THE WORLD BANK

# GOVERNMENT OF INDIA
# NATIONAL TRANSPORT SECTOR DEVELOPMENT POLICY COMMITTEE

## FREIGHT RAILWAYS GOVERNANCE, ORGANIZATION AND MANAGEMENT: AN INTERNATIONAL ROUND-UP

**July 7 2011**

A Resource Paper prepared by the World Bank

## Contents

## Nomenclature

**Rail freight provider** is used generically in this Paper to refer to any entity that provides railway freight train services whether private or publicly-owned, and irrespective of whether the provider is a stand-alone train operating entity or vertically integrated with a rail infrastructure provider.

The term **freight train operating company (TOC)** refers specifically to a company that runs trains via an access agreement with a company that separately manages the railway network.

**Freight customer or shipper** is used generically to refer to those companies on behalf of whom rail freight companies haul freight: they may be the owners of the freight, the receivers of the freight, or a third party freight forwarding or logistics company.

**Intermodal transport** refers to the movement of goods in one and the same loading unit or vehicle, which uses successively several modes of transport without handling the goods themselves in transshipment between changing modes. The main form of intermodal transport is container transport.

**Multimodal transport** is the use of at least two different modes of transport on the basis of a single multi-modal transport contract to move a load of goods from origin to destination. Intermodal freight is always multimodal in nature but not all multimodal freight is in 'intermodal'.

## Disclaimer

The Paper has been prepared by the Bank's Consultant, Paul Amos. It draws heavily from the Bank's recently published Freight Transport website, its Railway Reform Toolkit, Railways Database, and World Bank experiences of rail reform[1]. It has also sourced UIC Statistics and Websites and Annual Reports of many ministries and railway companies. However, any findings, interpretations and conclusions expressed herein are those of the author and do not necessarily reflect the views of the World Bank. Neither the World Bank nor the author guarantees the accuracy of any data or other information contained in this publication and accept no responsibility whatsoever for any consequence of their use.

[1] The Railway Reform Toolkit will be published at www.ppiaf.org/railtoolkit in the near future. Other World Bank resources relevant to the railway industry can be found at: http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTTRANSPORT/EXTRAILWAYS/0,,menuPK:515251~pagePK:149018~piPK:149093~theSitePK:515245,00.html

# Synopsis

This Resource Paper has been prepared for the World Bank for the **National Transport Sector Development Policy Committee** established by the Government of India to advise on the framework for long term development of comprehensive and sustainable transport infrastructure in the country. The Committee requested the World Bank's support in sharing international experiences. The Paper focuses on issues in **Rail Freight Transport** ranging from the framework of its public governance through to specific issues of freight business strategy.

The Paper summarizes the transport role and salient features of the rail freight sector in eight countries with large railway systems in geographic, traffic or regional terms: **Australia, Brazil, Canada, China Germany, Japan, Russia and the USA.** There are over 800 freight railway freight providers of various kinds operating in these eight countries. Together, they carry more than 90 percent of the world's rail freight outside India.

There are clear and common patterns of governance, organization and commercial approach of the rail freight industry in most, and in some cases all, of the countries reviewed:

- Public policy for freight transport, including rail freight, is made by **multi-modal transport ministries** that attempt to transcend the provider interests of individual modes;
- Most transport ministries have formulated national, **multi-modal freight transport strategies** seeking greater policy consistency and better integration between modes;
- Transport policy-making is kept **institutionally separate** from rail freight service provision because of different competences required and to avoid conflicts of public interests with provider interests;
- Virtually all the rail freight service providers are **corporations**, whether large or small, publicly or privately-owned, constituted under companies law or by special legislation, and irrespective of whether they are integrated railways or just train operating companies;
- Rail freight is usually constituted and nearly always managed as a **separate business from passenger services,** because of wholly separate markets, different economic drivers, and different social obligations.
- All the countries have encouraged or permitted a **plurality of rail freight providers** and all but one features some (either narrower or wider) form of **access** to the national rail network;
- In all the countries, railways have devolved to specialist agencies the great majority of historically accrued **social welfare activities** and divested **manufacturing businesses,** while many also contract out non-core **business support services;**
- The prevalent management model of the larger freight railways is by **line-of-business** although implemented in a variety of different forms;
- The major freight rail providers are virtually all seeking to **interact with wider supply chains**, adopting strategies ranging from partnering with specialist logistics companies and/or operators of other modes, through to full-service logistics capability;
- **Heavy load freight trains provide clear cost advantage** in markets where there is sufficient traffic to establish them; all major rail freight providers have sought this within their local constraints; those providers with dedicated freight lines generally run the heaviest load trains that are compatible with market needs;
- Investments in network infrastructure and modern centralized train control methods have been found to be **critical to capacity utilization and to building competitive advantage.**

Features of policy and practice so widely adopted, in different forms, to address public and customer interests in the world's main rail freight markets must be given serious consideration, but the Paper does not endorse any specific country model as being applicable to India.

## 1. Why railway freight matters

**The rail freight industry can be either an enabler of or constraint on economic growth.** Well-run railways do the land-based 'heavy lifting' of economic development, giving producers in several key industries access to high-capacity transport at a cost lower than road transport enabling them economically to source raw materials and other inputs, and to consign their final products to markets. In doing so railways can facilitate trade, encourage economic specialization, support economies of scale and promote economic growth.

**Freight railways can also deliver external community benefits.** These benefits are increasingly valued by policy-makers, particularly in the areas of safety, environment and lower greenhouse gas emissions. The last decade has seen the emergence of an increasing body of knowledge about the external costs of different modes of transport, including the impact on greenhouse gas emissions. Evidence from Europe and the USA indicates that when its assets are well utilized, freight rail can deliver significant environmental and safety advantages over road haulage. (Annex C).

**The TOR for the Committee's railway group require them to *'review the role the railways could play in integrating different transport modes to provide a sustainable and low energy logistics system for the movement of freight in the country'.*** Transport policies for a sustainable and low energy transport system may imply a bigger role for railways but is attractive to governments only if also promises an equal or better transport service affordable to users. International experience is unequivocal. The more efficiently that freight railways are managed, the greater will be their role in the markets they serve, the fuller will be their contribution to economic development, and the higher will be their external benefits. That experience also tells us that the way the industry is governed and structured are always influential and often decisive in helping or hindering rail freight providers to do their job well.

**The Resource Paper describes international practices in the railway freight industry, their sector governance, industry structure, corporate forms, business management models and selected business processes.** It highlights experiences in eight countries from diverse regions but all with comparatively large railway systems either in geographic or traffic terms, or both. They are: Australia (835 million tonnes p.a[2]); Brazil (460 mtpa), Canada (289 mtpa); China (3,333 mtpa); Germany (500 mtpa); Japan (31 mtpa[3]), Russia (1,109 mtpa) and the USA 1,635 mtpa)[4]. These countries **carry more than nine-tenths of the world's rail freight outside India.** China[5], Germany, Japan and

[2] 2010 freight volumes shown in parentheses.
[3] Japan is included even though its freight is relatively limited, because it is one of the world's busiest railways overall and the organization of its rail freight industry is unique within the group.
[4] Tonneages from UIC statistics except for Australia (Australian Railway Association) and Germany (UIC statistics factored up to allow for private operators). USA tonneage is the UIC's estimate for Class 1 railways only.
[5] For a more detailed account of China's experiences see the following World Bank publication: http://www.worldbank.org/research/2009/05/12721204/tracks-past-transport-future-chinas-railway-industry-1990-2008-future-plans-possibilities

Russia are, like India, mixed-use railways with significant freight volume but also heavy passenger train use of the network. By contrast, Australia, Brazil, Canada and the USA have only marginal passenger train activity outside the cities. Not having to share the network with a substantial passenger rail service affords both institutional and operational freedoms on rail freight service. Nevertheless, the freight railways in those countries contain some of the most efficient land-based freight operations in the world and much of this experience is equally valid for mixed-use rail systems.

**Although the range of traffic types carried by railways in each country is similar (discussed later), the overall contribution to the domestic freight task differs in each country.** The modal share of rail freight ranges from only 3 percent in Japan to around 65 percent in Russia. The proportion is influenced by management performance and also by (a) the actual freight markets offering and whether they are suited to railways; and (b) the existence and extent of domestic waterborne transport (coastal shipping and/or inland waterways). Since railways and these waterway services target many of the same market segments a large commercial waterway sector will significantly constrain railway modal share. The table below summarizes some of the country specific factors involved. Modal share does not equate to market share. Different modes can only 'share' markets where they exist as viable alternatives in those markets. The market reach of road networks is much greater than of railway systems, and that of rail systems exceeds that of waterway networks.

| Country | Modal share of domestic freight (excluding pipelines)[6] |
|---|---|
| **Australia** | Railways carry about 44 percent of domestic freight. Because of concentration of population and industry around the coast, the coastal shipping industry carries a substantial 20 percent. |
| **Canada** | Railways carry about 66 percent of domestic freight. The high market share is influenced by Canada's long east-west distances, but water transport (coastal shipping and St Lawrence/ Lakes transport) is significant with about 12 percent modal share. |
| **China** | Railways carry about 51 percent of domestic freight. Waterways (including both coastal shipping and over 24,000km of commercially significant inland waterways) perform a very large role in China carrying about 27 percent of traffic. |
| **Germany** | Railways carry about 19 percent of domestic freight. Germany has little bulk traffic and faces rather short rail distances; it also has an extensive inland waterway network consisting of the Rhine River and its tributaries, and a solid canal network, which together carry about 18 percent of freight. |
| **Japan** | Railways carry about 3 percent of domestic freight; because of its island geography, coastal shipping is the overwhelmingly dominant carrier with 58 percent modal share. |
| **Russia** | Railways carry about 65 percent of total freight. Russia's main waterways are south-north (which is contrary to main traffic flows); also the long east-west distances and relatively poor east-west road system contribute to the very high railway modal share. |
| **United States** | Railways carry about 44 percent of total domestic freight. The USA has important coastal shipping links and about 12,000 km of commercially significant inland waterways (dominated by the Mississippi-Missouri river systems), which together carry about 25 percent of freight. |

**The relationship between rail traffic growth and GDP growth differs in each country.** Over the last decade, rail freight in Australia, Brazil and Germany has increased

[6] Data approximate and derived from US Department of Transport comparative statistics, Russian Ministry of Transport, China Statistical Yearbook and Australian BITRE. The indicators for China are prior to recent changes in the method of road transport estimation (that has increased the share of road traffic). No data available for Brazil. Interpretations of data are the author's.

at a much faster rate than GDP. In Australia and Brazil this is due to the global resources boom which has led to heavy rail shipments of coal and iron ore. In Germany it is partly attributed to the open access regime for freight which has been many new operators entering the market[7]. In Canada, Japan, Russia and the USA, traffic has been growing at about the same rate as GDP. In China, railway freight has not kept pace with GDP growth, partly because much of the growth has been driven by international exports of consumer goods from coastal regions of eastern China which is mainly carried to ports by road trucks, partly due to massive expansion in the freeway network and partly due to capacity constraints on the main railway corridors.

| Country | Growth factor in GDP 2001-2009 | Growth factor in Rail Traffic 2001-2009 |
|---|---|---|
| Australia | 1.29 | 1.61 |
| Brazil[8] | 1.19 | 1.30 |
| Canada[9] | 1.17 | 1.14 |
| China | 2.26 | 1.77 |
| Germany | 0.00 | 1.26 |
| Japan | 1.04 | 1.01 |
| Russia | 1.46 | 1.49 |
| United States | 1.14 | 1.13 |

**In addition to the eight-country industry comparisons, annexes address three other specific issues for which the Committee has requested specific information.**

- Annex A: International comparisons of productivity and tariffs;
- Annex B: Cost of externalities of railways versus road transport;
- Annex C: International experience in setting track access charges.

[7] The two EU members states that were arguably most liberal in regard to rail freight access, Germany and UK, were those with fastest growing rail freight traffic volumes.
[8] Brazil figures based on period 2004-2009.
[9] Canada figures based on period 2001-2007

## 2. Transport policy, integration and railways

**All the 8 countries in the group have adopted and, with the exception of China, have implemented the principle that public policy roles in the rail freight sector should be separate from role of rail freight provider.** Two factors seem to have been influential in adoption of this principle. First, governments are concerned that those accountable for the commercial results of a freight transport provider will be conflicted whenever alternative public interest policies are considered that may make it harder to achieve their own targets, such as reducing barriers to entry, or implementing consumer protections; Second, there are substantial differences in skill-sets necessary for the analysis and formulation of public interest/public policy solutions versus running a commercial enterprise.

**In China, the separation of policy and regulatory functions from commercial enterprise in railways has been prescribed by the National Development and Reform Commission[10].** Such separation has been implemented for all transport modes and implemented in all sectors other than railways. It has so far been left to the Ministry of Railways to determine the mode and timing of such separation for the railways sector.

**In the 7 countries that have implemented a policy of separation of public interests from industry interests, a Ministry of Transport decides policies for the rail freight sector as for other modes of transport.** Australia, Brazil, Canada, Germany, Japan, Russia and the United States, all have unitary transport ministries[11] at the central government level whose role is to develop and administer policies to protect and promote public interests across the transport sector. This is to establish integrated national transport policies that transcend or augment individual modal interests. As mentioned, China is a partial exception, although it has recently enhanced the Ministry of Transport to bring together responsibilities for national highways, ports and waterways, shipping, airports, aviation and transport integration. The Ministry of Railways for the time being remains outside this structure.

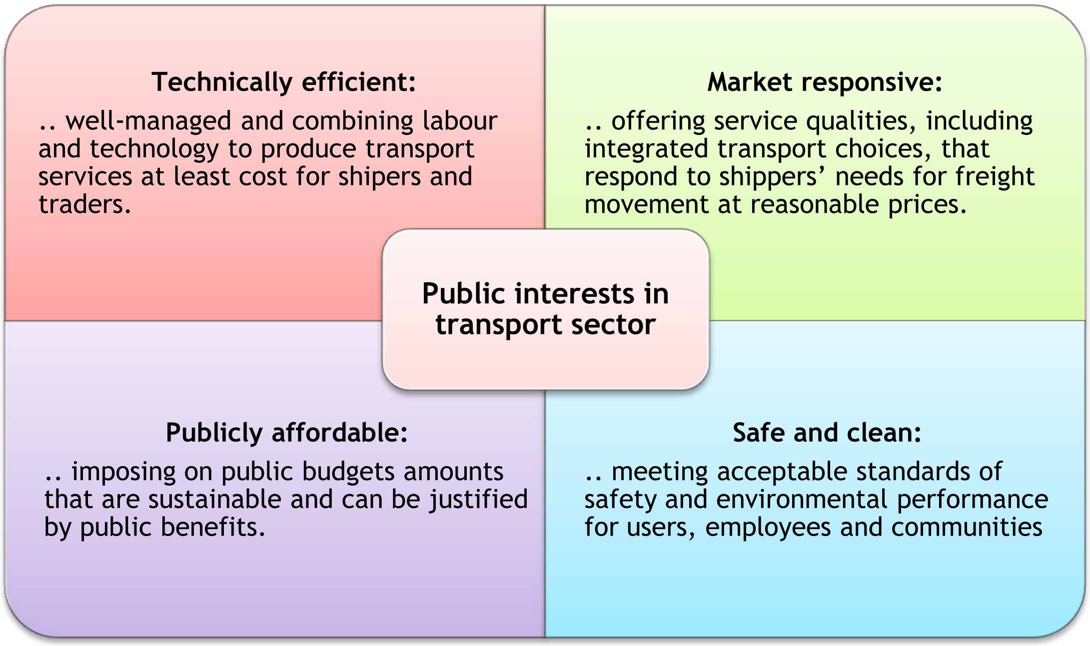
**Most of the countries have also separated the public policy roles of the Ministry in transport integration and sub-sectoral policy making from either the economic regulation and/or safety regulation roles.** It cannot be objectively determined which of the eight governance structures works best, although all except China (and then only in railways) achieve their main purposes of separating responsibility for protecting the public interest from responsibility for protecting the interests of publicly-owned transport providers.

[10] National Development and Reform Commission (2004): *'China's Key Reforms in Seven Fields'.*

[11] In some cases the Ministry or Department involved incorporates wider communications and infrastructure sectors.

| Countries | Main responsibility for public interest roles | | | |
|---|---|---|---|---|
| | **Integrated transport policies** | **Railway sector strategy/policies** | **Economic regulation** | **Safety regulation** |
| **Australia** | Department of Transport | | Australian Competition Commission | Departments of Transport or Independent regulators (varies by State) |
| **Brazil** | Ministry of Transport | | National Agency for Land Transport | |
| **Canada** | Department of Transport | | Canadian Transportation Agency | Transportation Safety Board |
| **China** | Ministry of Transport | Ministry of Railways | | |
| **Germany** | Ministry of Transport | | Federal Cartel Office | Federal Rail Agency |
| **Japan** | Ministry of Transport | | | Japan Transport Safety Board |
| **Russia** | Ministry of Transport | | MOT & Ministry of Economic Development and Trade (MEDT) | Ministry of Transport |
| **USA** | Department of Transport (DOT) | | DOT-Surface Transportation Board | National Transport Safety Board/ DOT-FRA |

**Public policies are founded on public interests and these are expressed in by the countries in similar terms despite different political leanings.** To paraphrase, the governments believe transport should be efficient, market-responsive, publicly affordable, safe, and environmentally acceptable. These interests apply to rail freight transport as to any other kind of transport. Governments of the eight countries examined are all seeking to attain transport systems (freight and passenger) that are more integrated than has typically been delivered either by traditional public administration of individual transport modes or by the market. Greater integration in freight transport can make transport systems more responsive to shippers' needs, provide more technically efficient combinations, provide better value from the public investments in individual modes, and sometimes provide system solutions that are safer or more environmentally friendly than single mode solutions.




Source: World Bank Railway Reform Toolkit.

**Many of the countries are grappling with how to develop integrated freight transport systems in which each mode performs to its comparative advantage, while improving the opportunities for both inter-modality and multi-modality.** At the highest level, the key questions in integration are about *roles*: of different modes of transport; of the public and private sectors; of the market versus regulation; and of the investment of public resources in each modal network. The subsidiary dimensions are 'physical integration', that is the technologies and facilities that permit interchange, and 'operational integration', the coordination of transport services that connect at the interchange points.

**Most of the eight countries have chosen to develop a medium or long-term integrated freight transport strategy as a public policy tool.** Co-locating transport modal agencies within the same ministry facilitates political resolution of conflicting modal demands but has seldom been found sufficient for effective modal integration. Competing ministry silos can readily become internal divisional ones within a single ministry unless there is a means of creating a common purpose and policies. An overarching plan backed by legislative or regulatory instruments, and by the human and funding resources of a Transport Ministry, can provide a counterweight to individual modal interests. In principle, it is not essential to have a unitary transport ministry to develop an integrated national transport strategy. But it makes it more likely that such a strategy is not simply the binding together of the plans of individual departments and that there will be the powers and resources to back the strategy.

| Multi-modal freight transport strategies and websites |
| --- |
| AUSTRALIA<br>Nation Building Program<br>http://www.nationbuildingprogram.gov.au/ |
| BRAZIL<br>National Logistics and Transport Plan<br>http://www.transportes.gov.br |
| CANADA<br>Freight Integration Policy<br>http://www.tc.gc.ca/eng/policy/acg-acgc-menu_intermodal-811.htm |
| CHINA<br>Development of a Comprehensive Transport Strategy including all modes is under consideration. |
| GERMANY<br>Freight Transport and Logistics Action Plan<br>http://www.bmvbs.de/EN/TransportAndMobility/TransportPolicy/FreightTransportAndLogistics/ActionPlan/actionplan_node.html |
| JAPAN<br>The Fundamental Direction of a comprehensive transport policy in the beginning of 21st Century<br>http://www.mlit.go.jp/english/policy_planning/load/index.html |
| RUSSIA<br>Transport Strategy of the Russian Federation until 2020<br>http://www.mintrans.ru/activity/detail.php?FOLDER_ID=439 |
| USA<br>Six-year surface transportation plan for highways, transit, and rail infrastructure<br>http://www.dot.gov/budget/2012/fy2012budgethighlights.pdf |

**Some jurisdictions support their strategies with mandated programs and funding channels for pursuing integrated freight transport.** Legislation can, at a minimum, oblige and empower existing institutions to look beyond their modal responsibilities to promote interconnectivity. But it can also go further and create financial incentives, in teh form of carrots and/or sticks, to encourage compliance. In Germany as in other countries of the EU[12] and in USA[13], for example, integrated transport policies are partly pursued through publicly-supported provision of better inter-modal connections that favour railway and inland waterway transport. The EU justifies this as a contribution to a more 'sustainable' transport system that is more energy efficient and environmentally friendly. In the USA, policy-makers argue the case more on the financial grounds of taking pressure off the imminent need to invest huge resources in the renewal of the US Interstate Highway System. Naturally, where the mechanisms adopted include legislative or regulatory compliance, or funding incentives, there is *always* a separation of the institutions that administer or monitor the policy from those to whom it applies.

[12] See for example the EU's Marco Polo Program at http://europa.eu/legislation_summaries/transport/intermodality_transeuropean_networks/l24159_en.htm
[13] See for example the US Federal TIGER II Program athttp://www.dot.gov/docs/tigerii_fact_sheet.pdf

## 3. Freight railway providers: ownership and corporate form

**In 5 of the 8 countries in the review, and on nearly all other mixed-use railways in the world, the major part of the public railway network remains state-owned.** Hence in China, Germany and Russia, all with huge socially important and politically sensitive passenger transport operations alongside freight, there is no intention of privatizing the national railway network. The only examples in the last 50 years of countries that have privatized a national railway network that is heavily used by passenger trains have been Japan and Great Britain. In Japan that privatization proved successful and sustainable, perhaps because of its relatively straightforward structure. In Britain, a far more complex structure saw railway infrastructure later brought back under de facto public ownership and financing[14].

**Irrespective of ownership and structure, in all the countries other than China, the preferred form of entity to manage rail freight services is the corporation.** Rail freight transport is a tough business with declining long-term revenue yields and in which success (in other than captive markets) depends upon the freedom and corporate agility to outsmart a highly decentralized, competitive and entrepreneurial road haulage industry. Some governments (including those of Australia, Brazil, Canada, Japan and USA) have decided they don't want to be in it at all. Germany and Russia retain public ownership but have opted for a government corporation to run it (in Germany a subsidiary company of the national railway group and in Russia a recently-formed national railway corporation).

**While there is an overwhelming preference in 7 of the countries for rail freight providers being corporations, a publicly-owned corporation is not a panacea.** A state-owned corporation's foundation law or charter defines its aims, commercial rights and freedoms, its social obligations, channels for conveying political decisions and so on[15]. But evidence suggests that while necessary, these are not sufficient, and that the structure should be braced with reinforcing obligations such as: independent and professionally-qualified directors; merit-based CEO and management selection; management accountability based on business planning targets; management structures geared to markets and focused on core functions; greater pricing freedom; use of adequate commercial accounting and auditing standards; and others.

[14] although private companies still run nearly all freight and passenger train services, including, in this context subsidiaries of publicly-owned foreign railways such as DB Schenker (Germany), which having purchased EWS Ltd is Britain's largest freight train operator.

[15] As compared with the Laws governing public authority railways which sometimes define none of these things.

| Country | Ownership of rail network | Ownership of rail freight providers |
| --- | --- | --- |
| Australia | Mix of public and private corporations | Several public and private corporations (some vertically integrated and some separated)- depending on State |
| Brazil | Publicly-owned infrastructure concessioned to private corporations operating as vertically integrated regional freight railways. | |
| Canada | Private corporations operating as competing vertically integrated railways | |
| China | Government authority operating through vertically integrated regional administrations plus two major coal-line companies (partially listed on stock exchange) | |
| Germany | Publicly-owned corporation | Public[16] and private corporations freight TOCs |
| Japan | Geographically-based integrated passenger transport corporations | One main private freight TOC operating under track access rights. |
| Russia | Publicly-owned national railway corporation operating as vertically integrated railway | |
| United States | Private corporations operating as competing vertically integrated railways. | |

**Fortunately, international experience in the field of corporate governance of State-owned corporations is extensive and comprehensive.** The main lessons are captured in the OECD Guidelines on Corporate Governance of State-owned Enterprises, 2005[17]. The Guidelines offer 32 specific recommendations in six groups dealing with: how to ensure an effective legal and regulatory framework; good practice approaches to the state acting as an owner; equitable treatment of shareholders; managing relations with stakeholders; transparency and disclosure; and Board responsibilities. Not all the guidelines are universally applicable to railways, and corporate governance must be fashioned in a real world that does not always conform, to the text-book paradigm. Nevertheless, if sensibly adapted to context, the guidelines offer a useful analytical resource that can be commended to the Committee

**China has increasingly tried to commercialize its Regional Railway Authorities but without establishing them as corporations.** The introduction of Assets Operation Liability System (AOLS) in 1999 was a key step in managerial decentralization by making Regional Railway Administration managements responsible for managing and increasing the value of the assets assigned to them. AOLS sets bonuses in relation to three targets and two commitments. The three targets are: to increase the net worth of the RRA; to make profits, expressed as a percentage of the RRA's gross operating assets; and to return dividends to MOR, expressed as a percentage of MOR's capital investment. The two commitments made by RRAs are: to operate safely; and to achieve a specified minimum increase in RRA profits or reduction in RRA losses. Under AOLS, each member of RRA management (as far down as stationmaster) puts up an incentive deposit, the size of which depends on rank. The deposit is forfeited if the targets and commitments are not met. [18] For target-beating performance, the manager gets the deposit back, plus a bonus equal to up to twice the deposit. During the eight years that ALOS has been in place, there has been a steady improvement in the financial performance of the RRAs (and of CR as a whole) as well as a significant improvement in safety, with the number of accidents reducing. Most RRAs now achieve the higher levels of bonus.

[16] The main operator is a subsidiary company of the national railway group.
[17] The Guidelines can be viewed at http://www.oecd.org/dataoecd/46/51/34803211.pdf
[18] Including such a severe collective 'downside' in the incentive structure would be unlikely to be legally and/ or industrially acceptable in the other 7 countries reviewed.

## 4. Pluralism and network access

**There are over 800 separate rail freight operating companies in the 8 countries and all have multiple rail freight providers.** Seven of the countries have policies that encourage some form of access to the national rail network by third-party freight trains.

| Country | Nature of multi-operator rail freight environment |
|---|---|
| Australia | 5 private freight TOCs running over a government provided interstate network run by the Australian Rail Track Corporation, plus several geographically-based companies operating both railway infrastructure and train services, plus 3 heavy-haul resource export mining railways (with more planned)[19]. |
| Brazil | 7 large private, regionally-based and vertically integrated rail freight concessions, CVRD mining railway concession and six other smaller rail freight/logistics operators.[20] |
| Canada | 2 major private vertically integrated freight railway companies plus about 10 small local operators and 4 Class 1 US railways licensed to operate in Canada (under voluntary track access agreements). [21] |
| China | Main freight services operated by Ministry of Railways regional railway administrations plus two large (publicly-listed) mainly coal export lines and 40+ main freight branch lines operated by provinces and joint ventures. |
| Germany | Main national operator plus 153 smaller mainly private freight TOCS (with collectively about 25 percent market share)[22] |
| Japan | One main private freight TOCs plus a few relatively small branch line freight operators. |
| Russia | Main freight services operated by national railway corporation plus a number of private train operators, who since 2003 can be licensed either to operate as general carriers or to run 'own-account' freight trains. Many of the companies use the national carrier to haul their trains. |
| United States | 7 Class 1 operators (including Canadian rail companies operating under negotiated track access agreements)) operators, 23 regional operators, 339 local (or short-line) operators and 194 switching and terminal operators.[23] |

**The access provisions differ markedly by country.** In Germany (as in all EU countries) there is a legal right of access to the railway network to any freight TOC (public or private) licensed by any member state under EU railway directives. Russia has a similar but less rigorously administered and regulated approach[24]. In Australia there is legal right of access to accredited TOCs under Competition Law. In the USA, about 37,000 km of route operated by private railway companies is on track owned by another 'vertically integrated' railway - equivalent to around a quarter of the total route-length of the US network[25]. Most of this access in the USA occurs under privately agreed track access

[19] http://www.ara.net.au/UserFiles/file/Publications/ARA-Industry-Report-2010.pdf
[20] http://www.antt.gov.br/concessaofer/apresentacaofer.asp
[21] http://www.otc-cta.gc.ca/doc.php?did=935&lang=eng
[22] http://www.deutschebahn.com/site/shared/en/file__attachements/reports/competition__report__2010.pdf
[23] http://www.aar.org/StatisticsAndPublications.aspx
[24] See updating paper by Thompson et al for OECD at: http://internationaltransportforum.org/pub/pdf/07RussRail.pdf
[25] A detailed description of US railway industry structure and traffic can be found at the Association of American Railways' website at www.aar.org.

contracts though some are mandated by (or agreed so as to head off) regulatory intervention. In Canada and Brazil, rights of access exist but are more limited in nature to allow multi-operator access to key destinations. China has divested many branch line operations and encouraged the establishment of special purpose listed companies using dedicated lines for export coal, not least to free up capacity on the existing network.

**The multiplicity of rail freight providers occurs in most countries without requiring vertical separation of the national railway entity and without privatization of the state-owned freight railway.** Only in the case of Australia (mainly interstate lines) is the national railway network managed by an independent infrastructure company and even in this case the infrastructure remains state-owned. Because of the increasing prevalence of track access situations there is now an extensive international experience in how to create and administer workable track access regimes to suit a variety of circumstances.

## 5. Focus on core business

**In all 8 countries the major railway operators have withdrawn from most non-core activities.** ‘Core’ is generally taken to mean the market focus that differentiates a business from its competitors. [26] For freight railways the core business is delivering competitive transport services through efficient use of railway technology[27]. In all the countries in the group, railways, both public and private[28], once encompassed a range of activities from which they have now withdrawn. Three main types were social and recreational services for employees (e.g. housing, schools and hospitals); materials supply and manufacturing (e.g. loco and wagon manufacture, quarries and forests for track materials); and business support services (e.g. vehicle cleaning, printing, building maintenance). The imperatives of transport competition in the motor age have led the railways to devolve social services to specialist organizations and ministries and concentrate on sourcing and procuring railway equipment and support services in the way that will best support the core transport business, that is, by competitive tendering among suppliers. North American railways are ‘leanest’ in this regard. China’s railway still retains ownership of various ancillary companies, though it has divested most of its social services and major construction and manufacturing activities[29].

**China’s refocusing on core business began in 1998 with reorganization of several engineering and rollingstock manufacturing units to create limited liability companies.** This was then followed in 2000 by the establishment of six major non-rail companies as independent enterprises[30], and their transfer to the supervision of the State Large Enterprises Working Committee. Also in 2000, MOR began transferring the schools, colleges and universities run by Regional Railway Administrations to local governments and to the Ministry of Education, although it still retained railway management institutes and colleges to provide occupational qualifications and training for railway staff. This process was completed in about 2005 when nearly 900 schools, 400 hospitals as well as kindergartens had been transferred. In 2004, the China Railway Communications Co. Ltd. (CRCC) (which had been established in 2000 and is responsible for providing railway telecommunications) and China Rail Materials and Supplies Co. Ltd. (CRMSC) (established in 1988 as the supply and trading agency for the RRAs) were transferred from MOR to the supervision of the State-owned Assets Supervision and Administration Commission (SASAC).

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[26] An influential management text by Peters and Waterman (1982) identified poor results among companies that diversified beyond their fields of real competence, and concluded that an organization's core business consists of activities delineated by its core competencies.

[27] Some railways in the group, such as DB Schenker in Germany, define core-business to include multi-modal freight transport and logistics. This concept is discussed further in section 5.

[28] For example, in 1896, American private railways employed over 6,000 railway doctors and operated 25 hospitals that treated over 165,000 patients annually.

[29] Most railways have however, found ways of exploiting land assets usually, though not always as a specialist division away from freight operations (Japanese Rail Freight Company is an exception in being a property developer in its own right).

[30] China Railway Engineering Corporation (CREC), China Railway Construction Corporation (CRCC), China Railway Telecom and Signaling Corporation (CRTSC), China Civil Engineering (Group) Corporation (CCEC), South LORIC (CRS), and North LORIC (CRN)

## 6. Freight as a business distinct from passenger transport

**In 7 of the 8 countries, rail freight is treated as a separate business from passenger transport.** It was not always so; in most countries, the major railway companies once had common business management of passenger and freight business. Because freight trains and passenger trains run on the same tracks, railways historically treated them as different parts of the same business, which they conceived as the business of running trains. Traditional management structures reflected the functional divisions that underpin a 'train' business (e.g. track, signaling, locomotives, traffic operations etc.) and (in larger countries) regional management divisions, similarly organized, as well.

| Country | Freight as a distinct business activity | Business separation |
|---|---|---|
| Australia | Both in federal and all state contexts (other than in Queensland) the operation of rail freight is managed by entities that do not operate passenger services. In Queensland freight is managed as separate division of Queensland Railways. | Mainly 1990s. |
| Brazil | Freight Concessions predominate (passenger services are mainly in city areas and are run by separate concessions) | 1990s |
| Canada | Freight companies and passenger company (Via Rail) are separately owned. Via Rail is a publicly-owned passenger TOC that pays the freight private freight companies for access | 1978 |
| China | Still combined: Regional Railway Administrations deliver both freight and passenger services | N/A |
| Germany | The main freight rail operator, DB Schenker is a separate company within the State-owned DB holding structure and purchases network access from DB Netz, also in the group. | 1991 |
| Japan | The Japanese Freight railway Company is a free-standing freight TOC separate from the 6 passenger companies from whom it hires track access. | 1987 |
| Russia | The Russian Railways Corporation has progressively split Intercity Rail away from freight. Passenger Branch established 2006. Currently accounting separation only, but Passenger Brach structured to permit it being split into 5-7 regionally based passenger companies. Within the freight sector several private freight-only companies have been established, mainly with trains hauled by RZD. | 2006 |
| United States | Freight companies and passenger company (Amtrak) are separately managed and owned. Amtrak is a publicly-owned passenger TOC and pays the private freight companies for access (at regulated charges). | 1970 |

**Agglomerated freight/passenger business structures were found to be increasingly ineffective in the competitive environment of road motorization and construction of freeway networks[31].** The business of a railway is now serving transport markets. Passenger and freight transport market needs and characteristics are quite different: different customers, different service needs; different economic drivers; and different social role. In agglomerated structures, the responsibility for market success or

[31] Although Germany started its autobahn network in the 1930s, most of the developed countries in the group developed freeway networks over the period 1955-1990. China's national expressway building program began with only 500 kms in 1990 reaching 74,000 kms in 2010. These programs and the improvements in road haulage technology and performance that they fostered, were possibly the ultimate driver of developments in railway industry thinking and action in all these countries, including China.

commercial performance is dispersed over, and shared by many players; only at the level of the CEO does commercial responsibility and accountability come together.

**Agglomerated structures also make it harder to control costs, essential in competitive businesses.** The functional/geographic divisions that most of the railways in the group once had led to budgeting systems based on cost centres (without revenue budgets) up to almost the top levels in the organization. The most compelling incentives for divisions of organizations structured by cost-centres are to maximize the budget and then to spend it all. In such structures there is an inbuilt tendency towards cost-bloating and empire-building because staff numbers and budget, not profit contribution, are the key to influence and rewards.

## 7. Line-of-business management structures

**In all of the countries reviewed rail freight services carry a similar range of commodities.** Traffic profiles in most of the eight railways reviewed, while naturally differing as to proportions, are dominated by bulk raw materials (coal, ores and minerals, crude oil, sand and gravel, grains, logs), semi-processed industrial goods (oil products, chemicals, iron and steel, cement, fertilizer) and containers (Japan's main rail freight traffic). The eight countries include some of the most efficient and market-oriented freight railways in the world; the general similarities in range of commodities clearly demonstrate where the greatest competitive strength of rail technology is to be found. It is the ability to carry regular, large consignments at low cost. Light industrial, consumer and mixed freight categories are usually a very low proportion of tonne-kms. They are most significant in the United States because a large proportion of the freight defined in these categories is unitized in intermodal containers and trailers, thereby transforming the transport of general freight into bulk transport of 'boxes' on rakes of flat-cars (discussed in Section 5.4).

**Successful rail freight providers target markets which best suit the capabilities of rail technology and then design transport service products to meet specific customer needs.** Freight customers choose modes on the basis of many criteria, including physical capacity to carry, service characteristics, prices, and other more strategic factors. For some customers and cargoes the decision is an easy one: they want the lowest tariff; or the fastest possible delivery time; or the most reliable delivery schedule. In many markets the matter is more complex with customers trading off the various factors. Customers with different kinds of freight, and even different customers shipping similar types of freight, make different trade-offs. The closer the railway is to their thinking the more successfully they can design and price transport products.

**The managements of most major freight railways in the countries reviewed have adopted lines-of-business (LOB) structures.** This has been partly to better tailor products and customer care to the target markets, because each market has different customers with different needs. Equally importantly (and like the split of freight and passenger services) it has also been to devolve management of specific segments to line managers, thereby making a complex freight business more manageable. Most freight is consigned by relatively few corporate customers who employ a small number of logistics decision makers. It is both desirable and feasible for LOB managers and marketing staff to get close to these customers, understand their businesses, assess their needs, determine whether railways can meet these needs economically, and try to match product to commodity or customer.

**LOB structures are applied in several different forms.** LOB structures can be implemented through Product Managers responsible for client relationships for defined markets or products and who 'transact' internally in the railway to plan and monitor delivery of the services sought; with agreed internal 'cost rates' or 'prices' for those services, management accounting systems can also segment financial performance according to LOB and so devolve 'bottom-line' accountability to product managers. LOB for larger traffic segments (say, coal or intermodal business) can be divisions of the company with management responsibility for dedicated rollingstock, terminals and other assets. Ultimately, LOB may be established as separate or subsidiary companies, particularly if services are so specialized that the required market profile and/or skill-set needs to be differentiated from that of the railway itself. Freight railways in the countries reviewed display elements of all these LOB models, sometimes within the same railway. There is no best approach. It all depends what the management thinks will work best in the context of its corporate aims and the nature of markets on offer.

**It is not possible to create an effective LOB organization simply by creating segmented accounting systems or appointing segment marketing managers.** Accounting and Marketing structures are tools of LOB, not the other way around. Finance departments need to adapt their accounting procedures to an authentic and agreed LOB structure[32], otherwise there will be no constituency of support for the accounting structures required and no market for the information they can provide. Similarly, marketing managers can discern client needs but if they have little influence and no control over product design and delivery, the implementation of LOB will probably fail. LOB management must be structured to suit the business and be holistically applied in the sense of linking market need, service response, and accountability for outcome.

**Nevertheless, LOB management has led to the transformation of railway freight marketing.** Those railways organized by LOB tend to have individual marketing teams specializing in the industry or customer group concerned. When railways still had monopoly power in freight, the main function of the Marketing Department (if there was one) was taking wagon orders, completing waybills and handling complaints; they employed clerical skills appropriate to clerical tasks. Rail freight providers today need marketing groups who can manage client relationships and not just client paperwork.

[32] That is, one which is already mandated and implemented, or on a fixed timeline to implementation. Delaying adoption of management structure on the pretext of 'accounting constraints' is a time-honoured way of slowing progress by locating the cart before the horse. Similarly, trying to reform an accounting system to be able to handle any 'virtual' LOB structure that may someday be contemplated is a recipe for system overspecification and time and budget overruns.

## 8. Efficiency of heavy load trains

**International experience is that most compelling potential source of rail freight's competitive advantage is to be the lowest cost carrier.** Service attributes other than cost are of course important in all markets (even in bulk markets where supply chain management is becoming ever more sophisticated). They are critical in most non-bulk freight markets where competition with road transport is fierce, but this does not gainsay the crucial importance of tariff. Road haulage services are more ubiquitous than rail services, are well-suited to small consignment sizes, are more immediately responsive to urgent orders, are faster door-to-door, can be dispatched more frequently, and can be used more flexibly. As the freight railways in the group have found, and just about every other railway in the world, a rail freight provider who charges the same or higher line-haul tariffs than road haulage, when the latter has capacity to carry, is doomed to lose the competition.

**Well-loaded trains of high net/tare weight, operated with well-utilized rollingstock deliver the lowest line-haul operating costs.** Improvements in the mechanical and electronic control elements of locomotives over the past thirty years has led to big performance gains in a number of areas: tractive efficiency (haulage capability relative to power rating); energy efficiency (fuel or electrical energy/gross tonne-km); availability (proportion of fleet available for service at any one time); reliability (distance traveled between breakdown); maintainability (maintenance intervals compared to utilization); and environmental performance (e.g. emissions standards). These improvements can deliver critical cost savings but modern locomotives that can deliver them are sophisticated and expensive capital assets. High utilization is needed to convert advances in technology into competitive cost advantage.

**Wagon technology has likewise advanced.** It has improved in areas such as: loading/unloading times (through design characteristics); carrying capacity (through bigger wagons and/or higher axle loads); better bogies (that permit faster speeds and fewer derailments); and better braking systems and draw-gear (that allow longer trains). There has also been an extensive R&D effort by wagon manufacturers to allow production of specialized rollingstock for specific traffics and even for individual freight customers. The effort is driven by the need to adapt railway technology to specific market segments.

**While rail freight train managers will need increasingly to match train types and service characteristics to the markets offering, they will need to do so against the primacy of maintaining transport cost advantage.** In train operations, the most effective ways of pursuing cost advantage additional to high equipment utilization is to maximize the ratio of net freight tonne-kms/tare tonne-kms hauled. Many train operating expenses of a railway vary, to a first order of approximation, with the total gross tonne-kms hauled. And indeed, most of that proportion of infrastructure costs that does vary with traffic, also varies with gross tonne-kms over the line. So the higher the ratio of freight tonne-kms /tare tonne-kms the more the revenue earned relative to the costs of moving the train.

**In most of the freight railways reviewed high density flows of rail-friendly traffics have created beneficial opportunities to operate longer, heavier trains and attain lower unit costs.** Australia, Brazil, Canada, China, Russia and the USA have all pursued heavy axle loads, better wagon design and minimization of dead-running to provide higher net-to-tare ratio, coupled with longer freight train length to reduce unit crew costs and (in some cases) release useable capacity. Germany and Japan are more constrained by the limited market availability of bulk freights (particularly coal), by their relatively short freight-hauls, and by the constraints of network parameters basically geared to passenger demands, but nevertheless they have also sought within their constraints to achieve the same sorts of efficiencies.

| Country | Examples of Heavy-load trains and typical freighters |
|---|---|
| Australia | Typical interstate freighters East-West 5,000 tonnes, North-South 2-3,000 tonnes.<br>**Dedicated freight lines**:<br>Rio Tinto: 30,000 tonnes iron ore trains<br>BHP Billiton: 44,500 tonnes iron ore trains<br>Leigh Creek: 10,000 tonne coal trains |
| Brazil | Typical freighters: various<br>**Dedicated**: Carajas Railway: 23,000 tonne iron ore trains |
| Canada | Typical long-distance freighter:<br>Canadian National bulk trains: up to 20,000 tonnes |
| China | Typical long-distance freighter: 4000 tonnes<br>**Dedicated:** Daqin Railway (mainly coal): 20,000 tonne coal trains |
| Germany | Trains typically constrained to 740 metres but 835 m trains being introduced Hamburg to/from Denmark and long-term feasibility of running 1,500 m trains on key routes is being examined. |
| Japan | N/A |
| Russia | Typical long-distance freighters: 4000 tonnes<br>Iron ore to Finland: 5,500 tonnes |
| United States | Typical freighters: 3000-5000 tonnes.<br>Double-stack container trains: typically 5,000-8,000 tonnes<br>Some iron ore and coal trains: 10-20,000 tonnes |

**There are limits on increasing train size.** For example it may not be feasible or desirable in all circumstnaces: if waiting to assemble larger trains would result in a poor frequency of service; if customer terminal facilities cannot handle a long train; if staging loops cannot be lengthened to take longer trains; if slow heavy trains would disrupt passenger service, if overall traffic levels cannot justify the heavier weight of rail required. Despite the exceptions the international direction is clear and well-justified. Heavier load trains offer cost advantages on any routes that have sufficient traffic and the infrastructure to handle them, and managers of freight-dedicated lines run the heaviest load trains possible consistent with market requirements.

**Rapid containerization of international trade over the last thirty years has also given all the railways a new market opportunity to operate heavy load trains.** International containerization has transformed what was once a diffuse, non-bulk general freight transport market, into a bulk-market for transport of boxes often concentrated on busy routes between major ports and distribution hubs in industrial cities. This market has thereby become better matched to the physical capabilities of railways. The economics of heavy load train operations are the same as for other commodities, which is why double-stacking of containers, which can allow much heavier trains with better net to tare ratio, can greatly improve commercial returns and save track capacity.

**International containers have been a major rail freight growth market in all the countries reviewed.** The USA and Canadian railways are leaders in the field with further multi-billion dollar investments planned. Double stacking has been facilitated by the USA's high average axle-loads (more than 50 percent higher than Europe) and the fact that primarily diesel locomotive haulage provides higher loading gauge than would an electrified system with overhead wires. Australia has introduced double-stack wherever density of flows and the loading gauge permit it[33] and China is currently adapting a number of routes from ports for double-stack[34] In the other countries constraints of current loading gauge (due to bridge, tunnel and overhead line clearances) and/or lack of market density make it difficult economically to justify the heavy cost of adaptation works, but it is likely that at least a few key routes will be fitted for double-stack in due course.

**Railways are not only about long-distances but can be the lowest cost alternative even over relatively short-distances with regular traffic flows in large consignment sizes.** Because of terminal and/or placement costs (and the loss of equipment utilization while in terminals), the potential unit cost advantage of rail freight tends to increase with distance. Nevertheless experience shows that with sufficient density and consignment sizes railways running heavy trains are competitive even for many of the relatively short-distance bulk movements that occur in many of the countries.[35]

**Non-containerized light industrial and consumer freight (commonly referred to as general or wagon-load freight) is more logistically demanding**. In most circumstances these traffic types exhibit a lower net/tare ratio than bulk freight and customer demands are often higher adding to line haul and final placement costs. They are invariably more costly for rail freight providers to carry than bulk freights and although their tariffs are usually higher than for bulk and semi-bulk products, their unit contribution to rail freight margins is rarely so. Australia's general freight markets are generally thin and, except on the long-east-west rail routes to Perth (of around 4000km) road transport wins a much

[33] double stack trains operate between Perth, Adelaide, Darwin and Parkes (NSW).
[34] under 25 kV AC overhead lines.
[35] Examples of such markets are short distance runs from coal mines direct to ports or power stations, iron ore mines to steelworks, grain silos to mills, quarries to cement works, oil refineries to regional storage depots

higher proportion of the market even on the 1000km intercity routes between Melbourne and Sydney and Sydney and Brisbane. Brazil's general freight markets are similarly thin except on a couple of key intercity routes, and road haulage dominates. Russia and China traditionally discouraged many of these general traffics with a tariff and service policy that reflected a preference to allocate capacity to bulk raw materials, though both are have trying better address the markets through intermodal solutions. In Germany and Japan, the relatively short distances have worked in favour of road transport, though Japan has built its service of fast container-liners and in Germany, DB Schenker has become a road, air and logistics company in order to break-out of the limitations of rail technology alone in serving these and other markets. Arguably, the railways of USA and Canada have been most successful, aided by a many long-distance transport corridors of relatively dense freight flows and also by innovative logistics strategies

## 9. Intermodalism, multimodalism and logistics capability

**Most larger rail freight providers in all the countries in the group have redefined their role beyond just running trains into the larger world of multi-modal freight transport and logistics.** They have done so not only to better serve their markets but also to avoid becoming disconnected from final markets, and thereby becoming passive 'price-takers' from the 'middlemen', including freight forwarders and logistics companies who in many countries are increasingly responsible for overall transport organization under contract to ultimate freight shippers or receivers. By engaging more effectively in supply chains the railways have increased market 'reach' without increasing network length.

| Country | Railways and logistics |
|---|---|
| Australia | Rail freight operators have had close partnering arrangements with freight forwarders for decades but since railway restructuring freight companies with wider logistics businesses now run most interstate freight trains in Australia. (e.g. Pacific National, SCT Logistics). |
| Brazil | Many of Brazil's railways deal with bulk mining and agricultural products but the company with the largest network (with concessions in Brazil and Argentina) 'America Latina Logistica', markets itself as a full service logistics company.[36] |
| Canada | CN promotes itself as a transportation company that offers integrated services: rail, intermodal, trucking, freight forwarding, warehousing and distribution. Canadian Pacific stresses ability to plan and manage logistics solutions and provide one-stop shopping for door-to-door transportation using long-haul capabilities of the railway and the local market access of trucking, for both rail and non-rail served customers. |
| China | China Railway Container Transport Company (CRCTC) was established to manage the container business, including rail and intermodal transport, cargo handling and delivery, the sale and leasing of wagons, containers and facilities. JV with international investors to establish 18 major intermodal centres linked by regular container train services. A further 37 satellite terminals to be established by redevelopment of existing freight terminals, with a further 150 conventional stations being equipped to handle containers |
| Germany | DB Schenker, the main national rail freight operator, is a multimodal transport company offering through separate LOB divisions and subsidiaries services in rail freight, land transport, air freight, ocean freight, contract logistics. DB Schenker Logistics is the second biggest 3rd party logistics supplier in the world by revenue. |
| Japan | With limited bulk traffic Japan Rail Freight Company has necessarily concentrated on efficient intermodal logistics linking 140 container rail terminals (its main traffic) with road, sea, and air routes. The company's Super Liner Container express service links all Japan's main cities. |
| Russia | Has established subsidiary companies to provide overall logistics services in shipping containers, domestic container service, automobiles, perishable goods. |
| United States | Many different models but Class 1 railways now typically have overall Logistics Planning capability offering solutions and management of logistics across modes, as a LOB or as subsidiary or associated companies. |

**One early form of integration with other modes was the so-called piggy-back service.** After about 1975, there was substantial growth in the carriage of road truck trailers on rail flat-cars (TOFC) in North America (and to a lesser extent Australia). However, the

[36] The company's logistics services can be viewed at http://www.all-logistica.com/port/index.htm

modest net/tare ratio of such arrangements[37] and the sometimes cumbersome and labour-intensive loading process inevitably raises the costs of train operations and potential margins are at best thin.

**More substantially, maritime freight containerization over the last thirty years has created a new niche for railways in an integrated transport market.** This is particularly so for ISO containers on routes between international ports and inland cities but traffic can then take advantage of unbalanced container loadings and the availability of the low-cost container liner services. In the last few years' intermodal traffic as a whole has overtaken coal as the single biggest generator of revenue in US railways (though not of profit). But the trailer traffic has declined and container transport, which is more cost-efficient for railways to handle (even more so with double-stacking) now dominates the intermodal market[38]. The same trend away from carrying whole trucks or road semi-trailers towards containers (and specialized road-railer vehicles) is also evident in Australia.

**Success in both intermodal and multi-modal transport depends not only on operating cost but also on how successfully rail services connect with other modes.** Connection is meant in both in a physical sense and in terms of being able to fit into a seamless logistics chain ordered via a single electronic consignment note. The long-term role of rail will naturally be supported by improving physical connections with container hubs, logistics centres, river ports and seaports and by looking for markets where connectivity of rail with other modes will improve service and/or reduce costs. But commercial connectivity is equally important to become part of logistics chains. The railways in the group reviewed have adopted a range of different strategies to do this.

**Logistics is not a core railway competence.** Railways in the group have either partnered or joint-ventured with successful logistics companies, set up specialist divisions, established subsidiary companies with management autonomy, or acquired logistics companies. Some railways have adopted several of these components to address specific markets (for example, container logistics, steel logistics and oil products logistics have quite distinct supply-chains and require different solutions to integration). While it is facile to prescribe the best course in all circumstances, the international experience suggests providers have avoided trying to shoe-horn logistics capability into the core railway function.

**Intermodal and multi-modal transport also allows railways to tap into higher value freight markets**. US data indicates that the per tonne value of freight carried by road/rail combinations is over 7 times higher than that carried by rail alone. Railways can only win this freight by offering a lower tariff for transport than road transport on its own, which means that many container movements in the countries reviewed are carried at very low margins compared to bulk commodities, even though the latter are much lower

[37] Caused by the combined tare of both the wagon and the trailer and low loading density of trailers.
[38] Through its partnerships with a number of railways, one of the USA's largest road trucking companies, JB Hunt, offers intermodal rail freight as one of its main transport services, see: http://www.jbhunt.com/solutions/intermodal/

rated. The success of US railways in winning intermodal freight, at what are presumably acceptable financial margins, is due to close attention to customer logistics needs while minimizing railway operating costs.

## 10. Network management

**Long-term technology choices, investment in and maintenance of rail infrastructure are also critical to the cost-competitiveness of railways.** Typically, network infrastructure costs represent between 30-40 percent of total railway operating costs. In most of the countries reviewed the commercial choices are about renewing or upgrading existing infrastructure (of the eight countries, only China is implementing a major network expansion program). Moreover the original vertical and horizontal alignments selected on most lines were often driven by needs of passenger service. In China, Germany, Japan and Russia the needs of passenger services still constrain some infrastructure options that might better serve freight.

**The most transforming investments for freight railways are those that simultaneously deliver train operating cost savings, new capacity that can be sold and train service improvements that can be priced up or attract new customers.** The table shows a number of ways in which most or all of the railways in the group have tried to attain one or more of these impacts in order to improve returns and/or grow profitable market shares.

| Measures | Potential Impact |
|---|---|
| **Double tracking** | Increases capacity substantially. Typically also improves transit times, reliability and train utilization by reducing potential traffic conflicts and creating system 'redundancy' to handle such situations. |
| **Dedicated lines** | Separate lines, dedicated to passenger and freight use, can allow optimum design characteristics and performance of each, while substantially reducing capacity losses of each due to mix of faster and slower trains. |
| **Motive power source** | Electrification typically allows improved operating performance (e.g. speed and higher freight loads/Kw motive power) particularly in hilly territory, reduces locomotive maintenance costs and may save energy costs (depending upon long-term costs of diesel fuel vs electricity and locomotive efficiency levels). |
| **Length of sidings** | Longer siding length (and crossing-loop length on single track lines) increases the maximum freight train length in normal operations allowing heavier load trains. |
| **Max. train speed** | Higher maximum train speeds may create service value for more time-sensitive traffics on longer routes, though for most rail traffic, commercial speeds of 30-50km/h are often perfectly adequate for most markets if they are reliably delivered. |
| **Weight of rail** | Weight of rail increases track life but, in particular, can allow higher axle-loads, allowing freight wagons to be used with both higher capacity, and higher net/tare ratio. |
| **Rail connections** | Continuous welding of rail can reduce track maintenance costs (and increase wheel life). |
| **Loading gauge** | Wider loading gauge can handle wagons with better volumetrics, and higher gauge can allow double stacking of containers (though is more costly to attain where the loading gauge is constrained by electric catenary. |
| **Mode of train control (section 11)** | Automatic block signaling can add 15-25 percent capacity to double-track line. On low density freight lines, use of train radio (GSM-R) for train control can reduce train control costs to much lower levels than conventional signaling. |
| **Maintenance** | Mechanized maintenance techniques such as automated track lining and leveling, ballast cleaning, rail grinding and others can substantially improve rail performance and increase track life. |

**Selectivity is an important part of infrastructure investment strategy.** Creation of more capacity is only valuable if there are growth markets available to use it. Similarly, train performance improvements are only useful to customers who value that performance. This means not only investing in the most effective enhancements in the most promising corridors, but also divestment of infrastructure that is  no longer productive or which if it is kept, will divert scarce investment resources to its upkeep. In most of the countries in the group, railways have divested low density branch or regional lines (passenger and freight) which they were not able to operate economically either to specialist operators or regional governments.

| Country | Divestment of low density branch-lines |
|---|---|
| Australia | Small regional branch networks mainly handling grain, fertilizers or timber were privatised mainly in period 1995-2005.[39] |
| Brazil | Most low density branch-lines were part of the packages of routes regional concessions tendered to private sector and which concessionaires are generally not permitted to close. |
| Canada | Canadian Pacific and Canadian National have spun off a number of secondary and branch lines to short line operators. |
| China | Following 1991 Railway Law, Ministry of Railways devolved many low density freight branch-lines to independent management groups and regional government authorities. |
| Germany | The Lander (States) have been given responsibility for regional (passenger transport) services which are typically tendered out and pay DB Netz for access. (DB passenger company has won many but not all of these tenders). |
| Japan | The main freight company JRFC is a TOC without significant network infrastructure, but there are around 12 small private railway companies (private or local government owned) that operate short-lines. |
| Russia | Russia has relatively few low density railway lines and divestment is not a part of its current three-stage reform strategy |
| United States | Over last fifty years all US major railways have sold numerous short and medium length, low density lines to private companies who are able to run them more profitability from a lower cost base. |

[39] Further details are available in

## 11. Benefits of Information and Control Technology

**Train control and signaling technology has a key influence on the capacity that can be obtain on a given line infrastructure.** All the railways in the group have upgraded their signaling and control technology. This has been prompted in some countries by clear capacity constraints and the need to optimize its utilization (e.g. many routes in China and some in the USA and Russia). Elsewhere it has been more a case of cutting the costs of more labour-intensive signaling systems (as in Australia, Brazil), or by the desire to improve train speeds and safety in passenger-dominated systems (Germany, Japan).

**The most basic systems use written orders to tell departing trains how to navigate the track ahead.** In rudimentary train control systems, train meets can take a long time and the train crew may have to stop the train and manually throw track switches to take the siding, and then, when clear, throw them back; on departure from the siding, they have to do the same thing. In somewhat more advanced systems, switches are manually or electrically controlled. While this kind of system is faster, it still does not allow much flexibility and only can affect train speed and control at manned stations.

**Automatic block signal system (ABS) uses electrical circuits in the track to detect the presence of trains**. It automatically aligns the switches and signals at passing loops to provide the proper indications to trains in both directions. In such systems, the signals controlling sidings must be connected to each other so that trains are not permitted to depart a station if there is a train in the block of track ahead. Where there is a long distance between passing sidings, intermediate signals are used to permit trains to operate at track speed to certain points. Typically, ABS systems are automatically first come first served so no preferences can be given to higher priority trains – the first train to the siding where trains will meet automatically take the siding.

**Centralized Traffic Control (CTC) extends the capabilities of ABS to provide greater control of trains.** For example, it can allow slower trains to be passed by faster trains moving in the same direction, or allow trains longer than the siding-length to remain on the main-line for any given meet, or allow higher priority trains to keep to the main lines and avoid stopping as much as possible.

**ABS and CTC systems provide several safety advantages.** The track circuits provide broken rail protection – if there is a broken rail or a wash-out, train signals in that section of track all turn to red. The electronic controls also are designed so that they are fail-safe and interlocked – a switch cannot be thrown across trains, if any part of the system fails or breaks, signals automatically protect trains so that they do not run into each other.

**CTC can also allow bi-directional running on any track.** Double track segments are usually uni-directional (up trains on one track, down trains on the other). However, CTC systems can be designed for reverse running so that trains can use either track, increasing flexibility and capacity. Such systems allow maintenance gangs to work on one track while trains move on the other, they permit fast trains to pass slow trains, and allow some trains to work (or serve customers on the main line) while trains continue to move on the opposite track.

**In traditional ABS and CTC systems the railway line is segmented into signal control blocks; the train transit time through the longest block is a key determinant of track capacity.** The length of a block is fixed by the design of the track circuits. Block length is determined by the stopping distance of the heaviest or fastest train – the one with the longest stopping distance. The systems will permit trains to occupy a block with at least one empty block between trains. The number of blocks between trains is in part determined by how many aspects are used in the signal system (three aspects are typical but some systems, mostly in very busy lines, have four or more aspects). More aspects provide finer control of speed and allow overlapping blocks so that trains can follow more closely.

**The latest and most advanced signal systems do not need wayside signals and provide digital control of train speed**. They base train spacing on the physical characteristics and current speed of trains so as to always maintain stopping distance between the end of one train and the front of the following train. More advanced signal systems also provide train spacing or speed information – permitting trains to meet with the minimum amount of slowing, thus reducing energy consumption and maximizing the capacity of a the existing railway line.

**Each step up in the sophistication of signal and train control systems involves substantial investment.** Other things being equal, ABS and CTC are easier to justify in higher wage economies because of the lower capital/labour cost ratio. Automation can replace the many signal-boxes and signalmen of a labour-intensive system. But the long-term benefits of investment in signaling and train control technology are not primarily in their effect on the wage bill. The real benefits are greater line capacity, higher commercial speeds with greater energy efficiency, better utilization of locomotives, rollingstock and train crew, and improved safety.

**China has invested heavily in train signaling and control technology in a comparatively low-wage economy.** Between 1990 and 2007, over 20,000 route-km of the busiest corridors were equipped with ABS. Nearly half the network now has ABS and more than three-quarters of freight traffic is carried under ABS. Headways between trains of 5 to 7 minutes are common and on some of the busy double-track electrified corridors up to 150 pairs of trains are operated daily. The development of signaling systems has focused on using digital and computer-aided equipment. Computerized signal diagnostic systems have been set up to monitor the condition of signals and the communication lines between stations and dispatching centers. Cab signaling and 'over-speed' control devices are provided on locomotives and EMUs for speeds of 160 km/h and above.

**China has also implemented CTC on around 6,000 route-km and it is being extended to more routes.** However even without full-blown CTC, all busy corridors have train dispatching controlled from train control centers located at the 18 Regional

Rail Administration head offices where control panels display the configuration of tracks and real time location of trains for several hundred kilometers of the route. The span of responsibility of train control centres was widened when the Ministry of railways abolished China Rail's divisional level of management (around 80 divisions) in March 2005. The divisional train control function was then transferred to the main Administrations, improving efficiency and reducing costs. The traffic control functions have an interface with Dispatch Management Information System (DMIS), Traffic Management Information System (TMIS) and Supervisory Control and Data Acquisition (SCADA), and with detectors for hot boxes, hanging parts and unusual sounds from trains. Integration of the computer-aided dispatching system and the dispatcher's supervision system has resulted in the generation of automatic real-time train movement records and raised the efficiency of train operations.

**Because of its pressing capacity constraints, China uses many other IT systems to improve utilization.** Since 2003, large shippers of freight have been able to order freight cars through the automated car order center, although smaller shippers still need to order from a station. Related operational systems include a Train Consist Reporting System, Container Information System, Train Dispatching System (covering train and locomotive planning), and Yard Inventory Management System (covering 100 main yards and about 300 smaller yards). On the most intensively used railway network in the world it is also vital to avoid equipment breakdowns that disrupt traffic. China Rail is developing a preventive maintenance management system for locomotives, freight cars and passenger coaches; it will be based on the actual utilization of units rather than on time elapsed since last maintenance.

**CR has built its communication network using fibre optics.** The communication network was transferred to the Railway Communications Corporation (established as a separate corporation outside the railway in 2004) which also operates a GSM-R mobile phone service for railway and non-railway customers. Mobile radio communication is provided on all locomotives and EMUs with a maximum speed of 140 km/h or more.

## Annex A: International comparisons of productivity and tariffs.

Table A1 provides estimates (based broadly on 2009 data) of network, wagon and labor productivity for the largest vertically-integrated freight railways in the group[40] and for India. India, China and Russia have substantial passenger operations so the network, locomotive and employee productivity estimates include passenger-kms as well as freight-kms operated. Wagon productivity refers only to freight-tonne-kms.

**Table A1: Asset and labor productivity estimates (2009)[41]**

| | Brazil | Canada | China | Russia | USA[42] | India |
|---|---|---|---|---|---|---|
| **Network utilization (Traffic units/route-km/year) millions** | 9.0 | 4.5 | 38.5 | 23.7 | 10.6 | 22.0 |
| **Loco productivity (traffic units[43]/loco/year) millions** | 103 | 112 | 146 | 93 | 98 | 66 |
| **Wagon productivity (net tonne-km/wagon/ day)** | 8334 | 11099 | 11816 | 5156 | 4637 | 7781 |
| **Labour productivity (traffic units/employee/year) thousands** | 7097 | 9563 | 1790 | 1876 | 15817 | 996 |

These indicators are especially valuable when monitored in a time-series for a given national railway or company. They also provide useful inter-country benchmarks, but in interpreting them on a cross-sectional basis the Committee should note the following.

***Network utilization.*** The three networks that handle substantial passenger volumes as well as freight have the highest overall network use, but such use can also be heavily influenced by all the technology and operational standards and choices discussed in Sections 10 and 11. The average is also affected by the relative intensity of use of different parts of the network. For example, whereas nearly all China's network is heavily used, the Indian average contains around 11,000 kms (nearly 20 percent of the network) of little-used non broad-gauge lines carrying only around 1 percent of rail traffic.

***Locomotive productivity.*** The achievable productivity is partly influenced by the markets offering, which differ from country to country. Modern locomotive types and technologies also have higher haulage capability. Productivity is also influenced by the maintenance standards and efficiency of equipment and crew rostering.

[40] Comprehensive data are not available for Australia.
[41] Based on UIC published statistics and railway Annual Reports.
[42] Class 1 railroads only
[43] Traffic units are the sum of net tonne-kms of freight and passenger-kms.

***Wagon productivity.*** Like locomotives, achievable productivity depends partly on traffic mix; other things equal, it should be higher with longer length of haul, higher proportions of bulk relative to non-bulk traffic, and the use of non-specialist wagons for a variety of traffic types. It is also influenced by train operating strategies and the efficiency of customers' terminal operations. High utilization generally assists in controlling operating costs, but it can occur at the expense of customers: for example many customers may prefer to use specialized wagons. And while China's wagon utilization is the highest, many major customers in China complain of chronic shortages of wagons to meet traffic demand.

***Labor productivity.*** Labor productivity is partly a function of overall freight and passenger mix: for example, the large passenger volumes handled in China, Russia and India require a more labor-intensive service response than freight. Similarly, bulk freight is, by and large, less labor-intensive than non-bulk freight. A key factor is also the extent to which the railway runs 'lean and mean' with the contracting out of non-core (functions (and in some cases core functions too). For example, while the USA Class 1 freight railways are indeed some of the most efficient freight railways in the world, the very high in-house employee productivity is to some extent offset by the correspondingly higher need to incur the cost of buying-in services.

Table A2 summarizes 2010 estimates of average revenue yield/tonne-km in equivalent US cents at current exchange rates for three of the countries for which data is available, and for India. Estimates are both for total freight and (more meaningfully) for selected commodities, giving average haulage distance for those commodities.

**Table A2: Comparison of freight traffic yields 2010 (US cents/tonne-km at current exchange rates).**

| | **USA Class 1** | | **Russia** | | **India** | | **China**[44] | |
|---|---|---|---|---|---|---|---|---|
| | *Ave. haul (kms)* | *Yield (us₵/ntk)* | *Ave. haul (kms)* | *Yield (us₵/ntk)* | *Ave. haul (kms)* | *Yield (us₵/ntk)* | *Ave. haul (kms)* | *Yield (us₵/ntk)* |
| **All traffic** | 1479 | 2.28 | 1510 | 2.20 | 677 | 2.11 | 765 | 1.49 |
| **Coal** | 2204 | 1.45 | 2127 | 1.00 | 624 | 2.02 | 836 | 1.66 |
| **Coke** | | | 2477 | 1.85 | | | 607 | 1.86 |
| **Oil products** | 487 | 3.38 | 1517 | 3.41 | 641 | 2.85 | 928 | 2.20 |
| **Ferrous** | 961 | 4.08 | 1888 | 3.04 | 988 | 2.37 | 912 | 1.77 |
| **Fertilizers** | 1324 | 3.55 | 1543 | 1.92 | 840 | 1.81 | 1385 | 1.10 |
| **Cereals** | 1777 | 2.05 | 1336 | 2.56 | 1323 | 1.69 | 1364 | 1.10 |
| **Ores** | 2449 | 3.02 | | | 406 | 3.44 | 1078 | 1.62 |

As with the productivity figures, caution should be exercised in drawing cross-sectional conclusions regarding revenue yields. The commodity groups are similar but not homogeneous between countries. Competitive circumstances differ. Also, tariff yields typically decline with distance and India has the shortest distances of the countries

[44] Includes construction and electrification fund surcharges.

compared. For example, at India's average coal haul the US yield is about 2.72 cents/tonne-km (Table A3).

**Table A3: US coal yields by distance band[45].**

| Distance band | Average yield *(us¢/ntk)* |
|---|---|
| 0-249 kms | 6.30 |
| 250-499 kms | 4.66 |
| 500-749 kms | 2.72 |
| 750-999 kms | 1.43 |
| 1000-1249 kms | 1.14 |
| 1250-1499 kms | 1.19 |
| 1500+ kms | 1.29 |

Another factor varying between countries is the relative purchasing power of money between countries. Table A4 compares the yields shown in Table A4, adjusted for parity of purchasing power (PPP). The paper makes no endorsement of this approach: apart from labor costs, many railway input costs are similar in different countries; and many railway customers are also sourcing inputs or trading in international markets so a PPP approach does not necessarily better reflect their perception of affordability than the actual money tariff.

**Table A4; Comparison of yields, adjusted for Purchasing Power Parity**

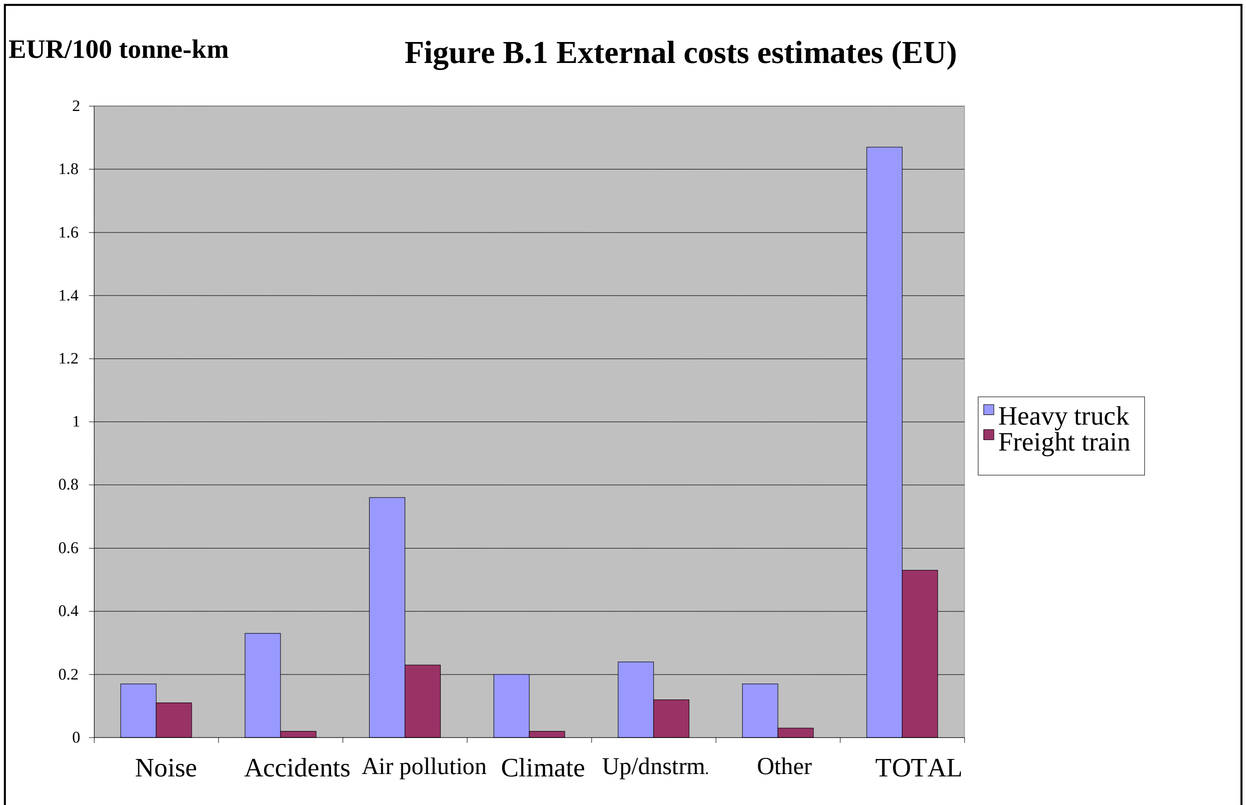
| | USA | Russia | India | China |
|---|---|---|---|---|
| **All traffic** | 2.28 | 3.33 | 4.44 | 2.57 |
| **Coal** | 1.45 | 1.52 | 4.06 | 2.85 |
| **Coke** | | 1.85 | | 1.86 |
| **Oil products** | 3.38 | 5.18 | 8.12 | 3.78 |
| **Ferrous** | 4.08 | 4.61 | 5.60 | 3.04 |
| **Fertilizers** | 3.55 | 2.91 | 3.27 | 1.89 |
| **Cereals** | 2.05 | 3.89 | 2.87 | 1.89 |
| **Ores** | 3.02 | | 11.82 | 2.78 |

[45] Based on a 2006 distance-based survey factored up for inflations to express in 2010 prices.

## Annex B: Cost of externalities of rail against road freight transport.

The last decade has seen the emergence of an increasing body of knowledge about the many environmental impacts and external costs of different modes of transport, including now the impact on greenhouse gas emissions. Figure A.1 derives indicative estimates[46] of the external costs of road and railway freight derived from the EU's Social Costs Handbook which synthesizes European research in the area[47]. Detailed estimates will naturally vary by country, income levels, load factors, degree of urbanization, proportion of diesel and electric railway operation, and nature of the road haulage fleet. However, the estimates shown in Figure A.1 are within a wider range of differentials that show road haulage in Europe having higher external costs per tonne-km than rail freight of up to five times.

Figure B.1 External costs estimates (EU)

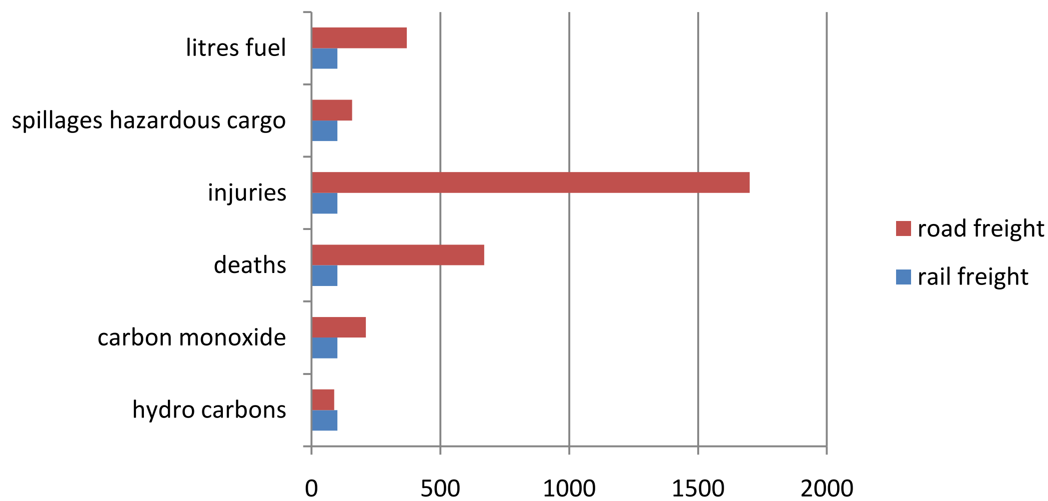



[46] Estimates derived from Handbook, Table 53, using the European 'daytime' rates; it also assumes 75% electric train-km and 25% diesel train-km. For both rail and road transport the averages assume 85% of unit traffic task is interurban and 15% passes through urban (and therefore more sensitive) areas. Up/downstream. in the legend refers mainly to impacts of power generation at source (e.g. at coal-fired power stations)

[47] This handbook is available on line at: http://ec.europa.eu/transport/costs/handbook/doc/2008_01_15_handbook_external_cost_en.pdf.

In the United States the University of Texas Transport Institute (2007) has also made estimates of differentials in various impacts between road haulage and rail freight. Some of its results are summarized in Figure B.2. Again, the results should be treated as indicative and like the European figures are context specific. In particular, freight railways in the USA are almost exclusively operated with diesel locomotives which have a higher impact on emission rates than electric locomotives (which predominate in Europe). Moreover, Europe is more urbanized than the USA which also affects external impact. Still, the much higher rate of external impact of road haulage over rail haulage is again shown clearly.

**Figure B.2: Indices of impacts rail and road freight/tonne-km USA (rail freight = 100)**




In China, a World Bank commissioned a study for the Ministry of Railways commissioned the University of Leeds to try to assess social costs of roads and railways in the Chinese context. The consultants applied European methodology but derived values to be consistent with Chinese transport and income parameters. The findings indicated that in China's conditions, with most road freight carried by relatively small (inefficient) trucks and much higher road accident rates than in USA or Europe, the external cost penalty of road freight per tonne-km may be more than 10 times that of rail freight. It is possible that the additional environmental penalties of road haulage in China compared to USA and Europe may also exist in India.

## Annex C: International experience in setting track access charges

This Annex summarizes the track access tariff principles and/or formulae used in four of the countries reviewed: Australia (interstate), Canada, Germany, and USA.

**Australia- Interstate freight**

The Australian Rail Track Corporation (ARTC) publishes a list of Reference Tariffs for track access on each of its routes. The Reference Tariffs are based on a fixed component (referred to as a 'flagfall') per train for each route, plus a variable element that depends on the gross tonne-km of the train. The fixed element itself is actually fixed for different routes reflecting the length of route, so is basically distance-related rather than a true 'flagfall'. This distance-based component is affected by the speed of train and whether the train path is peak or off-peak.

The different train types are listed in Table C1. The current Reference Tariffs for the different train types on different routes is publicly available and can be reviewed on line[48]. The pricing formula is the same for each route and the tariffs are shown separately by route for convenience of customers.

The Reference Tariffs relate to a particular (standard) service performance specification. There can be negotiation with individual customers for specific needs or service characteristics that vary from the reference assumptions; for example, with respect to axle loads, speed, train length, origin and destination, stops and operating timetable. However, ARTC has undertaken to the Australian Competition and Consumer Commission that it will not charge different prices to different clients where the characteristics of the service are alike; and where the applicants are operating within the same end market. ARTC also specifically undertakes not to discriminate pricing on the basis of whether the Train Operating Company is privately owned or owned by a state or federal government. All negotiated tariffs are also published.

The fixed component is paid for the right to reserve a train path and is payable by the customer whether they use the train path or not. The ARTC has also undertaken to the Australian Competition and Consumer Commission to limit the increase in the Reference Tariffs to a rate below the inflation rate, as its own efficiency incentive.

[48] At the following address:
http://www.artc.com.au/library/Pricing%20Schedule%20Effective%2001072010.pdf

**Australian Train types used by ARTC for fixed (flagfall) tariff components**

| Flagfall | Train type and description | Trains |
|---|---|---|
| **Super Premium** | Max train speed 130 km/h<br>Max axle-load up to 20 tonnes | XPT (fast passenger train) |
| **Premium** | Max train speed 115km<br>Max axle-load up to 20 tonnes | Passenger, Bi-modal |
| **High** | Max train speed 110km/h<br>Max axle-load up to 21 tonnes<br>Length up to corridor standard max | Superfreighters |
| **Standard** | Max train speed 80km/h<br>Max axle load up to 23T<br>Length up to corridor standard max | Express goods |
| **Low** | Off -peak train paths | Metro shunts/work trains |

## Canada

Canada has many examples of what are referred to as ‘voluntary running rights’ which are commercial agreements between two railway companies (usually between Canadian National and Canadian Pacific companies) to allow one to run its trains on the track of the other. There are also some broader access provisions administered by the Canadian Transportation Agency (CTA) which administers interswitching rights (a form of limited-distance track access rights) and sets the access tariffs. CTA can also impose more general running rights, where one railway seeks to operate on the lines of another.

Interswitching rights allow freight customers with access to a federal (inter-province) railway (basically Canadian National or Canadian Pacific) to have cars transferred (interswitched) onto another federal railway if the point of origin or destination is within 30km of the interchange point. This provision basically avoids the need to transfer wagons from one train to another for short distances at the beginning and/or end of journeys. The tariffs for this form of track access are set by the CTA because it is not convinced that market forces could otherwise protect shippers from the market dominance of one railway service provider. The CTA’s Regulations establish four distance zones within the 30-kilometre radius and prescribe rates per car for interswitching traffic to or from each zone. The rates are based on the estimated costs of interswitching traffic borne by the Canadian National Railway Company and the Canadian Pacific Railway Company. Lower per-car rates are prescribed for the interswitching of blocks of 60 or more cars as a unit. The Canadian Transportation Act requires that the Canadian Transportation Agency examine railway costs in its determination of the rates and stipulates that the resulting rates shall not be less than the average variable cost of moving the traffic. The interswitching rates are also subject to section 112 of the Act, which requires that rates established by the Agency be "commercially fair and reasonable to all parties".[49]

[49] The regulations and rates can be viewed at: http://laws-lois.justice.gc.ca/eng/regulations/sor-88-41/page-5.html#h-8

As noted, imposed running rights can also be mandated by the CTA on a federal railway, if it decides this in the public interest. In practice, the CTA's power to approve such applications (and so confer wider track access rights) has rarely been used and most examples of running rights in Canada have been by private agreement (voluntary running rights). If the CTA does grant an application for running rights, the two railways have the opportunity to negotiate the tariff for track access. If the negotiations fail, the Agency may determine the financial compensation to be paid.

**Germany**

Track access for passenger and freight trains in Germany is subject to a common basic tariff framework, though the pricing factors in the framework lead to different tariff rates. DB Netz' terms and conditions for access to the network are published in a brochure published in the German Federal Gazette and on the internet[50].

The brochure includes a detailed list of tariffs for train paths and for the other facilities and installations. In summary, the train path tariff system has a modular design in three parts:

a. **basic price depending on route category and its level of utilization:** there are 12 route categories grouped by infrastructure performance standard and transport importance. The basic price is increased by a premium of 20 percent on routes with very high utilization.
b. **train path products (the product factor):** the basic price (i above) may be multiplied by a number of factors which depend on whether the Train Operating Company is a freight or passenger train service or wishes to purchase particular features or levels of service: these factors differ for passenger and freight services.
c. **special factors:** these are a series of multiplicative, additive or regional factors, for example for steam trains, extra heavy freight trains, or tilting passenger train technology.

Table 2.4 (a) summarizes the basic charges. Table 2.4 (b) summarizes the main product factors and Table 2.4(c) the special factors as they were in January 2006.

[50] They can be viewed at: http://fahrweg.dbnetze.com/site/dbnetz/en/product/train__path/prices/brochure/train__path__pricing__brochure.html

| Route category[51] | Main features |
|---|---|
| **Long distance:** | |
| **Fplus:** | Premium lines (usually 280km/h plus) primarily used for high speed services |
| **F1** | 200-280 km/h high speed traffic and mixed passenger and freight operations |
| **F2** | 161-200 km/h high speed traffic and mixed passenger and freight operations |
| **F3** | 101-160 km/h mixed passenger and freight operations |
| **F4** | 101 -160 km/h use for handling fast inter-regional trains |
| **F5** | Up to 120 km/h used for handling slower inter-regional lines |
| **F6** | 101-160 km/h Local passenger and regional lines |
| **Feeder:** | |
| **Z1** | Up to 100 km/h |
| **Z2** | Up to 50 km/h |
| **Rapid transit** | |
| **S1** | Lines primarily or exclusively for rapid transit (passenger) services |
| **S2** | Direct rapid transit routes in Hamburg |
| **S3** | Direct rapid transit routes in Berlin |

* an additional premium of 20 percent of basic price is paid on the most heavily utilized lines in each class.

**Track access product factors**

| Passenger trains | | Freight trains | |
|---|---|---|---|
| **Product** | **Factor*** | **Product** | **Factor*** |
| Express train path | 1.80 | Express train path | 1.65 |
| Long-distance regular-interval train path | 1.65 | Standard train path | 1.00 |
| Local regular-interval train path | 1.65 | No load train path | 0.65 |
| Economy train path | 1.00 | Feeder train path | 0.50 |
| No-load train path | 1.00 | | |

- basic price for route category is multiplied by product factor for track access charge

**Track access special factors**

| Special supplements | Factor applied |
|---|---|
| Applications for special trains | 1.10 multiplicative |
| Steam trains | 1.20 multiplicative |
| Out-of gauge trains | 1.50 multiplicative |
| Heavy haul freight trains | + up to specified amount EUR/train path-km |
| Tilting passenger trains | + specified amount EUR/train path-km |
| Regional supplements* | differs by region. |

* To improve cost-recovery of low density lines

The tariff system imposed by DB Netz (and approved by regulatory authorities) is designed partly to reflect the costs of providing and maintaining infrastructure, partly the level of performance provided by different standards of train path, partly their degree of utilization, and partly differences in market ability to pay between passenger and freight trains. Using the tariff tables, it is in principle very straightforward to calculate the tariff any Train Operating Company must pay for track access for a particular type of train

[51] Product and special factors are summarised as at 2008. See current brochure for any amendments.

service on a particular route. In practice DB Netz offers its customers use of an internet based tariff calculator to work it out.

**United States of America**

Privately negotiated track access agreements have a history as long as railways themselves. Early railway companies in most continents were regionally rather than nationally based. In the boundary areas in particular they had a strong incentive to come to agreement to use each other's tracks to reach major business origins and destinations that lay over their own company's boundaries.

Access by private contract is the predominant form in the World's biggest single freight railway market, the USA. In 2010 for example there were over 550 common carrier freight railways operating in the USA. They include seven major (Class 1) railways, 31 regional railways 314 local railways, 204 switching (shunting) and terminal railways, plus 2 Canadian railways operating in the USA. All the Class 1 railways and around 90 percent of the rest are privately-owned. United States Law does not give any legal rights of access of one freight railway company over the tracks of another freight railway company.[52]

However, under US Competition Law, railways have 'common carrier' obligations to freight customers. They must provide to customers routes and tariffs to move traffic from any origin to any destination on the railway network. If it is necessary for more than one railway to participate to complete the traffic movement the railways must interchange the traffic and establish a tariff for the total movement. However, as an alternative to interchanging the traffic, a railway can complete the movement with its own trains by entering into track access agreement with one or more other railway(s). Around 37,000 km of route operated by US railways is on track owned by another railway. That is equivalent to around a quarter of the total route-length of the network.

Agreements that set out the conditions and prices for use of another railway's infrastructure are known generically as ***'trackage agreements.***' They exist in many different forms. They can include agreements to use specifically defined sections of track, to use terminals, to use shunting yards, or to use 'haulage' (i.e. the locomotives and crews) of another railway entity. The agreements vary but will typically set out the services to be performed and the performance level agreed, (which will generally be an undertaking to provide the same level of service as the host railway provides to its own trains of the same type or volume - i.e. without discrimination). Any additional expenses borne by the host railway such as fueling costs, rollingstock repairs etc are charged back to the guest train operator at agreed rates.

For multi-year agreements there is often an indexation of tariffs based on cost indices maintained by the Association of American Railways (AAR). AAR's critical role in

[52] However, Amtrak, the (state-owned) long-distance passenger train operator in the USA has a legal right of access to specific routes of the freight railways, at regulated track access charges.

managing a range of technical and economic interfaces in the US railway industry is discussed in more detail in Section 3.

Most trackage agreements are mutually agreed between private companies, and are not subject to any form of external oversight or regulation. However, the US Surface Transportation Board (STB) does have regulatory jurisdiction over railways mergers (and other railway matters). Some railway trackage agreements have been required by the STC as a condition of approval of mergers between railways; or they have been pre-agreed by merging railways to forestall regulatory opposition to merger. Even so, the agreements themselves are typically privately negotiated between the parties.

Because these private agreements are undertaken by negotiation and for a wide variety of reasons, the terms and conditions vary widely. In most cases, access rights are reciprocal (Railway A gets access to B's tracks, B gets access to A's tracks). The access fees to be paid by each of the two railways involved then tend to be offsetting. As a result, relatively straightforward formulae are typically used (for example, a fixed price per wagon-km traveled on the 'host' network), but there are many different approaches used and no standard formula. Such private track access contracts also occur in Brazil and Mexico.