003) the cost of rail construction in the region is higher at Rs.7-8 crores per km for the single lane due to undulating terrain and rivers as compared to

plain areas (approximately Rs.3 crores per km of single line and Rs. 5 crores for double line). This together with insufficient travel demand makes the viability of railways in the State difficult.

### *Water Transport and Ropeways*

According to the Resource Atlas on Arunachal Pradesh (1999), the State consists of five well-delineated river systems—the Kameng, Subansiri, Siang, Dibang and Lohit-Tellu, which form a part of the Brahmaputra system. However, as far as inland navigation is concerned, it is only viable in the southern plains of the State overlooking the Brahmaputra river (Gopalakrishnan, 1994). Currently some small-scale ferry services are in operation, carried out mostly by private operators but no planned effort has been made at developing an efficient means of water transport system in the State. In fact, no budgetary allocations have been made to this sub-sector (Table 19.9). In the NE region, only Assam has made some progress in this region due to its geographical advantage.

Interaction with the State officials revealed that despite geographical limitations, there is potential to develop water transport systems at certain points in the medium to long term for both passenger and freight movement. This would not only be an environmentally friendly mode of transport but also help in revenue generation for the State. In 2000, the Directorate of Transport, Government of Arunachal Pradesh, presented a proposal to the State to streamline the water transport system for all navigable rivers, swamps and lakes in the State.<sup>12</sup> Such initiatives need to be pursued more actively. Further investigations and surveys need to be carried out to determine suitable river stretches, potential travel demand of people and cargo, technology options, development of terminal and storage facilities, and fiscal incentives for infrastructure development.

Ropeways are another transportation option in the State, especially in locations where the cost of providing roads or other means cannot be justified by the demand. However, the safety concerns associated with ropeways cannot be overlooked and technology options need to be well planned before this option is developed further.

### *Civil Aviation*

Arunachal Pradesh is only one of the few states in India which does not have any functional airport. In 1995 only the Government of India decided to run Pawan Hans Helicopter Services in Arunachal Pradesh on commercial

12. Notification No. TPT(B)16/97 dated Itanagar, the 3rd August 2000.

TABLE 19.9  
Arunachal Pradesh-Annual Plan Allocations (lakh Rs.)

Sector	10th Plan Projected Outlay	Annual Plan 2002-03		Annual Plan 2003-04		2004-05	2005-06
		Revised Outlay	Expenditure	Revised Outlay	Expenditure	Revised Outlay	Projected Outlay
1. Civil Aviation	1386	310	264.76	310	285.24	310	366
2. Roads & Bridges (a+b)	78898	9999	11899.27	12333.33	13119.44	10482.08	16868.50
a. Rural Roads	22090	568.79	568.83	2892.91	2388.86	899.32	3263.50
b. PWD Roads	56808	9478.31	11330.44	9466.42	10730.58	9582.76	13605
3. Roads Transport	1982.40	450	373.76	450	420.5	450	531
4. Inland Waterways	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5. Other Transport (c+d)	175.56	44	44	44	43.70	44	360
c. Directorate of Transport	138.60	35	35	35	34.70	35	50
d. Road Safety	36.96	9	9	9	9	9	310
6. Communications	0	0	0	0	0	0	0
Total (1 to 6)	82442	10803	12582	13163	13137	11286.08	18125.50
Total Budget allocation to the State	-	67600	-	72300	-	75542	121212
Transport share as a %age of the total state budget	-	16	-	16	-	15	15

Source: Draft Annual Plan (2005-06).

visits. The decision was a consequence of the limited scope of surface transportation development and the need to create a quick link between the capital and administrative centres in various districts. Initially, Pawan Hans Helicopter Services were started on two routes<sup>13</sup> and subsequently extended to other locations to be availed on emergency situations like rescue operations during roadblocks, landslides, etc., and rendering services to government officials.

Presently there are 85 helipads, 11 advanced landing grounds (ALGs) for transporting passengers and goods for operation of Pawan Hans helicopter services and Army sortie services (Draft Annual Plan, 2005-06).

Despite the emphasis on the improvement and upgradation of ALGs in the Tenth Plan, the sector is saddled with financial constraints. During the 9th Plan, six airports (Itanagar, Pasighat, Ziro, Tezu, Along and Daporizo) were identified in Arunachal Pradesh for construction, but no major progress has been reported.

However, under the package announced by the Prime Minister in 2000, fuel price and tax concession were offered to encourage internal air services within the north-east region (State Development Report for Assam).<sup>14</sup> In

the light of this, some progress is expected in developing civil aviation infrastructure in the region. There have been recommendations to make Guwahati the central hub of air transport for air connectivity with other Indian states and perhaps also capitals of neighbouring countries.

Air connectivity with Arunachal Pradesh is vital not only for strategic reasons but also for developing the state's economy and thriving tourism. Recently, Government of India has decided for a greenfield airport in Itanagar. The consultant appointed by Airport Authority of India has submitted a Detailed Project Report (DPR). The cost of the Project has been indicated Rs.515.17 crore. The report is being reviewed. Table 19.9 throws light on the annual plan allocations for the State, which indicate a slight decline in the overall share of the transport sector in the past few years.

## Telecommunications

Apart from people's access to general telephony, the benefits of good telecommunication facilities could be realised through specific applications in sectors such as agriculture, education, health care, and transport. The remoteness of the region has affected the development of the telecom sector in the State.

13. Naharlogan-Guwahati and Naharlogan-Mohanbari.

14. [http://planningcommission.nic.in/plans/stateplan/sdr\\_assam/sdr\\_assch5.pdf](http://planningcommission.nic.in/plans/stateplan/sdr_assam/sdr_assch5.pdf); accessed on 20.10.2005.

Presently the north-eastern telecom circle has been bifurcated into two circles:

1. NE-I Telecom Circle with its headquarters at Shillong and comprising three telecom districts Tripura, Meghalaya and Mizoram.
2. NE-II Telecom Circle with its headquarters at Dimapur and comprising three telecom districts Nagaland, Manipur and Arunachal Pradesh.

The north-east falls in the C'Circle of cellular phone services in India, where there are three players operating namely, Reliance Telecom, Bharti Cellular and BSNL. So far, BSNL was the only player in Arunachal Pradesh. Now some private companies such as Airtel and Aircel have started their operation in the State. The State itself is divided into eight telecom sub-divisions namely Itanagar, Naharlagun, Bomdila, Tezu, Pasighat, Anini, Khonsa and Changlang. Teledensity, defined as the number of telephones per 100 persons is used to evaluate the telepenetration in any region. The summary of status of teledensity and other parameters in Arunachal Pradesh is given in Table 19.10.

TABLE 19.10

**A Summary of the Current Status of the Telecom Sector in Arunachal Pradesh**

	Population		
	Urban	Rural	Total
	222688	868429	1091117
Telephone connections as on 31.08.2005	29920	27056	56976
Mobile connections as on 31.08.2005	17381	4383	21764
WLL connections as on 31.08.2005	4145	294	4439
Teledensity as on 31.08.2005	23.1	3.65	7.62
Number of exchanges	13	88	101
Total exchange connection capacity	38300	44468	82768
Mobile connection capacity	21711	16527	38238

Source: Department of Telecommunications, Arunachal Pradesh (2005).

Compared to the all India status of teledensity—31.13 per cent in urban, 1.94 per cent in rural, and 9.86 per cent in aggregate,<sup>15</sup> the State appears to be doing well. This, however, does not say anything about the locations, accessibility and quality of services provided.

Table 19.11 gives the status of internet services in the north-east region in the years 2002 and 2004. Clearly the

penetration of such services needs to be improved. There exists a plan to lay optical fibre cables in Arunachal Pradesh along with improved satellite connectivity. Besides the existing telecom network, an additional police telecommunications network exists which not only caters to the needs of the State government and civil administration (60 per cent of the total traffic share belongs to this category) but also renders services to other government departments like Public Works Department (PWD), District Rural Development Agency (DRDA), health, and education. It also carries out works in remote areas, in absence of any public facility for communication, and during times of natural calamities, fire accidents and other exigencies.<sup>16</sup> According to the Economic Survey 2004-05 (MoF, 2005), Arunachal Pradesh was not a recipient from the Universal Service Obligation (USO) Fund (based on a 5 per cent levy on adjusted gross revenue of telecom companies), created to ensure provision of services at minimum costs in rural areas through a system of open bidding. However, this may change. Under the Bharat Nirman Programme of providing Village Public Telephone (VPT) in over 60,000 revenue villages in India by 2007, 1074 villages in Arunachal Pradesh have been identified for providing VPT services by November 2007.<sup>17</sup>

TABLE 19.11

**Internet Service in North-east India**

					Year on Year Growth (%)
	2002		2004		
	No. of Subscribers	% of Total Subscribers	No. of Subscribers	% of Total Subscribers	
Arunachal Pradesh	380	0.01	1010	0.03	165.79
Assam	9899	0.31	14440	0.41	45.87
Manipur	630	0.02	1026	0.03	62.86
Meghalaya	1455	0.04	5285	0.15	263.23
Mizoram	743	0.02	959	0.03	29.07
Nagaland	452	0.01	2536	0.07	461.06
Sikkim	928	0.03	965	0.03	3.99
Tripura	816	0.03	1194	0.03	46.32

Source: Indian Telecommunication Statistics 2004, Ministry of Communications and IT, Department of Telecommunications, Government of India.

Remoteness and the scattered population, the lack of adequate power supply and adequate voltage to run telephone exchanges, and inadequate trained manpower

15. <http://www.trai.gov.in/recom3oct05.pdf>; accessed on 30.11.2005.

16. [http://arunpol.nic.in/home/police\\_tele.htm](http://arunpol.nic.in/home/police_tele.htm); accessed on 25.10.2005.

17. [http://pib.nic.in/archieve/others/2006/may2006/upa\\_gov\\_20060521/UttarPradesh.pdf](http://pib.nic.in/archieve/others/2006/may2006/upa_gov_20060521/UttarPradesh.pdf); accessed on 10.07.2006.



are some of the causes behind the dissatisfactory service quality of the sector. While several private players operate in many parts of the country, the non-lucrative nature of markets in Arunachal Pradesh has limited competition in the State. The State government should consider extending financial support to the sector as against the present status of no financial allocation (see Table 19.11). These are also some of the findings of a study conducted by the Omeo Kumar Das Institute of Social Change and Development (OKDISCD) on 'Demographic and socio-economic profile of users and demand for various telecom services' for the Department of Telecommunication (DoT), Ministry of Information and Technology, Government of India, in the North-east.<sup>18</sup> According to this study, the major problem areas in telecom in north-east regions were cross connections, line congestions, faulty bills and delayed fault repairs.

Since the region is not lucrative for private players, the Central government will have to intervene with incentives for telecom facilities such as power subsidies and reduction or exemption for cable-laying. The State should take initiatives to improve the level of usage of telecommunications. The promotion of Information and Communication Technologies (ICT) that are now increasingly being used in other states can be one of the means to achieve this. Worldwide, ICT are looked upon as tools for socio-economic development that enhance the delivery of information to individuals, institutions and societies, thereby empowering them in various ways. The government should promote the application of telecommunication services for capacity building, development and training of human resources and technology support in the State.

## Postal Communication

During the year 2003-04, the average area and population served by each post office were 207.77 sq km and 3675 persons respectively (*Economic Review*, 2004). Table 19.12 exhibits the growth of the post offices in Arunachal Pradesh in the four years. There has been a marginal improvement in the past four years in terms of number of people served per post office.

The different types of postal services provided in Arunachal Pradesh are:

- a. Commercial—letter mails, parcel mails, money orders, IPO, VPP, VPL, Insurance, etc.
- b. Financial—SB, RO, TD, MIS, KUP, NSC, ICICI, PPF, UTI, WUMT, IDBIT, Oriental Insurance, etc.

- c. Premium—speed post, greeting post, express parcel post, business post, media post, e-post/e-business.

**TABLE 19.12**  
**Growth of Post Offices in Arunachal Pradesh**

Indicator	Unit	Post Offices as on 31.03.2004				
		2000	2001	2002	2003	2004
Post Offices	No.	301	303	304	305	305
Head Post Office	No.	1	1	1	1	1
Sub-Post Office	No.	46	46	47	47	48
E.D.B.P.O.	No.	254	256	256	257	256
Telegraph Office	No.	21	21	31	31	-
Population served per post office	Person	3005	3601	3675	3675	3675
Area served by one post office	Sq. km	278	276	207	207	207

Source: Economic Review (2004).

Telegraphic facilities do not exist in any of the post offices in the State. Poor road connectivity and level of public bus services affect the quality of the postal sector performance. Topographical constraints, limited financial resources, and low population density are hindrances in the smooth operation of the postal services. As part of the new initiatives, postal vans for rendering services are being considered. Postal services remain an important form of communication in remote areas and should be duly strengthened. The augmentation and improvement in transport and telecommunication services will play an important role in improving the quality of postal services in the State.

## Policy Implications

Adverse terrain and climate make the development of transportation infrastructure in Arunachal Pradesh a challenging task. In addition, the State also faces several institutional constraints.

In the light of the forgoing discussion, some strategies that need to be adopted in the future for improvement of the transport sector in Arunachal Pradesh are:

1. Given topographical factors, financial constraints, low population density and insufficient travel demand to justify the costs, development of rail, as major mode of transport may not be financially viable. Air connectivity is also a cost-intensive option but one which needs to be developed in the medium-term for promoting tourism and economic

18. Quoted in article found at [http://www.voiceofassam.com/voa\\_n9.htm](http://www.voiceofassam.com/voa_n9.htm); accessed on 10.07.2006.



growth. For the present, the thrust should therefore, continue to remain on the improvement and development of a basic road network, including the national highway.

2. Public transport and intermediate transport services need to be made more efficient. A functional, well-regulated and integrated public transport system of buses and private light vehicles should be developed to provide easy mobility to people, at the same time addressing road safety and environmental concerns. Introducing competition, profitable schemes and imparting manpower training and skills to different levels of service providers is also recommended to help the State Transport Department overcome its operational and financial difficulties.
3. In the long-run, the thrust of transport development in the State should be based on the utilisation of locally available natural resources and manpower. Wherever possible, the potential of water transport needs to be exploited. Further in-depth studies should be carried out to examine the feasibility of the option.
4. At the institutional level, different administrative units need to come together on one platform and formulate an integrated transport policy, wherein their roles and contributions are clearly defined. More autonomy needs to be given to the two transport departments in terms of functioning and decision-making.
5. The financial and budgetary allocations for the transport sector in the State needs to be revisited in accordance with the new and emerging needs. Work on proposals such as weigh bridges, inland waterways, and ropeways should be accelerated.
6. Finally, the data base on the transport sector needs to be strengthened. This includes conduction of traffic, geographical and household surveys to understand travel needs, behaviour and possibilities. The inconsistencies and gaps in existing datasets should also be addressed.
7. Adequate attention needs to be given to the provision of an institutional infrastructure especially for market institutes. The institutional rigidities in Arunachal Pradesh often inhibit the emergence of factor markets (Human Development Report, Chapter 8). Hence, it is necessary to develop the institutional infrastructure along with physical infrastructure for rapid economic development of the State.

## Chapter 20

# Science and Technology

### Introduction

Arunachal Pradesh requires a great deal of science and technology (S&T) input for sustained development and for improving the quality of life of its people. The present status of S&T including research and development (R&D) and the input needed for the overall development of the State have been covered under the following heads:

- Information technology
- Biotechnology
- Telemedicine
- Tele-education
- Bamboo technology
- Biodiesel production
- Medicinal plants
- Establishment of an Arunachal Pradesh Institute of Science, Technology and Environment (APISTE).

### Information Technology

Arunachal Pradesh has so far established 55 CICs, which are disseminating information on agricultural market status, government schemes, air and railway reservation, examination results, job opportunities, election, etc., and are generating computer awareness. The State should take full advantage of the scheme, expand it to the fullest for wider coverage and educate the people to benefit from it. There is also a GoI scheme to develop processing and exchange of software in local languages so that the benefits of IT can be brought to the doorsteps of the masses. The State should keep itself posted so that it is not left out of the culture of IT. The *nic.in* website has already incorporated information on sectors like agriculture, governance, orchids, forestry, demography, geography, economy, job market, etc.

However, many people do not yet seem to be IT savvy and the gap has to be bridged by IT education and training.

There are abundant international examples of the effective use of kiosk technology to deliver government information and services to the people. Many countries where personal computer systems are not very popular, have found it effective to establish multipurpose community telecentres (Kiosks).

These, of course, need skilled and knowledgeable human intermediaries to help the people in collecting information. Gradually, the users get IT-literate and their dependence on intermediaries reduces. A database on agricultural and bio-resources of the State can be developed for policy planning, trend analysis and forecasting in these areas.

Apart from the public kiosks, to create widespread ICT literacy and affinity for e-knowledge, the government will have to make provisions for people to have computer systems and Internet connectivity at affordable price. Special schemes can be operated to spread PCs to as many households as possible. This will lead to the spread of an actual e-revolution with e-governance, e-banking, e-shopping, e-medicine, e-education, e-entertainment, etc.

*Digital Libraries and Traditional Knowledge Digital Libraries:* The Council of Scientific and Industrial Research (CSIR) through its National Institute of Science Communication and Information Resources (NISCAIR) has established traditional knowledge digital libraries (TKDL) to—as the name implies—digitalise traditional knowledge available in the various societies in the country to make it patent compatible. For this, a local unit of TKDL connecting the central TKDL is essential. The genetic (mt DNA-based) information about the ethnic population in the State should also be preserved in TKDL.

ArP. The State will have to prepare and implement a scheme for organising digital libraries at the community level or in the village markets.

The government should formulate a comprehensive IT policy like Assam to achieve the following:

- to accord primacy for the growth of information technology industry in the state,
- to accelerate the use of information technology at the government level with a view to providing better services to the people of the state,
- to improve productivity and efficiency of the government services to the people of the state,
- to serve as an important tool to enhance employability as well as to absorb a major portion of the educated unemployed in the state,
- to enable the state to reach an eminent position in the information technology sector,
- to encourage and accelerate the growth of both the domestic and the export-oriented IT units in the state,
- to make the state an attractive destination for IT investment from the rest of India and abroad, and
- to accelerate the use of information technology in schools, colleges and educational institutions in the state to enable the youth to acquire necessary skills and knowledge in this sector making them highly employable.

The government should also set up an Information Technology Task Force under the Chairmanship of the Chief Minister to review the implementation of the IT policy. The policy should also aim to introduce IT literacy in schools and colleges with basic courses designed to provide employment opportunities in IT-enabled services.

**BPO:** In order to generate employment, training for BPO or call centres may also be organised by the Government for the youth of the State. Some model BPOs may be opened through NGOs or through collaborative schemes with private business houses. Gradually, manpower can also be trained on software development since this has a large worldwide market.

A Centre for Bioinformatics should also be established. The Centre for Bioinformatics can also form a part of the proposed Arunachal Pradesh Institute of Science, Technology and Environment (APISTE), or the existing arrangement of State Level Coordination for Biotechnology Research and Development at SFRI, Itanagar.

## Biotechnology

Considering the rich potentiality of the State and keeping in view the urgency of conserving depleting bio-resources and sustainably developing the same for improving the socio-economic conditions of the rural poor in the following thrust areas that require biotechnological intervention—especially collection and selection of elite germplasm, crop improvement and application of plant tissue culture for mass propagation of quality planting materials—have been identified:

- Agricultural crops,
- Horticultural crops,
- Floricultural crops including orchids,
- Medicinal and aromatic plants,
- Forestry—timber and non-timber species, and
- Sericulture.

## Agricultural Crops

Important areas where biotechnology can help in agriculture are:

- Development of high-yielding varieties of crops—cereals, pulses and oil seeds with stress tolerance to moisture, water logging, low temperature for hills, pest and diseases,
- Development of micropropagation protocols for selected elite clones for large-scale production and distribution to farmers,
- Development of bio-fertilisers and biological control of pests and diseases, and
- Application of genomics for molecular characterisation of plants species, transgenic, molecular breeding, etc.

The research establishments of the State in collaboration with the Agriculture Department should carry out research programmes on both field crops in use and wild varieties and carry out selection, screening and development applying biotechnology on the selected ones and transfer the technology to the farmers and industries. Further, with the organic food products gaining importance all over the world and the traditional agriculture in Arunachal Pradesh especially prevalent in the Apatani Valley being considered as one of the efficiently-managed systems of organic agriculture, such a model should be propagated throughout the State.

## Horticulture

Conventional horticultural crops like apple, banana, guava, jackfruit, orange, pear, peach, pineapple, etc., need

the following R&D interventions through biotechnological approaches:

- Collection, selection, breeding and improvement of indigenous fruits, vegetables and plantation crops for both hills and plains of the region with a focus on the production of high-yielding, disease- and pest-resistant varieties,
- Clonal selection and development of package and practice for cultivation/plantation activities,
- Application of tissue culture technology for large-scale production and distribution of quality planting materials of fruit and vegetable crops,
- Promoting organic farming and certification, and
- Development of post-harvest technology, improving shelf life and value addition.

### Floricultural Products Including Orchids

Under this programme, required biotechnological interventions are:

- Germplasm collection, both native and exotic, selection, breeding, plant improvement, and isolation of superior clones/varieties of hybrids with high-yielding, attractive vase quality, colour, shape, longevity of bloom that are resistant to pests and diseases,
- Tissue culture, induction of polyploidy, soma cloning, protoplast fusion, production of haploids through another culture, adopting molecular approaches for improvement, etc.,
- Development of micropropagation protocols, hardening and distribution of quality planting materials,
- Mycorrhizal studies and development of protocols for biological hardening and improvement of tissue cultured orchid plantlets,
- Development of cost-effective polyhouse or greenhouse technology for the production of disease-free quality flowers of selected clones, and
- Post-harvest technology to increase shelf life and retain freshness.

*In vitro* multiplication of orchids is now a proven technique and is a routine work in many laboratories within the country and abroad. Micropropagation of orchids would be facilitated through the establishment of a few tissue culture laboratories across the State. Such laboratories can be established both in public and private

sectors. In favourable climatic conditions, floritech villages could be established promoting orchid farming in various districts where communication is easy. These will open up a new and wide marketing channel joining the region to potential markets of the world.

### Medicinal and Aromatic Plants (MAP)

Micropropagation protocols have been developed on some important medicinal plants (Nandi *et al.*, 2002) and pharmaceutical industries like Dabur India have taken up large-scale propagation of selected medicinal plants adopting tissue culture technique. Further work, however, is needed to develop protocols *in vitro*, micro-propagate elite clones and undertake field trials and assess the biochemical composition of the active compounds useful in pharmaceutical industries on commercially important medicinal plants like *Andrographis paniculata*, *Coptis teeta*, *Taxus buccata*, *Eleocarpus ganitrus*, *Gymnema sylvestris*, *Gymnademina orchidis*, *Panax ginseng* and other species of *Aconitum*, *Acorus*, etc., besides, some aromatic plants like *Geranium*, *Citronella*, *Cymbopogon* and *Pachouli*.

Arunachal Pradesh maintains incomparable reserve of aromatic and medicinal plants. Immediate collection, conservation and sustainable utilisation of MAP are expected to bring a rapid economic gain to the region. Moreover, collection and marketing of secondary metabolites may pave the way for economic betterment of the people. In this regard, collection of germplasms and their molecular characterisation may be taken up. This would help conserve the local germplasms and avoid patent controversy.

### Forestry—Timber and Non-Timber Species

In order to replenish the vanishing woods and heal the wounds of environmental damages done over the years, there is an immediate need to take up genetic improvement of useful multipurpose tree species and their fast regeneration by adopting various biotechnological means. Besides trees, there are non-timber forest produces (NTFPs), traditionally known as minor forest produces (MFPs) from which rural communities derive their sustenance and livelihood. Standardised techniques could immediately be adopted for commercial production of NTFPs in the State.

However, further research is needed on micro-propagation, somatic hybridisation especially for silica free (for industrial point of view), and pest and disease-free bamboo on commercially important and threatened species. Similarly, there are some important cane species in the region, on which research needs to be taken up.



## Sericulture

It is essential to take up biotechnological works on the sericultural aspects for cooler hill regions of Arunachal Pradesh. The programmes would be breeding, genetics, rearing, seed technology, egg production, entomology, etc., in addition to improving agronomy and cultivation, packages of suitable clones of selected species of *Quercus griffithii* (for *tasar*) and *Ricinus communis* (for *muga*) through biotechnological approaches. Extension and training to the farmers would help boost the industry throughout the State.

The State should also take up:

- (1) DNA fingerprinting of local germplasms,
- (2) Molecular identification of biocontrol agents,
- (3) Conservation and sustainable utilisation of local bio-resources and generation of income and employment to usher in a new dawn. (Talukdar, 2005), and
- (4) Awareness and income-generation programmes.

## Institute of Biotechnology

An institute in the line of the Institute of Bio-resources and Sustainable Development, Imphal, may be established in Arunachal Pradesh also. Alternatively, this area can form a part of the proposed Arunachal Pradesh Institute of Science, Technology and Environment (APISTE).

## Bioinformatics

Bioinformatics, which is the integration of biology, IT and computer science, helps integrate, manage, analyse and visualise genetical and biological information. The area has gained in importance and a state like Arunachal Pradesh should try to catch up with it.

## Telemedicine

To be really useful in a state like Arunachal Pradesh, telemedicine must reach the unreached rather than merely enhancing the facilities of those who already have better means of obtaining medical service. But, certain amount of infrastructural facility is a prerequisite to a telemedicine system. These include elementary hospitals with investigation facilities, manpower and devoted doctors.

With advances in telecommunications, information processing capability and miniaturisation of health diagnostic equipment, it has become possible to deliver immediate and effective health care to the masses.

Some of the other important areas that can be covered by telemedicine are: tele-diagnosis, tele-pathology, tele-

radiology, tele-cardiology, tele-endoscopy, tele-dermatology, tele-therapy, tele-psychiatry, tele-care, tele-education, tele-research and tele-measurement. Patients' smart cards should also be introduced.

## Telemedicine Network

The first telemedicine centre of Arunachal Pradesh came up in the General Hospital, Naharlugun, in 2004, under the programme Providing Urban Facilities in Rural Areas (PURA) sponsored jointly by ISRO, NEC and the Government of Arunachal Pradesh. It links the medicos of the State to these in other states. The Second Centre of telemedicine was established recently in the Ramakrishna Mission Hospital, Itanagar. Tawang and Bomdila will be taken up subsequently.

Centres of telemedicine are proposed in the eight districts of the State but the names of the districts have not yet finalised and this will depend totally on the feasibility condition. In order not to lag behind in this extremely important area, the State should adopt a telemedicine plan (Saikia, 2005).

## Tele-education

Tele-education programmes will be highly relevant and extremely useful for the masses in the State. Sparsely distributed as it is in a large geographical area, many parts of which are difficult to cover under normal education dissemination mechanism, the tele-education system can be useful through:

1. A SITE-like programme,
  2. Other television programmes designed specifically,
  3. Internet with the help of
    - (a) Community Centres, and
    - (b) Home PCs.
- The Space Application Centre, North-east (SAC-NE) may be specifically requested to design and implement such a programme,
  - The scope of the tele-education in the State should include literacy drive, to career education and to technology transfer,
  - Vocational and community education must also be included,
  - Programmes must be developed for the community on health, hygiene, nutrition, agriculture, cottage industry, hazard mitigation, environmental education, etc.,



- Apart from the programmes of University Grants Commission and the Education Technology Centre, which can also be oriented to cater to the needs of the State, collaborative schemes can also be taken up with the National Institute of Open Schooling.

Since language may be a barrier for the learners, programmes in local languages/dialects will also have to be developed for the various communities. Tele-education units may be established at convenient locations in the communities where expert guides will browse, search and assist the interested registered learners in collating information and educational materials.

Tele-education can also include activities under a well-designed computer literacy programme by linking selected educational institutes of the State with core centres like IIT-Guwahati. IGNOU programmes can also be made available to the target audience.

The educational satellite EDUSAT was launched on 20 September 2004 by the Indian Space Research Organisation with the sole aim of disseminating education to various levels of the Indian society through the 'two-way virtual classroom' approach. Apart from the pre-school, school, college and higher education, these programmes may be extended to cover non-formal education and developmental communication. Arunachal Pradesh should also gear itself up to acquire these facilities.

### *Bamboo Technology*

#### **Bamboo Mission**

Considering the importance of bamboo in the economy of the rural areas and the abundant resources available within the country which is next only to China, Planning Commission, Government of India, has launched a National Mission on Bamboo Development for employment generation, livelihood security and environmental upgradation. Raising bamboo plantations and regeneration of bamboo growing areas for consistent supply of bamboo is the key to the growth and development of this sector.

To be useful, logistics have to be ensured, local people will have to be trained, their participation has to be encouraged right from the beginning of raising of plantations. Interests of the population have to be sustained by undertaking extension and publicity works in its proper perspective.

To meet these objectives it is essential to take up extensive plantation programmes systematically in a phased manner in tune with the objectives of the National Mission for Bamboo Development.

Plantation activities will be taken up in various locations. Community participation is crucial in successful implementation of the policy through JFM model and also as horticultural crops in farm lands. Plantation of bamboo will require prioritisation of species based on industrial demand.

#### **Bamboo Resource**

In spite of much potential for bamboo resources in the State, it is observed that bamboo has depleted at an alarming scale. A reliable strategy to ensure sustained availability of bamboos for extensive use is the need of the hour.

The strategies which are proposed for mass production of bamboo and bamboo products are:

- (i) Identification and study of important and useful genotypes,
- (ii) Mass-propagation of desired and improved genotypes,
- (iii) Standardisation of cultural practices,
- (iv) Resource assessment and conservation,
- (v) Genetic improvement,
- (vi) Sustainable management of natural habitats,
- (vii) Development of plantation technology,
- (viii) Pests, diseases and post-harvest studies,
- (ix) Development of harvesting technology,
- (x) Socio-economic aspects of resource production and management, and
- (xi) Resource utilisation: Specific issues to be addressed are properties and product relationship, shoot utilisation for curry and pickles. It requires R&D to include more species, proper preservation, elimination of toxic chemicals, etc.

Use of the individual bamboo species is related to their individual structural composition, but a synoptic review about the properties, processing, products and their relationships would widen the scope of uses, for which the following criteria may be involved in R&D work:

- (a) Quality improvement,

- (b) Product research and development including design of tools,
- (c) Technologies for small-scale enterprises,
- (d) Socio-economic studies including women in development,
- (e) Marketing studies.

If these R&D activities are properly executed bamboo will certainly become a green gold for the State.

Detailed schemes from cultivation to product development are:

- (1) Domestic use of bamboo around the farm,
- (2) Commercial production for construction, food and art, and
- (3) Ornamental landscape and conservation uses. (Hazarika, 2005).

### Product Development

A multi-level approach is necessary to address the problems of product development right from the source to destination. Apart from afforestation schemes, it is vital to establish links between the rural artisans and the urban consumers through development agencies. Entrepreneurship by professional designers would help identify new product areas. These could be communicated to artisans to produce contemporary items and the generation of a sustainable source of income. Marketing and export of bamboo products would require mass production by organising artisans with small equipment and facilities.

### Action Plan for Bamboo Resources

#### Database and Value Addition

- (1) A database for bamboo in the State has to be established.
- (2) Knowledge bank should be developed and skills promoted.
- (3) Degraded bamboo plantations should be rehabilitated.
- (4) Community management of bamboo sites should be encouraged.
- (5) Backyard bamboo plantation should be encouraged.
- (6) R&D activities on bamboo—including post-harvest technology, seasoning, durability and manipulability enhancement, value addition, protection from

cracking splitting and discolouration, etc.—should be taken up.

- (7) Awareness and training programmes should be taken up for rural population on value addition, technology transfer, skill development, protection measures (in case of bamboo flowering), etc., with the help of on-site training programmes and/or ICT centres (Kiosks).

### Biodiesel Production

In view of the topographic disadvantages, and the communication bottleneck that hinders other income-generating activities, the State should pay high priority to cultivation of plants with better prospects—like the biofuel-generating plants. Gradually more and more areas of wasteland may be utilised for cultivation of this plant and similar plants like *Pongamia* sp. and Paradise tree. Apart from generating biomass energy, it will lead to increase in rural economic activities from the plant products.

Efforts should be made to create conditions that encourage participation of the private enterprises in the establishment of agro-based industries like that based on oil-bearing trees. In order to attract more and more farmers to this new line of agriculture (i.e., biofuel-plant cultivation) and to utilise more and more unutilised land and wasteland, an incentive scheme should be introduced by the State government.

Self Help Groups should be promoted for the sole purpose of cultivation of biofuel generating plants. A sound market-support system should also be worked out for this. For integrated development of cultivation of oil-bearing plants and production of biodiesel, an autonomous biodiesel board should be constituted in the State.

In this context, emphasis may be given to the following aspects to add a new vista for generation of biofuel:

- 1. Survey to identify and assess potential of different tree-borne oil seeds in the State,
- 2. Analytical studies on characteristic of oil seeds/oil yield, composition of oil,
- 3. Agro-technology development of marked species and post-harvest operation,
- 4. Development of processing technologies, viz., multipurpose decorticator, improvement of oil recovery and enhancing the value, and utilisation by catalytic cracking.

The Government should also give incentive for plantation of biodiesel trees under the Employment Guarantee Scheme. With a practical plan, the State can attain leadership position in this sub-area (Firodia, 2005). Collaborative scheme should also be taken up on commercial cultivation of biodiesel plants with experienced companies like Godrej Agrovet Pvt. Ltd. in line with the model of Mizoram. (*The Telegraph*, 2005).

### *Medicinal and Aromatic (M&A) Plants*

The cultivation of medicinal and aromatic plants have great potential for employment generation and economic development for a state like Arunachal Pradesh as it possesses enormous diversity of M&A plants and the eco-climatic conditions favour its mass cultivation. Further, the economic efficiency ratio of these medicinal plants is observed to be several-fold higher than those of traditional cash crops and horticultural crops (Maikhuri *et al.*, 1998). However, the following points need to be emphasised prior to a large scale cultivation:

1. Documentation of indigenous agronomic practices and use of medicinal plants followed by the farmers,
2. Preservation of intellectual property rights (IPR) of the traditional societies as they are the main cultivators and conservers of medicinal plants,
3. Strengthening of traditional techniques of medicinal plants cultivation through cost effective and appropriate technology (i.e., polyhouses, vegetative propagation, bio-composting, etc.),
4. Exploration of avenues for value addition to the medicinal plant products and research into their potential market demand,
5. Establishment of processing or semi-processing units dealing with medicinal plant extraction and manufacturing of indigenous medicines in remote and far-flung areas so as to provide employment opportunities to locals while enhancing cultivation and reducing the pressure on natural resources,
6. Promotion of village marketing cooperatives for diverse medicinal plant products so as to avoid exploitation by middlemen,
7. Medicinal plants cultivation on restored lands could be encouraged under the management action plans to increase peoples' participation and improve local economy,
8. Organisation of regular farmers-to-farmers training programmes on medicinal plants cultivation to train

and to make them more aware about medicinal plant cultivation (Maikhuri *et al.*, 1999).

It is important that from cultivation to product (including value-added product) development of the medicinal and aromatic plant, the facilities should be confined within Arunachal Pradesh, so that at every step of its production, employment avenues remain open to the people of Arunachal Pradesh. Therefore, to earn monopoly of some unique medicinal and aromatic plant products, the government with the aid of universities and research institutions, should identify some prominent M&A plants which are not only endemic to the region, but also have a good national and international market.

In order to fully convert the potential of the available medicinal plants into economic wealth, a very active R&D programme is essential on the following aspects:

1. Optimising the most appropriate parameters for conservation, especially for endangered or endemic species and molecular methods for characterisation,
2. Studies on taxonomy both in molecular and chemical level,
3. Ecological studies related to conservation *in vivo*, and
4. Post-harvest operation.

The search for new drugs of plant origin yielded fruitful result in the past. In terms of a modern research endeavour, drug development from plants must necessarily imply a multi-disciplinary approach. In general, natural products that have come into modern medicine are the result of research. The emphasis of R&D should be on the following:

- i) Development of technology for bulk production of medicinal products.
- ii) Quality control for the starting materials as well as for the finished products.
- iii) Assimilation of acquired technology and its continuous improvement to make the products competitive.
- iv) Studies on bio-equivalence, bio-availability and pharmacokinetics.
- v) Search for new plant sources for known drugs and for new drugs from locally available plants.

A multi-disciplinary approach to drug development from medicinal plants used in traditional medicine is required and this includes:

- (a) Economic mapping of the flora,
- (b) Selection and authentication of plant species,
- (c) Collection of ethno-medical and ethno-botanical data,
- (d) Trial propagation to develop high-yielding varieties,
- (e) Medium-scale plant propagation,
- (g) Chemical studies on plant constituents,
- (h) Pharma-ecological and toxicological studies,
- (i) Pilot plant scale processing of plant extracts,
- (j) Standardisation of extracts, and
- (k) Formulation studies on extract into dosage forms.

Apart from the traditional use, some of these medicinal plants can be effectively used for commercial and industrial activities. There is huge demand for these plants from pharmaceutical, aromatic and cosmetic industries located outside the region. A few such plants include Pipli, Boch, Tamen, Taxus, Aconite, Kutki, Ginseng, Lissi, Oroxylum, Garcinia, Dioscorea, etc. A few other high value plants like *Rauvolfia serpentina*, *Withania somnifera*, *Gloriosa superba*, *Artemesia annua*, etc., can be easily introduced and grown in the State as some of the initial trials conducted by the State Forest Research Institute (SFRI) suggest their suitability. This institute has also explored the possibility of plantation of medicinal plants, taking advantage of their habit like trees, shrubs, herbs or climbers. Such plantations can enhance the productivity and frequency of economic returns. Combinations for such plantations suitable for different altitude have been worked out. The Regional Research Laboratory has also made extensive investigation into the development of agro-technology for farming. However, a full documentation of medicinal plants of the state and protocols for farming of each species are yet to be developed.

Recently, enthusiastic farmers have taken up cultivation of medicinal plants and 632 farmers have enrolled themselves with the State Medicinal Plants Board. The Department of Environment and Forest, the Regional Research Institute (*Ayurveda*), the Regional Research Laboratory (Branch of RRL-Jorhat) are engaged in survey and trials on growing medicinal plants. But it is also important to note that a few of the promising NGOs are currently cultivating and seriously working on the medicinal plants sector with a good performance. The requirement for the planting material is met by the Regional Research Institute (*Ayurveda*), the State Forest Research Institute and the Regional Research Laboratory.

## Priorities

The people of the State have a strong interest in medicinal plants. The following points must be kept in focus:

- (i) The ethno-medicinal studies in the State should be given due importance in order to set out a very effective strategy for the discovery of more and potentially useful chemical compounds. Their identification and conservation also deserve careful attention.
- (ii) Medicinal plants should be given the status of national resources as their sustained availability is essential to sustain the local health traditions and the ever-expanding herbal and pharmaceutical industry.
- (iii) Formulation of regulations to avoid indiscriminate harvesting of medicinal plants from the wild.
- (iv) Setting up raw drug processing units/industry.
- (v) Developing buy-back policy for the benefit of the cultivators (Arunachal Pradesh State Medicinal Plants Board, 2002).

## *Arunachal Pradesh Institute of Science, Technology and Environment (APISTE)*

For all-round development based on science and technology, the State would do well to establish an Institute of Science, Technology and Environment (APISTE).

The objectives of the institute may be:

- (1) To carry out research and development for utilisation of the natural resources of the State,
- (2) To generate scientific manpower by on-job training and exposure,
- (3) To provide scientific and technical inputs for industries by way of
  - (a) Technical consultancy services
  - (b) Analytical and testing services
  - (c) Facilities of a well-equipped industrial research institute including pilot plants to entrepreneurs, and
- (4) To undertake basic and exploratory research in areas where the scientists of the institute are capable of making significant contributions towards advancement of knowledge.

Although a thorough plan of the institute will have to be worked out, some areas of interest of the institute may be:

- (1) Biodiversity—survey, conservation, utilisation (similar to the Institute of Bio-resources and Sustainable Development, Imphal),
- (2) Minerals—gradation, utilisation, etc.,
- (3) Medicinal and Aromatic Plants—survey, conservation, adaptation, utilisation,
- (4) Energy—conventional and non-conventional,

More areas like information technology, bioinformatics, seismic surveillance, etc., can be added gradually depending on the assessed needs. Moreover, the institute will coordinate R&D and S&T activities relevant to the State with other institutes of excellence.

The institute may be established afresh or can be developed at an existing institute by building infrastructure and recruiting expert manpower. The immediate aim of such an institute will, of course, be the development of local experts who contribute to the application of science and technology to satisfy all local needs.



## Chapter 21

# Fiscal and Financial Issues

### Introduction

The cost of provisioning of public goods is relatively high in Arunachal Pradesh. For example, the unit cost of provisioning of merit goods like education and health facilities is two and a half times that of the plain area (Sarma and Nayak, 2006). However, the own resource of the State to finance its budget is very low, and the State is highly dependent on the central inflow. Thus, the budgetary policy of the government is constrained by limited resources on the one hand, and high unit cost of supply of public and merit goods, on the other. The economic reform process initiated by the Central government in the beginning of the 1990s has also constrained the State in terms of access to soft central resources. This has resulted in bulging of the public debt which reached 54 per cent of the GSDP in 2000-01 (EPWRF, 2004). Further, easy access to market borrowing (after the implementation of 12<sup>th</sup> Finance Commission Report) has refuelled the process, and as a result, outstanding liability of the State as shown in the budget of 2007-08 climbed to 80.06 per cent of GSDP. It is with this background that the finance and fiscal issues of the State have to be considered. The chapter proposes to analyse:

- (i) Broad budgetary trend;
- (ii) Growth and changing composition of revenue;
- (iii) Growth and changing structure of public expenditure;
- (iv) Growth and sustainability of public debt; and
- (v) Policy options.

### Broad Budgetary Trend<sup>1</sup>

From 1993-94 to 2006-07, except the years 2000-01 and 2004-05, the State had surplus in revenue account (Table 21.1). However, the fiscal deficits in all the years were positive. The State had to borrow from different sources to finance its budgetary needs. The revenue surplus averaged more than 10 per cent of the GSDP during 1993-2000. Then it turned negative in 2000-01 and 2004-05. In the subsequent years, the surplus became very small. However, from the fiscal year 2005-06, revenue surplus has been substantial (Table 21.1).

Thus, in the initial seven years of the period under review, low fiscal deficit is maintained because of a high revenue surplus. In the years subsequent to 1999-2000 the revenue surplus declined drastically and fiscal deficit<sup>2</sup> widened. The committed liability of the past borrowing, stood very high after 1999-2000, and the loan repayment became the main reason behind the bulging fiscal deficit of the State. Over the period: (i) revenue receipts as a percentage of GSDP has declined, while revenue expenditure as a percentage of GSDP increased, (ii) non-developmental capital expenditure has increased while developmental capital expenditure has declined in the State. The implication of this trend is that, financing of the non-developmental expenditure has been done by curtailment of developmental expenditure. This method of financing revenue expenditure refuels the growth of public debt and adds to the fast growing interest payment and thus to revenue expenditure growth (Sarma, 2000: 3126). In Arunachal Pradesh, the same thing has happened, and the process has led to a drastic reduction in revenue surplus and rise in fiscal deficit.

1. Data on GSDP of the State at current prices with 1993-94 base is available from 1993-94 to 2004-05. Therefore, the deficit calculation as a percentage of GSDP is limited to the period 1993-94 to 2004-05 only. From the period 2005-06 onwards, GSDP refers to the base 1999-2000. For the entire analysis the source of data is Annual Financial Statement of various years as presented to the Legislature.

2. Fiscal deficit is the difference between revenue receipts plus non-debt capital receipts and total expenditure.

TABLE 21.1  
Different Deficit Indicators

	Revenue Deficit (Crore)	Revenue Deficit % GSDP	Fiscal Deficit (Crore)	Fiscal Deficit as a % of GSDP	Primary Deficit (Crore)	Primary Deficit as a % of GSDP
1993-94	-147.55	-16.52	27.52	3.08	-0.01	0.00
1994-95	-167.16	-17.24	92.80	9.57	58.27	6.01
1995-96	-246.50	-20.81	66.27	5.60	23.92	2.02
1996-97	-206.75	-17.05	103.41	8.53	50.15	4.14
1997-98	-172.30	-12.89	133.34	9.98	73.49	5.50
1998-99	-185.81	-12.26	96.45	6.37	25.19	1.66
1999-2000	-228.72	-14.03	662.57	40.65	582.77	35.76
2000-01	16.49	0.92	331.18	18.57	207.92	11.66
2001-02	-27.02	-1.39	321.79	16.57	210.22	10.83
2002-03	-76.90	-3.92	280.14	14.27	152.16	7.75
2003-04	-184.47	-8.15	456.90	20.20	308.68	13.64
2004-05	78.04	0.28	539.73	19.36	392.83	14.09
2005-06	-181.76	-6.08	584.37	19.57	428.28	14.34
2006-07	-694.94	NA	193.92	NA	6.15	NA
2007-08(RE)	-665.37	NA	503.92	NA	316.50	NA
2008-09(BE)	-940.24	NA	-442.86	NA	-670.05	NA

Note: Positive indicates deficit and negative indicates surplus.

Source: Computed from Annual Financial Statement, (Various Years) as Presented to the Legislature, Government of Arunachal Pradesh and Central Statistical Organisation as mentioned in the text

## Revenue

Different components of revenue receipts are analysed by taking three indicators, namely: (i) share in aggregate revenue receipts, (ii) as a percentage of GSDP, and (iii) growth. Two time periods, i.e., 1995-2000 and 2000-2004, is taken for an inter-temporal analysis. The growth analysis is done up to 2006-07.

Tables 21.2 and 21.3 show the following trend in the revenue receipts of the State during the period under consideration:

- The growth rate (11.63 per cent) of the aggregate revenue during 2000-2007 is more than that (0.87

per cent) of 1995-2000. However, as a percentage of GSDP there is a declining trend during the above time periods. The higher growth rate observed in 2000-2007 is mainly due to faster growth of revenue than that of GSDP.

- Own tax revenue shows an increasing trend both in terms of share in total revenue receipts and GSDP, and growth rate.
- The share of central taxes in all measures i.e., share in aggregate revenue receipts, percentage of GSDP and growth, declined up to 2000-2004. However, improvement is observed in 2004-2007, as a percentage in aggregate revenue. Because of this trend, growth rate in 2000-2007 is higher than in 1995-2000.
- Growth rate of non-tax revenue in 2000-2007 is significantly higher than the period 1995-2000. The trend is same, (i) as a percentage of GSDP, and (ii) share in aggregate revenue.
- The negative growth rate observed in own non-tax revenue in 1995-2000, became positive in 2000-2007. The importance of own non-tax revenue in terms of, (i) as a percentage of GSDP, and (ii) share in aggregate revenue, was same in 1995-2000 and 2000-2004. However, there was a sudden upward jump after 2004-05 and is reflected as 11.27 per cent of aggregate revenue receipts in 2004-2007. This particular trend may be attributed to accrual of power royalty from the power producing companies in the State.
- Grants from the Centre constitute 92 per cent of the non-tax revenue of the State. Importance of this component increased during 2000-2004 as compared to previous periods. However, in 2004-2007, its share in aggregate revenue has declined to 71.88 per cent.

TABLE 21.2  
Composition of Aggregate Revenue

	% of Aggregate 1993-1995	% of GSDP 1993-1995	% of Aggregate 1995-2000	% of GSDP 1995-2000	% of Aggregate 2000-2004	% of GSDP 2000-2004	% of Aggregate 2004-2007
Tax Revenues	22.50	13.92	27.79	17.57	12.63	7.47	16.85
State's own Tax Revenue	0.72	0.45	1.11	0.70	2.76	1.63	3.19
Share in Central Taxes	21.77	13.47	26.68	16.86	9.87	5.84	13.67
Non-Tax Revenue	77.50	47.95	72.21	45.64	87.37	51.68	83.15
State's own Non-Tax Revenue	14.38	8.90	7.65	4.83	7.05	4.17	11.27
Grants from the Centre	63.12	39.05	64.56	40.80	80.32	47.51	71.88
Aggregate Revenue Receipt	100.00	61.87	100.00	63.20	100.00	59.15	100

Source: Same as Table 21.1.

**TABLE 21.3**  
**Growth Rate of Different Revenue Aggregates**

	1995-2007	1995-2000	2000-2007
Tax Revenues	0.19	17.30	18.61
State's own Tax Revenue	18.83	9.00	16.66
Share in Central Taxes	-2.01	17.69	19.55
Non-Tax Revenue	6.73	-4.84	10.49
State's own Non-Tax Revenue	8.12	-10.31	22.74
Grants from the Centre	6.53	-4.13	9.07
Aggregate Revenue Receipts	5.33	0.87	11.60

- The decline in Arunachal Pradesh's share in central taxes has not been adequately compensated by grants from the Centre. The net loss to the State exchequer was around 4.32 per cent of GSDP during 2000-2004. As a percentage of total revenue, total inflow from the Centre is declining over time.
- The own tax revenue of the state has improved substantially in all measures. However, as a percentage of GSDP it remained around 1.6 per cent in 2000-2004. However, as a percentage of aggregate, it has improved to 3.19 per cent in 2004-2007. Thus, the State needs to reform its own tax revenue policy which is recommended in the following section.

### Policy Prescriptions

A substantial improvement in growth is observed in the different components of tax revenue, but the tax bases are very low (Table 21.4). Therefore, the State may adopt the following measures to augment the revenue:

- Land revenue as a percentage of GSDP declined from 0.10 during 1995-2000 to 0.09 during 2000-2004. Further it dipped to 0.03 per cent in 2004-05. This calls for immediate revision of existing land tax rate and improvement in land revenue administration.
- There has been a declining trend in revenue collection from stamp duty in recent years. Again, the revamping of land revenue administration can brighten the prospects of revenue generation from this source.
- There has been significant improvement in revenue collection from State excise and sales tax up to 2000-2004. However, in 2004-05 revenue collection from State excise declined and sales tax has

improved as a percentage of GSDP. In 2000-2007, growth rate in state excise was negative and that in sales tax was 26.66 per cent. Because of implementation of MODVAT by the State government the revenue collection from sales tax has improved substantially. In order to strengthen MODVAT there should be more publicity among the people.

- There is stagnation in tax collection from motor vehicles. It is also noted that the State has not revised the vehicle tax since 1991. Thus, the reform in the Assam line is strongly recommended to improve revenue collection from this source.
- Further, the State may think about the imposition of professional tax in the line of other north-eastern states to augment the tax revenue.
- The decline in the share of central taxes has not been fully compensated and as a result, the net loss to the state exchequer is around 4.32 per cent of the GSDP in 2000-2004. This point should be brought to the notice of the Central government.
- There is a bright prospect in the State to generate more revenue from selling its share of electricity from various central schemes to central grid. Thus, the State must go for all the hydropower projects that are feasible, economically and environmentally.

**TABLE 21.4**  
**Major Components of Own Tax Revenue**

	1995-2000				
	% of GSDP	Growth Rate	% of GSDP 2000-2004	Growth Rate (2000-2007)	% of GSDP 2004-2006
Land Revenue	0.10	0.39	0.09	0.39	0.03
Stamp Duty	0.03	3.09	0.04	1.79	0.02
State Excise	0.46	14.07	0.62	-1.95	0.47
Sale Tax	0.02	-9.16	0.81	26.66	1.31
Taxes on Vehicles	0.08	-4.75	0.08	11.45	0.09

Source: Same as Table 21.1.

### Public Expenditure

Public expenditure is studied for the period 1995-2000 to 2006-07. Due to non-availability of GSDP data beyond 2004-05, different aggregates as a percentage of GSDP is restricted up to 2004-05. The growth of different components of fiscal aggregates is given in Table 21.5 and as a percentage of GSDP in Table 21.6.

**TABLE 21.5**  
**Growth Rate of Different Fiscal Aggregates**

		1995-2000	2000-2007
1	Revenue Expenditure	4.16	8.00
1 a	Developmental Expenditure	1.75	9.33
1 a (i)	Social Service	4.96	9.21
1 a (ii)	Economic Service	-0.91	9.43
1 b	Non-Developmental Expenditure	9.57	5.20
1 b (i)	Interest Payment	9.14	4.46
1 b (ii)	Pension	29.67	6.00
1 b (iii)	Establishments	6.18	6.00
2	Capital Expenditure	10.09	12.07
2 a	Developmental	-11.23	8.60
2 a (i)	Social Service	-24.9	14.75
2 a (ii)	Economic Service	-8.59	7.07
2 b	Non-Developmental Expenditure	50.70	29.07
2 b (i)	General Service	7.71	-3.67
2 b (ii)	Loan and Advance	-3.23	0.99
2 b (iii)	Public Debt	55.92	36.12

Source: Same as Table 21.1.

**TABLE 21.6**  
**Broad Expenditure as a Percentage of GSDP**  
**(Average of the Period)**

		1995-2000	2000-2004	2004-2006
1	Revenue Expenditure	48.06	55.38	54.62
1 a	Developmental Expenditure	33.46	36.87	37.69
1 a (i)	Social Service	15.49	17.53	18.07
1 a (ii)	Economic Service	17.97	19.34	19.62
1 b	Non-Developmental Expenditure	14.6	18.51	16.93
1 b (i)	Interest Payment	4.46	6.43	5.57
1 b (ii)	Pension	1.62	2.88	2.46
1 b (iii)	Establishments	8.52	9.2	8.9
2	Capital Expenditure	37.23	28.87	22.52
2 a	General Service	9.45	8.95	0.53
2 b	Developmental	18.78	15.32	13.54
2 b (i)	Social Service	3.14	2.4	2.81
2 b (ii)	Economic Service	15.64	12.92	10.74
2 c	Public Debt, Loan and Advance	8.89	4.60	8.45
2 c (i)	Public Debt	8.89	4.45	8.35
2 c (ii)	Loan and Advance	0.98	0.45	0.10

Source: Same as Table 21.1.

### Macro Trend

- Over the period, revenue expenditure has increased and capital expenditure has declined as a percentage of GSDP.
- Growth rates of plan and non-plan expenditure are 3.69 and 5.45 per cent respectively, over the period. During the first period, plan expenditure decelerated

(-2.15 per cent) and non-plan expenditure grew at a rate of 4.05 per cent. Higher growth rate is observed in plan expenditure (16.39 per cent) as compared to non-plan expenditure growth rate of 6.02 per cent, during the second period.

- During the whole period, non-plan revenue expenditure stands around 99 per cent of the non-plan expenditure. Plan revenue expenditure has gone up from 38.64 per cent in 1995-96 to 56.13 per cent in 2004-05. Thus, a declining trend in share is observed in capital expenditure in the State.
- Developmental revenue expenditure (to put the analysis in a temporal comparison, the period is divided into three sub-periods: 1995-2000, 2000-2004 and 2004-2007) increased both in terms of growth and as a percentage of GSDP. In capital expenditure, though growth rate is increased during 2000-2007, the base has declined.
- Non-developmental revenue expenditure as a percentage of GSDP increased by four percentage points in 2000-2004 as compared to 1995-2000, and a marginal increase took place in 2004-05. Thus, the overall increase is due to a substantial rise in interest payment and pension.
- Capital expenditure in the form of public debt-redemption, and loan and advance, has declined by four percentage points between the first two time periods. However it has gone up to 8.45 per cent of GSDP in 2004-05.

### Micro Trend

#### Developmental Expenditure on Social Services

The micro trend in developmental expenditure is analysed by converting the value at the constant price of 1999-2000. Table 21.7 shows the trend of real developmental expenditure in social services during 1995-2000, 2000-2004 and 2004-2007.

- Average revenue expenditure in social service was 34 per cent higher in 2000-2004 than in 1995-2000. Between 2000-2004 and 2004-2007 the increase was 38.43 per cent. However, capital expenditure in this sector declined by 13 per cent in the first two periods and there was an increase of 80 per cent between the period 2<sup>nd</sup> and 3<sup>rd</sup>.
- There is a consistent increase in average revenue expenditure in education. Capital expenditure declined between the first two time periods and then increased in the 3<sup>rd</sup>.



- In health sector, revenue expenditure consistently increased. The increase in capital expenditure in the first two time periods was only 12 per cent, whereas between the second and third, the increase was 137 per cent.
- In water supply, housing and information services, revenue expenditure increased, whereas capital expenditure declined in the first two time periods. However, between 2<sup>nd</sup> and 3<sup>rd</sup> time periods, the increase in capital expenditure in water supply was 67 per cent.
- In other social services, the trend is increasing in both the accounts.

TABLE 21.7

**Average Expenditure in Social Services at Constant Price (1999-2000 =100), (Rupees in Crore)**

	Revenue Expenditure			Capital Expenditure		
	1995-2000	2000-2004	2004-2007	1995-2000	2000-2004	2004-2007
Education	115.02	146.96	176.56	13.42	12.88	24.11
Health	46.44	55.53	63.50	5.13	5.75	13.67
Water Supply and Housing	45.44	60.46	116.94	31.35	20.35	33.99
Information, etc.	2.27	2.96	3.15	0.122	0.03	0.37
Other Social Service	28.05	53.59	82.15	0.25	4.83	7.33
Total	237.23		442.30	49.7	43.84	79.13

Source: Same as Table 21.1.

### Impact on the Economy

The increasing revenue expenditure and declining capital expenditure (particularly in the second period) has adverse consequences on delivery of social services. In many interior areas, doctors and school teachers find it difficult to reside in the place of their posting because of lack of residential accommodation, as a result of which (in the absence of private accommodation facilities) they remain absent from duties (GoA, 2006). This has adverse impact on the functioning of health centres and schools.

### Developmental Expenditure on Economic Services

Table 21.8 gives the comparative expenditure pattern in both revenue and capital accounts during the periods 1995-2000, 2000-2004 and 2004-2007.

- Between the 1<sup>st</sup> and 2<sup>nd</sup> time periods, revenue expenditure in economic services increased by 26.6 per cent whereas capital expenditure declined by 3.70 per cent. Between 2<sup>nd</sup> and 3<sup>rd</sup> revenue and capital expenditure increased by 37.59 and 16.97 per cent respectively.

- In all the sub-sectors revenue expenditure has increased, whereas capital expenditure has a mixed trend between the 1<sup>st</sup> and 2<sup>nd</sup> time periods. Between 2<sup>nd</sup> and 3<sup>rd</sup> time periods revenue expenditure in all sectors increased. The maximum increase was observed in energy (almost six times in revenue).
- In agriculture, industry and minerals, rural development, transport and general economic services; capital expenditure declined between 1<sup>st</sup> and 2<sup>nd</sup> time periods. Between 2<sup>nd</sup> and 3<sup>rd</sup>, except in general economic services, capital expenditure increased.
- Only in case of special area programme and rural development, the trend is upward in both accounts.

TABLE 21.8

**Average Expenditure in Economic Service at Constant Price (1999-2000 =100), (Rupees in Crore)**

	Revenue Expenditure			Capital Expenditure		
	1995-2000	2000-2004	2004-2007	1995-2000	2000-2004	2004-2007
Agriculture and Allied Sector	137.41	139.66	161.00	7.71	4.70	11.27
Rural Development	25.79	26.10	38.49	1.93	0.65	0.88
Special Area Programme	6.57	9.68	22.54	9.22	27.92	41.50
Irrigation, etc.	21.58	44.67	42.29	5.86	7.78	5.74
Energy	17.37	13.39	86.95	99.32	105.29	106.65
Industry and Mineral	11.21	13.44	12.65	0.55	0.49	1.11
Transport	38.53	51.92	67.51	117.60	86.22	107.44
General Economic Service	18.80	53.30	53.19	1.68	1.85	0.16
Total	277.28	352.19	484.60	243.87	234.90	274.76

Source: Same as Table 21.1.

### Impact on the Economy

The impact of declining capital expenditure and increasing revenue expenditure as a whole has been felt in the growth pattern of GSDP in the State. In the post-reform period in the economy of Arunachal Pradesh, agriculture and industry sectors were able to grow at a rate of 1.67 and 5.81 per cent respectively, which are lower than those in the pre-reform rates. Contribution to growth by agriculture sector has been negative and that by industry has declined. The service sector has become the driving force behind the growth and is contributing more than 100 per cent to the growth of GSDP. The non-infrastructure service sector is contributing more than 75 per cent to growth and a distorted growth pattern has emerged in the economy of Arunachal Pradesh (Sarma and Nayak, 2006). The distorted growth pattern has also



contributed to many inequalities and has thus, added inefficiency to the productive capacities of the economy of the State (Ibid).

### Expenditure Pattern in Non-Developmental Activities

Non-developmental activities include expenditure in different organs of the State, fiscal services, interest payments, administrative services and pension. Table 21.9 shows the following trends during 1995-2000, 2000-2004 and 2004-2007.

- Of the total revenue expenditure in general services the share of expenditure in organ of the State, fiscal services and administrative service declined from 58.84 per cent in 1995-2000 to 45.15 per cent in 2000-2004. In 2004-2007, it was 46.66 per cent.
- The share of interest payment and pension in the revenue expenditure in general services, increased from 41.37 per cent in 1995-2000 to 50.32 per cent in 2000-2004. It stood at 48.30 per cent in 2004-2007. This is the dominant reason behind the growth of non-developmental revenue expenditure in the State.
- Non-developmental capital expenditure had a declining trend between the 1<sup>st</sup> and 3<sup>rd</sup> time periods.

TABLE 21.9

Average Expenditure in General Services at Constant Price 1999-2000 =100), (Rupees in Crore)

	Revenue Expenditure			Capital Expenditure		
	1995-2000	2000-2004	2004-2007	1995-2000	2000-2004	2004-2007
Organ of the State	12.86	15.27	20.46			
Fiscal services	1.92	2.52	3.35			
Interest payment	67.89	117.39	137.77			
Administrative services	115.52	149.99	186.21			
Pension etc.	24.05	52.54	58.46			
Total	222.24	337.72	406.26	14.44	16.42	13.84

Source: Same as Table 21.1.

### Impact on the Economy and Policy Options

The rising revenue expenditure in all fronts has compelled the state to go for large scale reduction in capital expenditure. The slow-growing agriculture, non-growing industries and rising educated unemployment have compelled the government to go for the creation of more jobs in the government sector. The process has fed on each other and expenditure on salaries relative to revenue expenditure (excluding interest payment) has

gone up from 40.5 per cent in 1994-95 to 47.8 per cent in 2002-03 (12<sup>th</sup> Finance Commission Report p.487), which is 10 percentage points higher than the national average.

- Identification and redeployment of excess employees in meaningful ways can only bail out the State from the present position.
- Enhanced capital expenditure in economic service sector especially in expanding productive capacity of the economy can ease out the government from the pressure of creating more jobs in the public sector which may be less productive.

### Interest Burden

During 1994-1996, interest burden on the State hovered between 3 and 3.58 per cent of GSDP and during 1996-2000, between 4 and 4.9 per cent. It jumped to over 6 per cent of the GSDP during 2000-2004. It stood at around 5.61 per cent of GSDP in 2005-06. Thus, interest burden of the State is one of the major contributors to rising fiscal deficit.

### Debt Problem

Over time the outstanding debt of the State has risen. Aggregate outstanding liability which was 33.5 per cent of the GSDP in 1995-96, rose to 41.5 per cent in 2000-01 and then to 80.06 per cent in 2007-08 (Table 21.10).

TABLE 21.10

State-wise Outstanding Liabilities (As a % of GSDP)

State	1995-96	2000-01	2005-06	2007-08(BE)
Arunachal Pradesh	33.5	41.5	80.08	80.06
Assam	32.6	32.2	39.1	38.2
Manipur	41.5	64.1	92	77.4
Meghalaya	24.6	37.2	45.5	46.9
Mizoram	57.4	77.7	102.8	92
Nagaland	43	43.6	45.3	41.8
Tripura	41.3	45.2	58.6	51.5
All India	21	28.3	32.7	29.8

Source: RBI Website on Study on State Finance.

### Debt Position and Its Sustainability

During 1993-94 to 1998-99, the growth<sup>3</sup> rates of public debt, GSDP and interest payment in nominal terms were 10.82, 10.37 and 18.96 per cent respectively. In the periods 1999-2000 and 2000-2006, the growth rates of the same variables stood at 21.73, 10.13 and 10.56, respectively. Thus, the growth rate of interest liability was

3. Growth rate is calculated at current prices.

higher than those of debt and GSDP in both the periods. In spite of the rising interest burden, the capital expenditure recorded a declining trend in the same period. More serious problem is that the developmental expenditure that contributes to the productive capacity of the economy did not pick up.

It is noteworthy that during 1990-1995 around 2.83 times the borrowed capital was spent on developmental capital expenditure. It declined to 2.41 and 1.86 times during the subsequent periods, i.e., 1995-2000 and 2000-2005 respectively. In the year 2005-06 it stood at 0.42 times of the borrowed capital. The figure (8.95 times) reported for the year was because of zero borrowing from the market and Central government and the debt of Rs. 62.94 crore was mainly from public accounts. Then, it showed an improvement in 2007-08 (RE). Again in 2008-09 (budgeted), it has deteriorated to 0.59 per cent of the borrowed capital. (Table 21.11).

- In the process, while the contribution of revenue receipts to developmental capital expenditure has declined, the use of borrowed fund for non-developmental activities has risen, which is a serious issue in the budgetary policy of the State.

**TABLE 21.11**  
**Impact of Public Debt on Developmental Capital Expenditure**

	<i>Capital Expenditure as a Percentage of Public Debt and Loan and Advance</i>			
	<i>Economic Service</i>	<i>Social Service</i>	<i>General Service</i>	<i>Total</i>
1990-91	167.91	43.62	8.59	220.12
1991-92	251.77	58.28	9.90	319.95
1992-93	267.25	60.07	10.70	338.03
1993-94	257.93	58.06	11.02	327.01
1994-95	205.35	43.29	7.57	256.22
1995-96	261.58	58.27	11.36	331.21
1996-97	202.63	60.53	8.68	271.84
1997-98	263.13	49.99	17.49	330.61
1998-99	139.59	20.99	11.09	171.67
1999-2000	130.46	19.10	9.40	158.96
2000-01	202.94	42.33	15.67	260.94
2001-02	296.50	67.16	28.67	392.32
2002-03	107.58	17.83	8.39	133.80
2003-04	93.86	14.99	3.92	112.77
2004-05	71.15	17.72	3.58	92.46
2005-06	32.77	8.92	1.59	43.28
2006-07	673.23	222.20	34.98	930.41
2007-08(RE)	142.67	33.60	6.35	182.62
2008-09(BE)	50.93	7.84	3.41	62.18

Source: Same as Table 21.1.

### *Composition of Debt*

Between 1990-91 and 2005-06, the share of market loan, has increased by 40.74 percentage points, while loan from the Central government has declined by 42.69 percentage points. Dependency on the market has taken the momentum since 2002-03. After the implementation of the 12<sup>th</sup> Finance Commission's recommendation, the central loan turned negligible and the State become almost completely dependent on market for its loan requirement. This fetterless growth of market loan has obviously contributed to the rising interest payment liability, which in turn has worsened the revenue balance and has a direct impact on declining developmental capital expenditure in the State.

### *Debt Sustainability*

The 12th Finance Commission has recommended bringing down the debt-GSDP ratio of the State to 28 per cent (12<sup>th</sup> Finance Commission Report, p.71) and phasing out of the central loan to the states to assure sustainability. Keeping this in view it will be useful to examine, whether the debt of the State is sustainable or not.

Debt sustainability implies enduring without breaking down; solvency on the other hand, means the ability to discharge one's obligation in the long run (Rath, 2005). Fiscal policy is sustainable if the government is able to service the stock of public debt over the near future (Ibid). Thus, solvency is a necessary condition of sustainability.

Domar model prescribes the condition of solvency and sustainability of public debt as  $k < r < g$ , where  $k$  = growth rate of public debt,  $r$  = interest rate, and  $g$  = growth rate of the economy. In order to have a meaningful analysis the total time period is divided in to 1993-94 to 1998-99 and 1999-2000 to 2005-06.

In the first time period, the nominal growth rate of GSDP is ( $g = 10.37$ ), growth rate of debt ( $k = 13.82$ ), and average (weighted) interest rate paid ( $r = 12.42$ ) in the State. Here the growth rate of GSDP is same as the growth rate of debt but smaller than the rate of interest. Thus, the sustainability condition is only satisfied and not the solvency. In the second time period (1999-2000 to 2005-06), the nominal growth rate of GSDP is ( $g = 10.13$ ), growth rate of debt ( $k = 21.73$ ) and average (weighted) interest rate paid ( $r = 10.72$ ). Here, in both the periods neither the solvency nor the sustainability condition is satisfied. Thus, it is the high time to think about the debt problem of the State in a scientific way.

TABLE 21.12  
Outstanding Debt Position

	Total Rev. Receipts (Rupees Crore)	Interest Payment (Rupees Crore)	Gross State Domestic Product (Rupees Crore)	Interest Payment as a Percentage of GSDP	Outstanding Debt as on 31st March (Rupees Crore)	Outstanding Debt as a Percentage of Revenue Receipts	Outstanding Debt as a Percentage of GSDP
1991-92	539.46	21.37			287	53.20	
1992-93	615.13	21.83			262	42.59	
1993-94	658.16	27.53	893.11	3.08	281	42.69	73.69
1994-95	731.06	34.53	969.65	3.56	319	43.64	75.39
1995-96	859.51	42.35	1184.4	3.58	397	46.19	72.57
1996-97	965.00	53.26	1212.29	4.39	480	49.74	79.60
1997-98	1045.16	59.85	1336.52	4.48	477	45.64	78.20
1998-99	1182.60	71.26	1515.16	4.7	559	47.27	78.05
1999-00	1319.43	79.80	1615.39	4.94	728	55.18	81.68
2000-01	1084.78	123.26	1806.07	6.82	718	66.19	60.06
2001-02	1057.84	111.57	2126.84	5.25	769	72.70	49.74
2002-03	1108.29	127.98	2103.18	6.09	945	85.27	52.70
2003-04	1576.37	148.22	2407.74	6.16	1736	110.13	65.47
2004-05	1501.84	154.30	2787.94	5.53	1973	131.37	53.87
2005-06	1849.41	167.53	2987.14	5.61	2150	116.25	61.91
2006-07	2592.18	200.52	NA		2314	89.27	NA
2007-08(RE)	3307.24	199.82	NA		2614	79.04	NA
2008-09(BE)	3903.55	241.19	NA		2839	72.73	NA

Note: The outstanding debt is computed from RBI (2008) by deducting Ways and Means Advance from RBI from the total outstanding liability of the State as given in Statement 27, page 184.

Source: (1) Annual Financial Statements of Arunachal Pradesh (Various years), Website Central Statistical Organisation ([www.mospi.nic.in](http://www.mospi.nic.in)) and RBI (2008).

TABLE 21.13  
Composition of Total Debt

	Internal Debt as a % of Total Debt	Loan from the Central Govt. as % of Total Debt	Provident Fund, etc. as a % of Total Debt
1990-91	17.53	62.79	19.68
1991-92	20.47	54.18	25.35
1992-93	19.95	59.50	20.54
1993-94	19.78	55.06	25.16
1994-95	47.49	35.94	16.56
1995-96	35.38	43.77	20.85
1996-97	35.86	43.46	20.68
1997-98	17.41	55.14	27.45
1998-99	38.07	42.32	19.61
1999-2000	45.62	16.97	37.41
2000-01	15.87	17.94	66.19
2001-02	20.62	27.29	52.09
2002-03	47.72	30.91	21.37
2003-04	49.39	30.24	20.37
2004-05	59.09	17.54	23.37
2005-06	58.27	20.10	21.63
2006-07	0.00	0.00	100.00
2007-08(RE)	64.25	0.10	35.65
2008-09(BE)	59.90	0.31	39.79

TABLE 21.14  
Interest Paid and Outstanding Debt

Year	Interest Paid (Rs. Crore)	Debt in time (t-1) (Rs. Crore)	Rate of Interest <sup>1</sup> in time t (r)
1991-92	21.37		
1992-93	21.83	287	7.61
1993-94	27.53	262	10.51
1994-95	34.53	281	12.29
1995-96	42.35	319	13.28
1996-97	53.26	397	13.42
1997-98	59.85	480	12.47
1998-99	71.26	477	14.94
1999-00	79.80	559	14.28
2000-01	123.26	728	16.93
2001-02	111.57	718	15.54
2002-03	127.98	769	16.64
2003-04	148.22	945	15.68
2004-05	154.30	1736	8.89
2005-06	167.53	1973	8.49
2006-07	200.52	2150	9.33
2007-08(RE)	199.82	2314	8.64
2008-09(BE)	241.19	2614	9.23

Source: (1) Annual Financial Statements of Arunachal Pradesh (Various years) and RBI (2008).

The policy option for the State is to increase the growth rate of the economy and to find out loans at low interest rate. The second option is difficult to exercise as the interest rate is likely to rise in the inflationary situation. So the alternative is to increase the productive capacity of the economy such that dependency on debt is reduced. This is possible through, among others, increasing developmental capital expenditure of the State in a situation of low private investment.

### Policy Options

There has been a shift in the use of public debt from productive to non-productive sectors, and at the same time the State has moved from a low interest debt to high interest public debt regime. Therefore, it is high time for the State government to focus on the use of public debt for sustainable development. Further, timing of the creation of capital assets is also a crucial issue. Most of the developmental capital expenditure is undertaken in the month of March and the rainy season starts just after that. Heavy rainfall and frequent landslides tend to wash away the assets created hurriedly to utilise the allocated funds. Thus, the full benefit of the created asset is not realised and the productivity of the economy does not rise (it is true mainly in case of road). Therefore, Central inflow should be streamlined such that it reaches the State in an even manner and asset creation is made in a uniform way over the year.

### Conclusion

To sum up, Arunachal Pradesh finance has witnessed rising interest and pension burden, and non-developmental expenditure in the revenue expenditure side, while on revenue side, small own tax and non-tax revenue and declining central inflow of funds. This has shown up in declining revenue surplus and rising fiscal deficit. The Supreme Court restriction on felling of trees in 1996 has further refuelled the process. Because of the above process, the State has resorted to debt as a source of financing its fiscal deficit and the result is non-sustainability of the debt burden. The State in the beginning of the new century has taken many steps (GoA, 2006). The power royalty has improved the non-tax revenue of the State. These initiatives have resulted in improvement in own tax and non-tax revenue, but the rising revenue expenditure is persisting.

The most disturbing trend is the reduction in the share in central taxes. Since the State is moving fast to the tertiarisation process, tax accrual from goods is very limited. Therefore, a serious thinking is needed, apart from the policy measure prescribed above, on how to mobilise more revenue from the tertiary sector which is the most dominant sector of the State economy.

Further, rising outstanding debt has put the State under insolvency. The proper use of the borrowed fund in productive way is the call of the hour. e-Governance in the finance department may help the State in using the existing resource in a more productive way.

## APPENDIX A-21.1

**Ministry of DONER**

Department of north-eastern region was created in the first week of September 2001, and was formally inaugurated on 1<sup>st</sup> November 2001. The main activities of the department are dealt with under the following heads:

- Non-lapsable central pool of resources,
- North-east Council,
- Coordination with Central ministries and State government of north-east region,
- Advocacy and publication,
- Capacity building,
- Hill area development project, and
- International cooperation

**Objectives**

The objectives of the DONER ministry are as follows:

- Accelerate the pace of socio-economic development in the N.E. region.
- Synergies the effort of Central/State government and other stakeholder for balanced development of the region.
- Evolve a common approach for all the agencies working for the development of the region.
- Formulating policy for the rapid development of the region.

**Achievements**

As on 31-12-2006, a cumulative sum of Rs.5,823.64 crore (in 827 project) has been sanctioned under Non-Lapsable Central Pool Resources (NLCPR) through DONER ministry for the entire NE region. Arunachal Pradesh's share is Rs. 679.70 crore (11.67 per cent) in 78 projects. The infrastructure sector (namely power, road and bridges, irrigation and flood control) amounts to 61.91 per cent of the total allocation. However, Rs. 418.22 crore has been released so far up to 31<sup>st</sup> December 2006 which comes to 61.53 per cent of the total allocation.

**North-Eastern council**

North-eastern council was set-up in 1971 under NEC Act of 1971 for securing balanced development of the north-east region with seven states namely (Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura). Till then it was under Ministry of Home. After an amendment of the NEC Act in 2001, Sikkim was included as a new member. In 2004, the NEC was revitalised and came under the purview of the DONER ministry and minister of DONER became the chairman of NEC. Some of the salient activities of NEC in Arunachal Pradesh are:

- Establishment of duck, pig and poultry breeding farm,
- Extending financial support for marketing agricultural product,
- Capacity building of the farmer through strengthening agriculture training institute,
- Assisting the State for survey and investigation of hydropower projects,
- Providing support for e-governance, and
- Helping NGOs for imparting training to women entrepreneurs.

From 1996-97 to 2005-06, Arunachal Pradesh received Rs. 27.61 crore as financial assistance from NEC under different schemes. However, there is a huge gap between amount sanctioned and disbursement over time. During 1996-2006, the disbursement is 55.97 per cent of the allocation amount.

*Source:* Government of India, *Annual Report 2006-07*, Ministry of Development of north-east Region, Delhi.



## Chapter 22

# Looking Ahead: Strategy for Development

### Introduction

Arunachal Pradesh is richly endowed with a variety of natural resources. In spite of that, its level of development is very low. The inability of the State to transform its rich natural endowments into the flow of income and other forms of social well-being is usually traced to its historical legacy of semi-seclusion and sparse settlement of population. The policy of seclusion practised by the British caused a wide socio-economic and technological gap between Arunachal Pradesh and the rest of the country. After Independence, the Government of India launched the programme of planned development which shifted upward the growth trajectory of Arunachal Pradesh's economy and brought about dynamism in the socio-economic life of the people. The initial strategy of development, the one followed in the 1950s, was based on gradualism. This strategy got discredited after the Chinese aggression and was replaced by an activist one. This chapter evaluates the past strategies and formulates a new one based on the contextual factors.

### Review of Past Strategies

#### *Elwin Strategy*

The seminal research laying the foundation for government's strategy of development in Arunachal Pradesh, then called North East Frontier Agency (NEFA), was done by Verrier Elwin. His *A Philosophy for NEFA*, incorporating this strategy was taken to be the *Bible* of the policymakers and officials associated with the administration of NEFA (Rustomji, 1983). Apart from building a strategy of development for NEFA, Elwin who called himself the missionary of "Mr. Nehru's gospel for the tribes" (Guha, 1988: 326) played a leading role in the implementation of the policy. With a deep understanding of tribal society, Elwin prescribed a gradualist approach to

development. The basic thrust of this strategy was to avoid—in realms of technology and institutions—abrupt changes, the changes which in the special circumstances of NEFA (Arunachal Pradesh) were supposed to carry disruptive potentialities.

Underlying Elwin's phobia of abrupt changes was his implicit assumption of cultural invariance in the short run. His strategy of tribal development thus ruled out the large-scale industrialisation in Arunachal Pradesh, at least in the short run. It supported autarky of a tribal economy through promotion of traditional arts and crafts, and provision of public goods.

In order to put the development policy followed in Arunachal Pradesh into the national perspective, the Elwin strategy can be compared with the Mahalanobis model incorporated in the country's Second Five Year Plan. The Second Five Year Plan strategy of development based on the priority of basic and heavy industries, the commanding heights of the economy, is also known as Nehruvian strategy or Nehru-Mahalanobis strategy. The Elwin model intersects the Mahalanobis strategy on a number of points, but there are also differences between them.

An important point of intersection between Elwin and Mahalanobis strategies is their inward orientation—both are based on closed economy models. Export pessimism, widespread in the 1950s, motivated Mahalanobis to model an insular economy and the fear of exploitation of tribals by the non-tribals is the motivation behind Elwin's modelling an insular tribal economy. Mahalanobis strategy aims at the achievement of autarky in the production of capital goods, an objective to be achieved through import substitution, and Elwin strategy stresses the achievement of autarky at community level through promoting the traditional tribal industries. Thus, both the models use protectionism as the instrument of goal achievement.

Another point of intersection is that these strategies do not provide any room for price-guided resource allocation. In Mahalanobis strategy, capital goods sector receives top priority because of its relatively high contributions to growth in the long run; in the assignment of priority, expected profit and international market potentiality play hardly any role. In Elwin strategy, price mechanism does not play any role. Production in a tribal economy is seen not being motivated by profit but mainly by demand for home consumption and partly by the possibility of sale locally.

Both Mahalanobis and Nehru-Elwin strategies recognise an active government role in the economic sphere. In Mahalanobis strategy, the economy remains slow-moving till the government boosts investment and directs it towards basic industries, which propels the economy to a higher growth trajectory. In Elwin strategy the economy remains in stagnation and it is the enlightened intervention of the government, which sets the economy in motion.

As to the points of difference, Mahalanobis strategy is forward looking—it tries to break with the past. Big industries, modern technology and government efforts are the *sine qua non* for a rapid growth. Elwin strategy is Janus-faced, looking simultaneously forward and backward. It wants to build the future on the tradition of the past. It rules out the possibility of rapid modernisation. By prescribing caution in undertaking administrative and development projects and allowing only small changes, Elwin strategy pre-empts the possibility of hasty decisions.

An evaluation of Mahalanobis is irrelevant here but a very brief evaluation of Elwin strategy is a necessary step to put the later strategies on Arunachal Pradesh's development in order. North-East Frontier Tracts, now Arunachal Pradesh, which was till 1947 administered only politically with almost all offices situated in the plains of Assam saw in the 1950s an extension of regular administration right up to the McMahon Line. The peaceful spread of administration, the smooth consolidation of the tracts into a unit called North-East Frontier Agency (NEFA) in 1954 and successful launch of development programmes causing no adverse reaction are the fruits yielded by the Elwin approach. Specific outcomes of this strategy can be summarised as:

- i. Techno-cultural continuity and stability: The strategy did not try to introduce new mode of organisation of production nor did it disturb the cultural heritage of different communities. The maintenance of cultural continuity was instrumental

in ensuring stability. In North-east India instability seems to be the norm and stability an exception. Even Assam is being consumed by the fire of instability. The factor contributing to Arunachal Pradesh being an exception was the systematic effort undertaken by the government to preserve all traditions and cultural ethos of the people.

- ii. No modern industry: No modern industry was established in the 1950s and 1960s. However, an elaborate programme was undertaken to modernise the traditional arts and crafts.
- iii. Sentinelism: The caring and preservationist approach of the government nourished nationalistic fervour in the State and the people got the impression of having the responsibility of standing sentinel over the vast international borders.

The Elwin approach was followed without being questioned till 1962, the year which witnessed NEFA being invaded by China. The Indian reverses in the war with China tended to discredit gradualism and gave rise to an activist-integrationist policy (Das, 1995).

### *Shift in Strategy: Integrationism*

In order to frame a new strategy, the Government of India commissioned after 1962, National Council of Applied Economic Research (NCAER) to conduct a techno-economic survey of NEFA (NCAER, 1967). The spirit of the time—the integrationist mood—coloured the NCAER's study. Apart from this, the conceptual framework of the study was based on pre-Solow growth models which place singular importance on physical capital as the determinant of growth. Though by the middle of the 1960s a good number of studies on growth-accounting (for example, Solow, 1957; Denison, 1962, etc.) had showed that the contribution of physical capital to growth was much less than what was expected in traditional models and consequently human capital model as formulated by Schultz (1961) and Becker (1964) had become a new paradigm of development, yet the NCAER study was not informed by this paradigmatic shift. With an in-built bias towards physical capital, the study neglected the problems of human capital formation in the State.

Moreover, being techno-economic in scope, the study did not find it necessary to take into account contextual factors of mainly socio-cultural origins having bearing on economic behaviour. In this respect its approach was quite opposite to Elwin's which is thoroughly context-bound. (NCAER's study differs from Elwin's on suggestion also.

While Elwin suggested a reduced investment for Arunachal Pradesh, NCAER (1967) suggested an enlarged flow).

NCAER (1967) made an appraisal of the resources available in the State. Considering sparseness of population, the study suggested settlement of farmers from outside the State in order to raise agricultural production and modernise agriculture dominated by *jhum* cultivation. It did not ponder over the plight of the *jhum* cultivators, and ways of improving their conditions. On the industrial front the study suggested establishment of two pulp and paper mills, and a few timber mills based on the vast forest resources available in the State. It was the defence and internal security which seem to have pre-empted all other considerations in the formulation of the new strategy. Settling people (from the rest of the country) in the unpopulated border areas, rapid development of infrastructural facilities mainly roads, transport and communication systems, industrialisation and modernisation were ingredients of the new policy.

### Implementation and Outcomes

The construction of roads and development of transport and communication facilities enhanced the much-needed connectivity in the State and preparations were made in the 1960s and 1970s to set up a number of medium and small-scale industries based mainly on the locally available raw materials. In order to populate the unpopulated border areas, ex-servicemen and Chakma and Hajong refugees from East Pakistan were settled. However, the settlement policy incurred a heavy local reaction leading to its termination. A good number of industries such as cement, timber, veneer, food, etc., were established in the 1970s. Most of these industries were owned and managed by the government. Almost all the government-owned industries, except those based on timber, started incurring losses and when losses piled up into huge amounts in the 1990s they were closed down. The timber-based industries were spared only for a short time. In 1996 came the Supreme Court's restrictions on the felling of trees and it led to the closure of all timber-based industries.

Sickness affected not only the industries but spread in an attenuated form in other sectors especially the banking. Co-operative Apex Bank, the symbol of the development of the local banking and cooperative plunged into financial doldrums because of the poor recovery of loans. The industrial and financial sickness resulting from the government's management failures has brought realism

into the framing of economic policy in recent years. The new policy de-emphasises the government's role in the economic sphere and tries to promote local entrepreneurship. In order to reconstruct a new strategy it is necessary to deconstruct the old ones pursued till recently.

### Deconstruction

The policy pursued after the Chinese invasion in 1962 aimed at the rapid development of the State by boosting investment and bringing administrative and institutional uniformity. Defence warranted national unity which was thought to be promoted by homogenisation in the realms of technology and institutions, and removal of economic disparity between Arunachal Pradesh and the rest of the country. It was this project, usually called the project of modernisation, which entailed an increasing inflow of central funds, migration of both skilled and unskilled labour and inflow of most of the inputs from the rest of the country. Arunachal Pradesh's economy grew rapidly and the per capita net state domestic product (NSDP) approached the national average by the end of the 1980s. Literacy spread and health conditions of the people improved. Changes came in the realm of institutions. The process of individualisation tended to replace the traditional community ownership of land and other resources. Individual property rights became well-established in areas practising sedentary (permanent) cultivation. With the emergence of monetised transactions different community-level institutions such as mutual insurance communal mobilisation of labour, etc., tended to be attenuated, and social capital suffered erosion. Inequalities in the distribution of income, land and different assets emerged in scale unprecedented in the State. Arunachal Pradesh's economy has grown, but the growth has not strengthened the economy to be self-sustaining. Still the economy depends on the central funds for its sustenance. Table 22.1 shows the inflow of funds from the Centre as the percentage of the NSDP of Arunachal Pradesh. Over time, the ratio of inflow to NSDP has fallen but the fall is not very high.

In the State, the government expenditure constitutes a high proportion of NSDP. In 1986-87, the government expenditure constituted 139.83 per cent of the NSDP; the size of the government has exceeded the size of the economy in some years. During 1986-87 to 2003-04, the lowest value of the government expenditure as the percentage of NSDP was 70.79 in 1993-94. In spite of a high expenditure of the government the economic growth in the State is not high.

TABLE 22.1

## Inflow of Central Funds, Government Expenditure (Ratio in Arunachal Pradesh)

Year	Inflow as % NSDP	Growth of NSDP (in %)	3-Year Moving Average		Col. 4/Col.5	Govt. Expenditure as % of NSDP
			Inflow as % of NSDP	Growth of NSDP (in %)		
1	2	3	4	5	6	7
1986-87	78.96	6.67				118.43
1987-88	95.42	6.26	88.81	6.93	12.82	139.83
1988-89	92.05	7.87	88.18	5.67	15.55	111.47
1989-90	77.07	2.87	80.84	9.21	8.78	130.02
1990-91	73.04	16.09	73.18	11.05	6.62	93.67
1991-92	69.98	13.39	71.44	10.95	6.52	79.82
1992-93	70.94	2.55	65.50	10.72	6.11	82.12
1993-94	55.59	16.22	61.79	5.58	11.07	70.79
1994-95	58.84	-2.03	58.25	9.37	6.27	80.28
1995-96	60.31	13.92	61.62	1.90	32.43	76.67
1996-97	65.07	-6.18	62.60	3.51	17.83	84.25
1997-98	61.78	2.78	63.18	-0.16	Undefined	81.05
1998-99	62.06	2.93	61.88	3.24	19.10	76.75
1999-2000	61.08	4.02	59.84	3.87	15.46	84.96
2000-01	55.65	4.67	57.47	4.31	13.33	81.51
2001-02	54.97	4.23	55.87	2.34	23.88	86.23
2002-03	56.99	-1.88	58.46	3.30	17.72	80.75
2003-04	63.43	7.56				

Note: Incremental-output ratio is the inflow as percentage of NSDP divided by the growth of NSDP (in %), both being 3-year moving average.

Source: Budget Estimates of the Government of Arunachal Pradesh and Estimates of State Domestic product in Arunachal Pradesh, Directorate of Economics and Statistics, Government of Arunachal Pradesh, 2005.

In Table 22.1 the inflow as the percentage of NSDP and the growth rate of NSDP are smoothed by using a three-year moving average. If we assume a standard value of capital-output ratio of 4 per cent then a growth rate of 7 per cent during the last three decades gives an investment ratio of 28 per cent. However, during the last three decades the inflow of funds from the Centre has averaged more than 60 per cent of NSDP. This means that a part of inflow amounting to more than 32 per cent of NSDP has been consumed. In other words, Arunachal Pradesh's economy consumes more than 100 units of inputs in order to produce 100 units of output. That is, efficiency level of the economy is so low that 100 units of input cannot produce 100 units of output. So the inflow of central funds seems to have made the Arunachal Pradesh's economy more a consumer of goods and services than their producer.

The erosion of traditional communitarian institutions, high inequalities and above all, the inability of the Arunachal Pradesh's economy to reproduce itself are all dark patches in the rosy picture which is normally painted to show the high development achieved by the State. Dark

patches become more blackened if environmental costs of development, treated in another chapter of this Report are added. With these deconstructions in mind, we can try to reformulate a new strategy.

### Reconstruction: Derivation of Basic Thrust of Policy

In order to pursue a policy of sustained development, the deeper issues of the society, having bearing on the welfare of the people, should be addressed vigorously. The broad social goal embodied in the traditional values of different communities in Arunachal Pradesh should be reflected in the development strategy, a condition which demands the shedding of some light on the welfare criterion to be used in the allocation of resources and distribution of income.

### Welfare Criterion

Home to 26 major tribes and 110 sub-tribes and minor tribes, Arunachal Pradesh defies the use of any simple welfare criterion such as utilitarianism, which aims at the maximisation of the happiness of the maximum number of people. It is possible that the maximum number



belongs to a few communities, and the people of other communities who are in a minority are left in deprivations. The immediate concern of the utilitarian principle is not to address the problems of this minority plunged in sufferings; rather its concern is the aggregate happiness. But in a multi-ethnic society, total welfare may not be defined because of the non-additive nature of the ethnic-level welfare. In this Report the chapter on social transformation has highlighted the type of socio-economic inequality that has emerged in Arunachal Pradesh. Taking care of inequality within a tribe may be somewhat easy because of the operation of some redistributive mechanisms, but taking care of inter-tribal inequality is very difficult in view of the fact that in the first place the traditional redistributive mechanisms do not work from one tribe to the others and secondly, inter-tribal competition tends to clog the government's redistributive channels. This makes utilitarianism as well as the aggregate level of income and its growth unsatisfactory as the criterion of welfare. Given the multi-ethnic nature of society in Arunachal Pradesh, Rawlsian maximin principle appears to be the most attractive welfare criterion. Since this principle is concerned with the maximisation of welfare of the most deprived, its operationalisation is relatively simple and its acceptability, as an ethical category is more widespread than any other.

Applied to the formulation of a strategy this implies that the allocative and redistributive policy of the government should be reoriented to make the conditions of the most deprived communities better off. Tribe-wise data on the distribution of income are not available. The closest approximation is given by the inter-district distribution of income as shown in Table 22.2. There is a high inequality in the inter-district distribution of income. One way of reducing this inequality is to spread the government expenditure more equitably among the districts and their backward regions.

Income inequality-based resource allocation is narrow. A better perspective can be obtained by using human development index. As discussed in another chapter of this Report, the inter-district difference in human development is very high. This difference must be reduced to make development sustainable and socially desirable.

### *A Criterion of Resource Allocation*

In North-east the factor which is retarding development is instability. Arunachal Pradesh is not fully free from this scourge; already two of its districts, Changlang and Tirap, are badly affected by it. The most important factor behind instability is unemployment,

Sl. No.	Districts	2000-01	2001-02	2002-03	Average	% of Average GSDP	Rank
1.	Tawang	10782	10455	10661	10633	104.37	4
2.	West Kameng	12093	11917	12283	12131	119.08	1
3.	East Kameng	9493	8942	9440	9292	92.21	11
4.	Papum Pare	9737	9633	10361	9910	97.28	8
5.	Lower Subansiri	8772	8294	8783	8616	84.58	13
6.	Upper Subansiri	10204	9764	10179	10049	98.65	7
7.	West Siang	9914	9534	9983	9810	96.30	9
8.	East Siang	9285	9059	9440	9261	90.91	12
9.	Upper Siang	9900	9153	9791	9615	94.38	10
10.	Dibang Valley	11388	11100	11437	11308	111.01	2
11.	Lohit	10461	10240	10669	10457	102.65	5
12.	Changlang	10468	10002	10403	10291	101.02	6
13.	Tirap	11320	10975	11410	11235	110.29	3
	Arunachal Pradesh	10255	9921	10384	10187	100.00	
<i>Note:</i> Rank is calculated from the average.							
<i>Source:</i> Estimates of District Domestic Product of Arunachal Pradesh 2000-2001 to 2002-03, Directorate of Economics and Statistics, Government of Arunachal Pradesh, Itanagar.							

especially of the educated youth. So in the selection of investment projects, the employment generating potential can be assigned the singular importance. In what follows the employment elasticity of different sectors of the Arunachal Pradesh's economy is discussed.

### *Sectoral Employment Elasticity*

The estimated employment elasticity for different sectors of the Arunachal Pradesh's economy is provided in Table 22.3. The values of employment elasticity for some sectors in this State are quite unexpected. Commonly, elasticity of employment in the secondary sector in general and the manufacturing sector in particular is lower than that in agriculture. The estimates of elasticity for the 1970s and 1980s show that in both the decades the elasticity of employment is lower in the primary sector than in the secondary sector. A surprising, rather a bizarre situation, is in the tertiary sector in the 1970s 'other services' and the tertiary sector as a whole experienced a very high growth in output—in the 'other services' output grew at 10.43 per cent per annum and in the entire tertiary sector the yearly growth of output was as high as 11.39 per cent. But neither in 'other services' nor in the whole of tertiary sector the number of workers increased. In the 'other services' the number of workers rather



decreased significantly. In the 1980s no such things happened. So we take up the 1980s for analysis.

TABLE 22.3

## Sectoral Employment Elasticity in Arunachal Pradesh

Sectors	Growth of Workers (in %)		Growth of Output (in %)		Employment Elasticity	
	1971- 1980	1981- 1990	1971- 1980	1981- 1990	1971- 1980	1981- 1990
Agriculture	0.66	1.02	6.4	9.18	0.10	0.11
Forestry, Logging, Fishing and Hunting	25.62	3.77	0.38	4.84	67.42	0.78
Mining and Quarrying	23.03	26.5	14.39	37.26	1.60	0.71
<b>Primary Sector</b>	<b>0.85</b>	<b>1.11</b>	<b>4.61</b>	<b>8.48</b>	<b>0.18</b>	<b>0.13</b>
Manufacturing	18.82	5.35	14.2	7.85	1.33	0.68
Construction	44.19	0.69	7.7	6.26	5.74	0.11
<b>Secondary Sector</b>	<b>31.52</b>	<b>1.91</b>	<b>8.03</b>	<b>6.43</b>	<b>3.93</b>	<b>0.30</b>
Trade and Commerce	15	6.2	15.97	8	0.94	0.78
Transport, Storage and Communication	47.68	12.27	9.77	13.31	4.88	0.92
Other Services	-1.91	6.12	10.43	7.17	-0.18	0.85
<b>Tertiary Sector</b>	<b>-0.4</b>	<b>6.35</b>	<b>11.39</b>	<b>7.62</b>	<b>-0.04</b>	<b>0.83</b>
<b>Total</b>	<b>1.508</b>	<b>2.21</b>	<b>7.07</b>	<b>7.81</b>	<b>0.21</b>	<b>0.28</b>

*Note:* The data on workers are from Population Censuses of India (Arunachal Pradesh); Economic Tables, 1971, 1981 and 1991. The data on output are from Estimates of Domestic Product, Arunachal Pradesh, Directorate of Economics and Statistics.

In terms of elasticity, the tertiary sector is more labour-intensive than the secondary sector. In case of sub-sectors the employment elasticity in agriculture is almost the same as in construction and is the lowest among all the sub-sectors. The low elasticity in agriculture is due mainly to the steady extension of permanent cultivation and the associated technological change which generated a high growth of output but the employment did not increase much because of an intensive use of plough, mainly bullock-driven and partly power tillers and tractors. There was also the expansion in horticulture, which is land-using and labour-saving contributing to a low elasticity in agriculture. The manufacturing sector's relatively high employment elasticity is due to its low rate of adoption of new technology. Industrial units in Arunachal Pradesh are mainly small; very few are of medium-scale. Not a single large-scale industry has been established in this State. There are also handicrafts which are highly labour-intensive. The high employment elasticity in manufacturing is indeed reassuring holding a great promise of its expansion without curtailing the growth in employment. The investment in mining and quarrying, in livestock-raising, in fishing, etc., would also

ensure the creation of more employment. The expansion of horticulture along with the establishment of fruit-processing industries holds promises of creating more employment for the educated youths.

*Reduction of Transaction Costs*

That the Arunachal Pradesh's economy cannot reproduce itself is a measure of the amount of its operational inefficiency. There are many factors working in unison to keep the efficiency level low. The factor which can be singled out is the transactions cost which in the language of Kenneth Arrow, is the cost of running the economy. The high transactions cost can be reduced by reforming the institutional structure of the economy, a task whose accomplishment requires much care, judiciousness and a strong information base for actual decision making. At the same time to enhance efficiency, new technologies must be introduced.

*Strengthening Legal-Judicial Infrastructure*

In this State monetised transactions are new. Unlike barter, which operates mainly within a community whose members know each other, the monetised transactions involve people who too often belong to different communities. In commodity market the transactions are simple contracts, which do not require that the parties concerned should know each other prior to transacting the business. The factor markets, especially the credit and labour markets, are more complex requiring elaborate contract to be made prior to transaction.

In Arunachal Pradesh, organised credit market started growing in the 1970s and the legal framework regulating the credit is yet to be institutionalised. The customary laws are used by the local bodies in the administration of justice. The Indian contract law, the penal code, etc., are used mainly by the judiciary which, however, has not yet been separated from the executive branch of the government. The operational bases of the local customary laws and the all-India codes are yet to be defined clearly. There are instances where the court refers back the cases to the local bodies for adjudication.

The successful operation of the factor markets, especially the credit and labour markets, warrants that the legal framework should be well-defined to protect the parties to the contract. A significant sub-set of relations in the modern sector—approximately in the urban society—is the contractual relations. One can say in the language of Henry Maine that the urban society in Arunachal Pradesh has made a transition from status to contract (Maine, 1906). A steady growth of the modern sectors of the

economy requires a healthy growth of institutions supporting and ensuring the observance of all contracts. From the very beginning of planned development in Arunachal Pradesh, the building of physical infrastructure has been emphasised. However, the provision of institutional infrastructure, more specifically the legal-judicial infrastructure seems to be lagging. Thus, banks have been established but sufficient care has not been taken to establish contract-enforcing institutions. The banking system cannot work successfully unless supported by such institutions. The provision of adequate judicial services will pave the way for better enforcement of contracts and reduce the transactions costs.

As long as transactions cost remains high private investment from the rest of the country can hardly be attracted. Different studies conducted through out the world show the primary role of institutions in the promotion of investment (World Bank, 1997). In Arunachal Pradesh the task of institution-building is really difficult because an important subset of institutions is informal which can hardly be made amenable to government's policy actions. Again the expansion of judicial services is not a guarantee that the contract enforcing mechanisms will improve. Inefficiency in the judicial services may raise the transactions cost instead of lowering it. Raising the amount as well as the efficiency level of judicial services and removal of legal opacity can improve investment climate in the State.

### *Development of Market*

Government, market and community are three institutions facilitating production, exchange and distribution. Government works through coercion, market through competition, and community through cooperation (Hayami, 2003). The spaces of human actions occupied by these institutions are not well-demarcated; too often one acts as the substitute of the others. A large-sized government may crowd out both the market and the community. In the context of Arunachal Pradesh, the fundamental problem is to expand the institution of market. It is sometimes thought that it is the government which should try to develop this institution through strengthening its contract enforcement mechanism. True that the contract enforcing role of the government is universally taken to be a primary one, independent of the government form or of the type of the society, but the government has its own limitations.

To highlight the limitations of the government, one can point out the paramount influence of social norm. When the social norms and values do not accommodate

the principle of market, there may be too many infractions of formal contract, and whatever be the efficiency level of the government, it will fail to enforce all contracts. What is necessary is to instill the value or norm of market in the society, a task which the government may not perform very satisfactorily because of the limitations coming from its own operational principle.

A government does not operate on *quid pro quo*, the principle followed in the market. A government official cannot sell his services to the people. Similarly, a voter is not supposed to sell his vote to the highest bidder in elections. The operational principle in government being diametrically opposed to what forms the norm of the market, the government's success in spreading the norm or ethics of market may be limited. Under the circumstances, the development of community level organisations and the growth of social capital may promote the market. Being based on cooperative exchanges and mutualism, the community initiatives seem to be a stronger agent than the government in propagating the underlying principle of market.

At the more concrete level, the problem with the development of market is the low amount of surplus scattered over a wide area not connected by motorable roads. This problem can partly be solved by introduction of less bulky but high valued crops, plants and fruits. Some medicinal plants valued highly not only locally but globally are on the way to being extinct in the State. Their cultivation can solve not only the problem of extinction, but raise the income of the farmers and spread marketing mechanism. The government intervention in the form of technological package is, however, crucial not only in the supply side but also in the demand side—in the provision of marketing infrastructure.

### *New Technology and Organisation of Production*

Along with the restructuring and strengthening of the institutions and development of physical infrastructure, concerted efforts should be made to introduce new technologies and organisation of production. This is because heavy industries which are sources of innovation in both technology and organisation cannot be established in the State due to hilly topography, non-availability of basic raw-materials and low demand. Only medium and small-scale industries based on non-timber forest products, fruits, orchids, etc., should be promoted. Since local technological know-how and organisational capability are limited, firms equipped with the latest technology should be invited to set up their enterprises. Necessary incentives should be provided to these firms to employ

local youths so that they can learn by doing and in future establish their own enterprises. Experiences of different countries show that learning from the best is the secret of being innovative.

### *Heavy Investment Requirement and Government*

As stated before, Arunachal Pradesh depends heavily on the Central funds. This is a paradoxical situation in view of the fact that the State has huge resources especially water resources which can be exploited to generate electricity. The forest resources in the State are also vast, and these resources can be used subject, of course, to replanting. The development of hydropower which can reduce the State's financial dependence on the Centre requires an investment too big to be provided by the State government. The central assistance is the only way to exploit the water and other natural resources. The necessity of the resource exploitation for a sustained development of the State is also derived from the strategic importance of the State, an aspect which demands central care.

### *Strategy of High Growth: Himachal Pradesh as the Model*

Topographically Arunachal Pradesh has many similarities with Himachal Pradesh but that is the end, beyond topography there are only dissimilarities. The socio-economic level of Himachal Pradesh is much higher than that of Arunachal Pradesh. Though both the states belong to what is called 'special category'; yet Himachal Pradesh has been able to build up a strong economy utilising its agro-climatic endowments and other resources, and Arunachal Pradesh is lagging behind not only Himachal Pradesh but many other states in utilisation of its vast natural endowments. Himachal Pradesh's advanced economic status is reflected in its level of per capita income. During the triennium ending in 2005-06, Himachal Pradesh's per capita NSDP was 41 per cent higher than Arunachal Pradesh's and 34 per cent higher than the national average (Table 22.4).

Himachal Pradesh has a fast growing economy. During the decade ending 2002-03 its per capita NSDP grew at the average rate of 4.5 per cent per annum. No doubt Arunachal Pradesh's economy grew rapidly in the 1970s and 1980s but in the 1990s its economy suffered a severe stagnation due mainly to the closure of many industries. During 1993-94 to 2002-03 Arunachal Pradesh's per capita NSDP growth averaged only 0.3 per cent per annum. Later, the growth rate increased; during 1999-2006 per capita NSDP in the State grew at 4.8 per cent per annum which is almost the same as the long-term growth rate experienced since 1970-71.

TABLE 22.4

### **NSDP of Arunachal Pradesh: A Comparison with Himachal Pradesh**

<i>State/Country</i>	<i>Average NSDP (Rs.) during Triennium Ending 2005-06</i>	<i>Index</i>	<i>Index</i>
Arunachal Pradesh	22012	100	95
Himachal Pradesh	31093	141	134
India	23199	105	100

*Note:* NSDP is at current price. Indian figure is GDP.

*Source:* Government of India, Economic Survey, 2007-08.

If Arunachal Pradesh's economy wants to catch up with Himachal Pradesh's by 2018 then the economic growth in the State must be higher than what has been achieved. During 2005-06 Arunachal Pradesh's per capita NSDP at constant prices was Rs.20037 and Himachal Pradesh's Rs.28252. If Himachal Pradesh grows at 4.5 per cent, the rate experienced during 1993-94 to 2002-03, then in 2018 its per capita NSDP would turn out to be Rs.48,481 (at constant prices of 1999-2000). Arunachal Pradesh achieving the same level of per capita NSDP in 2018 requires a per capita NSDP growth of 7.36 per cent per annum, the rate which exceeds that achieved before. Given the high population growth in the State, the per capita NSDP of that order would warrant a NSDP growth rate of about 10 per cent per annum, a rate which is achievable if only the rate of investment can be increased commensurately. This is indeed a difficult task because the capital-output ratio in the State is much higher than that in the country as a whole. With a capital-output ratio of 6, the warranted rate of investment is 60 per cent of NSDP.

Investment of this order can be made possible especially in terms of the output if large scale hydropower projects are undertaken along with the investment in horticulture, floriculture and plantation crops. The success achieved by Himachal Pradesh, especially in horticulture, appears to be a worthy model that can be followed by Arunachal Pradesh with all desirable outcomes.

## **Conclusion**

Arunachal Pradesh has achieved significant progress in all indicators of development. Given a very low base from which the process of development started, the level of achievement is really outstanding. But when development is deconstructed, the picture turns somewhat pale. The basic inputs of development have come from the rest of the country, propelled by the inflow of Central funds. The Arunachal Pradesh's economy has not yet been able to

attain the capacity to reproduce itself, an incapacity caused, among others, by high transactions cost. Apart from its generalised inefficiency the economy suffers from high inequalities and growing unemployment both of which are unprecedented in a society, which not long ago, were ruled by the principle of communitarianism.

The new strategy should assign utmost importance to the generation of employment and reduction of inequalities in the distribution of income and assets. Rawlsian maximin principle appears relevant in this respect. In order to reduce the transactions cost, institutions should be strengthened and their opacity removed. Induction of new technology and new organisation of business activities should be the guiding principle of the new policy and since success in innovations comes from learning by doing from the best firms, necessary incentives should be provided to induce the most efficient firms to locate their operations in Arunachal Pradesh. A heavy investment in the development of hydro-electric capacity can reduce the State's dependence on the Centre.

The Sectoral priorities which emerge from the strategy of a stable development can be summarised as below:

- To speed up the development of hydro-electric projects. Public-private partnership may be encouraged in this sector.
- Provision of infrastructural facilities in the backward districts.
- Expansion of horticulture and plantations especially in districts still dependent largely on *jhumming*.
- Agro-processing industries, in general, and fruit processing in particular should be promoted in the poor districts in order to create necessary backward linkages.
- Cooperative mode of organisation should be encouraged. The fruit and agro-products may be provided necessary administrative support to form cooperatives in order to set up manufacturing units.



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