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## Summary Papers - Practitioners' Workshop - National Transport Development Policy Committee (NTDPC)

- Summary Paper on Highways
  - Summary Paper on Road Safety
  - Summary Paper on Urban Transport
    - Summary Paper on Railways
  - Summary Paper on PPPs in Transport
    - Summary Paper on Ports
  - Summary Paper on Inter-Modal Co-ordination
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# Summary Paper on Highways

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## Highways Overview and Issues Paper

**Kumares C. Sinha and Samuel Labi (Purdue University)**

**And**

**Clell Harral (Harral Winner Thomson Sharp Klein, Inc.)**

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# 1. Introduction

A set of six papers was prepared in June-July, 2011 on specific topics in the highway sector for the World Bank assistance to National Transport Development Policy Committee. The topics included the following:

- Cost effective standards for different type of roads
- Benchmarks based on traffic for widening of national highways vis-à-vis construction of expressways
- Institutional and regulatory framework for free movement of commercial vehicles through different states/provinces
- Policies to encourage energy efficient vehicles on the road
- Mechanism for direct charging for use of road and taxation policy
- Use of ITS to enhance the operational efficiency of the road network

The purpose of the exercise was to identify the international experience in these areas so that the lessons learned can be useful to the Committee in the preparation of the framework for long term development of comprehensive and sustainable highway transport infrastructure.

## 2. Design Standards

As the subject of highway standards is broad, an effort was made to seek insights into possible cost-effectiveness based on international experience on following specific areas: geometric elements; operational characteristics; pavements; and safety features. This was accomplished primarily through a comparative review of standards used in India and those in countries with well-developed highway facilities as well as in countries where a major expansion of highway infrastructure is in progress.

### *Geometric Elements*

The technical terminology for highway classification differs from country to country. For China and South Africa, multilane high-speed highways with full or limited access control are labeled Class I Highways and Expressways, respectively. In the United States and Canada, these highways are termed freeways or expressways; and principal arterials are highways with limited or no access control. In the United Kingdom, motorways are roads that have form, features, and function similar to those of freeways and expressways in the United States and Canada. The Indian Road Congress document IRC 73-1980 provides design standards for three classes characterized by different levels of access control, speed and function: (i) National and State Highways which are high speed, limited-access national highway corridors, (ii) State Highways, which are state corridors that connect with National Highways, and (iii) Major District Roads, which are significant arterials that provide mobility within districts and connectivity to State and National Highways.

**Design Speed and lane Width:** While design speeds for freeways in US and Canada and similar high quality highways in China, South Africa, and the United Kingdom range from a minimum of 80 km/h to a maximum of 120 km/h, design speeds on Indian National and State Highways are significantly less, ranging from 50 km/h to 100 km/h. The lane width standards in Indian National and State highways tend to be at the low end of the range used on freeways in South Africa and Motorways in the UK, but clearly less than those used in the US and China for comparable highway classes. Narrower lane widths reduce capacity and also increase potential for side swipe crashes.

**Shoulder and Median Widths:** While shoulder widths generally vary by highway class in other countries, as they should be, Indian shoulder widths are not only fixed, but they are also significantly less than those used in China, UK and US. Also, the international experience indicates that it is cost-effective for the shoulder to have a cross slope of 2% - 6% but not less than the main lane cross slope. In India, median width standards are substantially lower than those in the US. Most importantly, the Indian standards for median and shoulder widths do not appear to have been updated for many decades.

**Horizontal Curves and Superelevation:** Horizontal curve design, which affects vehicle safety, is influenced by the design speed and superelevation. The ranges of horizontal curve radii for Indian National and State Highways as well as for Major District Roads overlap with the low end of the ranges for similar classes in China, South Africa, UK and US. Superelevation, the rotation of the pavement at approaches to and through a horizontal curve, helps achieve vehicle stability by counteracting centrifugal forces produced while negotiating the curve. Standards in India are close to those in UK, but significantly lower than those in China, South Africa and the US.

**Vertical Curves:** Grade (the rate of change of highway vertical alignment) affects the speed and control of vehicles, particularly large trucks. In the countries studied, the observed design standards for vertical grades suggest an implicit compromise between cost and effectiveness, from the perspective of highway safety and operational effectiveness. Maximum vertical grades on Indian National and State Highways as well as on Major District Roads are in the range of 5 to 6%, higher

than the Chinese standards but comparable to US Freeways in mountainous terrain.

**Access Control:** Access control is used to enhance mobility and safety. Access-controlled highways have no traffic signals, intersections or property access. In all the countries studied, access control is rigidly enforced for all high class highways, through the provision of slip roads or ramps at interchanges to allow for acceleration/deceleration between the high class highway and adjoining roads. Unfortunately, many sections of Indian National Highways have no or little access control allowing pedestrians and two wheelers and thus causing a serious safety hazard and adversely affecting the overall mobility of the roads. With regard to non-motorized traffic, international experience has been unambiguous; standards do not allow the use of such vehicles on high speed roads, but duly accommodate them on lower classes of highways, particularly in urban areas.

**Sight Distance:** Sight distance is the key element of geometric design because of its safety consequences. The Stopping Sight Distance (SSD) is the distance traveled between the time the vehicle driver perceives a situation requiring a stop, and actual stopping. It is a function of driver reaction time and vehicle speed. The stopping sight distance standards in India are significantly less than in the UK or US, making Indian roads potentially less safe. The standards for overtaking sight distances for 2-lane, 2-way roads in India compare well with those in UK and US. However, in practice, this parameter is used for advisory purposes and its effectiveness depends entirely on driver compliance. Moreover, overtaking zones are not always well marked on Indian roads. Consequently, the stopping sight distance is a much more critical parameter and should receive careful attention in highway design.

#### **Innovations in Geometric Design:**

- **2+1 Road Sections:** A 2+1 road consists of two lanes dedicated to travel in opposite directions and a middle lane with alternating travel directions for the purpose of passing or turning. These roads involve either the new construction or the conversion of a 2-lane facility (single lane in each direction) to 3-lane facility in order to defer expansion to a 4-lane facility. Several European countries have already published standards on the design of 2+1 roads and have found their implementation to be highly cost-effective. For the 2000 km of two-lane highways that were converted to 2+1 roads in Sweden, analysis indicated fatalities reduced by 80% and severe injuries reduced by 50%, for both major rural and urban through roads (Bergh and Petersson, 2010).
- **Context Sensitive Design:** In many countries, both developed and developing, a growing trend is to inculcate flexibility in design guidelines to allow for creativity in addressing the site-specific project needs, including the natural and socio-cultural aspects of the highway environment. This is known as context-sensitive design and its use can be highly cost-effective.

#### Operational Standards

Operational standards are related to expected traffic performances expressed in terms of levels of service represented by density, speed, volume/capacity ratio and service flow rate. A review of the available information for China, U.K. , U.S. and India indicated that while China and US have explicit standards for freeways and multilane arterials, the Indian standards are vague in parts and do not provide details, leaving much to the interpretation of the users. Also, maximum service flow rates under various service levels are given in terms of daily rate for rural roads and in hourly rates for urban roads. For the purpose of ascertaining operational efficiencies, all service flow rates should be given as hourly rates, irrespective of the location of the highway. Also, many of the passenger car equivalencies in Indian standards do not appear to be up to date. For example, PCU values for two wheelers seem to be highly overestimated. Operational standards, including the PCU values for

various vehicle types are over 20 years old, and they require thorough updating to meet the needs of modern traffic.

**Pavement Design:**

**Surface Type Selection:** In selecting an appropriate pavement surface type for a given project, most countries consider a variety of factors: initial cost, life cycle cost, highway class, and truck traffic level, for example. Compared to asphaltic pavements, concrete pavements generally have higher initial costs and lower life cycle costs, and are often used for higher highway classes with higher levels of truck traffic. In many countries, the policy is that above a certain traffic level, concrete pavement is used. However, any arbitrary policy, such as the use of asphaltic surface for reconstruction of existing roads and concrete pavements for new roads, is not cost-effective, particularly if the pavement section has both new and existing alignments. In such cases, it will be necessary to deploy different sets of equipment, adding to the cost of construction. The trend worldwide is to use a life cycle cost analysis (LCCA) to select the pavement type on a case by case basis. In the United States, it is mandatory in many states to use LCCA for pavement type selection.

**Design Methodologies:** International experience for pavement standards is documented in design manuals such as AASHTO's Pavement Design Guides and Mechanistic-Empirical Pavement Design Guide (MEPDG), and TRRL's Road Note 31. In many countries, it is considered a good practice to carry out periodic laboratory testing and field observations to validate, the pavement designs. That way, the design methodology can be continually refined and/or the design parameters updated regularly to reflect better, the true existing characteristics of the traffic loading and material strengths.

**Concrete Pavements:** Some countries widely use jointed concrete slabs as standard practice; others use continuously-reinforced concrete. In most countries, the concrete pavement slab lies on a base layer that may comprise: an open-graded permeable aggregate; dense-graded hot mix asphalt (HMA); cement-stabilized aggregates with a separating layer of geotextile or thin HMA asphalt; or unstabilized aggregate.

**Flexible Pavements:** Using the pavement design procedures in the US, UK and India, total thicknesses of the surface and base course, for flexible pavements, under various traffic loading and subgrade soil strength, were estimated. This exercise suggested that the Indian standards generally appeared to be close to their US counterparts except at higher levels of axle loads. The Indian standards generally provided higher thicknesses than the UK standards under all load levels. A possible cause for the relative higher thicknesses given by Indian standards, at least with respect to UK standards, could be the anticipation of lower levels of future maintenance and the expected effects of excess, illegal loading, and rainfall. In some countries, the travel lane for multilane highways is designed thicker either because it is intended to be a truck lane by designation or because it is expected to have higher traffic volumes.

**Shoulder Paving:** For access-controlled high-speed highways, the international experience is to use hard (paved) shoulders. Wide, paved shoulders may be costly but they are effective for increased safety and capacity for high-speed highways. For lower highway classes, partly paved shoulders or unbounded aggregates or stabilized soil may be cost-effective. Our experience in the field indicates that the use of unstabilized non-granular soils for shoulders, particularly in areas of high rainfall intensity, is not a cost-effective practice due to erosion during the wet season and the need for frequent shoulder maintenance.

**Rehabilitation and Maintenance:** Since many of the existing roads in India have not followed any particular design and over time have been widened, overlaid, etc. without fundamental re-

examination of the subgrade, subbase and base courses, it is important that cost-effective design standards be developed for rehabilitation of such road pavements. The HDM software (Archondo – Callao, 2008) can be effectively used for this purpose.

**Safety Features:** In earlier sections, we discussed aspects of highway geometric design and operational standards that are related implicitly to highway user safety. In this section, we focus on explicit safety features and standards. Also, as a separate paper has been prepared on highway safety, we discuss only a few examples of safety features that have been found to be highly cost-effective.

**Longitudinal Rumble Strips**

*Longitudinal Rumble Strips:* There is a plethora of evidence in the literature that attests to the significant effectiveness of longitudinal rumble strips in reducing crashes for all highway classes, particularly for single vehicle run-off-road (SVROR) accidents for which driver inattention is the primary culprit. International experience has also shown that rumble strips are most effective when there is a wide, stable shoulder for recovery of errant vehicles. An important concern about rumble strip effectiveness is groove-filling, either by water or by sand. Raised designs, therefore, may be more cost-effective in some areas. In the U.S., with benefit/cost ratios between 30:1 and 60:1 or more, rumble strips have proven to be more cost-effective than many other substitute safety features, including guardrails, culvert-end treatments, and slope flattening on rural interstates (FHWA, 1991).

*Transverse Rumble Strips:* Transverse rumble strips are often used to warn drivers of approaching potentially hazardous situations where they need to slow down or stop, for example, intersections, toll plazas, lane-changing at work zones, changes in roadway alignment (such as sharp curves), etc. As a construction zone safety measure, the effectiveness of transverse rumble strips has been ambiguous in the U.S. However, as an approach stop-control crash reduction measure, they have proven successful both in the U.S. and in developing countries. In Ghana, rumble strips running across the entire carriageway at Suhum Junction on the main Accra-Kumasi highway reduced crashes by about 35% and fatalities by about 55% (Afukaar, 2003).

*Guardrails:* Guardrails are designed to prevent vehicles from leaving the roadway and crashing against solid roadside objects or falling into roadside ravines. Guardrails also keep vehicles upright after the crash by deflecting them along the guardrail. Guardrails are sometimes installed in medians to prevent head-on collisions with vehicles traveling in the opposite direction. The end design of a guardrail is a critical element of guardrail design standards. For most end designs, the effect will be to deflect, slow, or launch the vehicle.

#### *Pertinent Lessons for India: Design Standards*

*Lessons learned from a review of standards can be of great value in future highway planning and design activities in India. First and foremost lesson is that the standards are not static and they require periodic review and updating.*

- *Our field experience indicates that having standards does not necessarily mean that highways are always built to the stipulated characteristics. A safe and effective highway infrastructure requires careful monitoring of specifications and contract documents so that the standards are strictly followed. There could be a host of reasons for variations from design standards, including the lack of appropriate specifications at the design stage (often due to insufficient funds to pursue optimal standards), the nature of design practices, contractor inability to follow specifications, the quality of supervision, which is related, unfortunately, too often to corrupt practices.*
- *Findings from our review of the design standards in Indian Roads Congress codes suggest that they do not always explicitly indicate finer details for certain critical features associated*

*with geometrics, pavement, safety, and operations. The design of some of these features may be found in norms published by the government, while other features seem to be left to individual design consultants. This practice can result in the use of non-uniform standards even for similar highway designs – a confusing and potentially a hazardous situation for road users.*

- *For the design of a corridor of a given highway class, standards used for various elements of the highway are expected to be consistent throughout the corridor. This is because the strategic goal, or functionality, of any corridor depends not only on broad design features such as the number of lanes, lane width, curvature or vertical grade, but also on design details of associated features such as the location and design of under- and over-passes, service roads, and access controls.*
- *Corridors meant to serve high speed traffic are expected to have all elements and features designed for that strategic goal. For example, entrance and exit ramp curves at expressways should have radii appropriate for traffic conditions of the expressway, but these are not generally warranted for lower volume highways. There are both safety and cost consequences when design features are not consistent and different standards are mixed in the same corridor. In the end, the corridor fails to fulfill its strategic goals and the return from the investment is seriously affected. Similarly, a lower class highway should not have features applicable to expressways (this would be an unnecessary waste of resources). In many countries, public hearings are required before alignments and designs are approved. These hearings are excellent forums for revealing possible design inconsistencies.*
- *It is desirable to exercise sufficient flexibility during the design process to accommodate local conditions and needs without sacrificing safety and mobility of highway users. In most countries field tests and observations are carried out regularly so that the various standards can be continually refined and/or the design parameters updated to reflect better, the true existing characteristics of the local environment.*
- *Many countries are pursuing innovation in design approaches to achieve higher cost-effectiveness. The practice is to adopt, at least at an experimental level, a number of new design standards found to be highly cost-effective from international experience. The use of 2+1 design instead of 4-laning of 2-lane roads is an example of a possible innovative approach to widening under certain conditions. Innovations are also being pursued in other areas of highway design including pavements, operational standards and safety features.*
- *For high cost and large scale highway projects, a value engineering program is followed by many countries to determine cost-effectiveness of alternate design features. This exercise should take place as early as possible, preferably in the preliminary design phase, and should be used for scoping of project design elements. Such an approach has been found to provide considerable savings in countries, such as the U.S., U.K., Brazil, and, of course, India. The relevance of scoping and the use of value engineering exercises is particularly important in India in the current era as contract delivery processes continue to evolve from traditional contracts to design-build, warranty, and other contracts consistent with public private partnerships (PPPs).*
- *India was an early research leader in the area of highway value engineering, along with researchers in the UK, Kenya, Brazil, and the USA, all of whom worked closely with the World Bank to develop and locally validate the relationships that underlie the current Highway Development and Management Model (HDM-4). It is increasingly being implemented by various Indian states, particularly Gujarat and Maharashtra, and its use for major highway projects should be encouraged (Bandyopadhyay and Stankevich, 2010 and Harral et al., 2011). At the same time, as India's road conditions and its vehicle fleets are now beginning to change rapidly, an effort should be initiated to conduct research on the fundamental cost relationships across India's vehicle fleets, road characteristics, and*

*operating conditions to keep the key relationships in the HDM up to date. In determining research priorities, it should be borne in mind, as it was in the 1980s, that the operation of vehicles generates costs that are far higher compared to the costs of building and maintaining roads for all except the very lowest volume roads. Another area of critical importance is the economics of long haul transport vis-à-vis vehicle fleet characteristics, axle configuration and load regulations, initial design standard, and maintenance costs.*

- *Most operational standards used in India are outdated and need serious revision.*
- *Life-cycle costing tools, as provided by the HDM, are valuable not only for the choice of specific design standard (selection of the type of pavement materials and the thicknesses of the respective layers in the new pavement), but also for the evaluation of 8 subsequent maintenance scenarios associated with different designs, including the least-cost windows of opportunity for pavement strengthening and reconstruction (Harral et al., 2011).*
- *With regard to low volume roads, a typical life-cycle costing approach used for major roads may not be feasible. Instead, a multi-objective approach including such criteria as the provision of connectivity and basic access should be considered.*
- *Countries with an effective highway development program are increasingly using an asset management approach in making investment decisions over the life cycle of all highway asset types, pavements, bridges, safety features and the rest, in an integrated manner.*
- *Another area where the international experience is most relevant is in the design of safety features. A tremendous opportunity exists to improve road safety by adopting standards that have been found to be highly cost-effective in other countries. Work site safety measures during construction/maintenance also require serious attention.*

### 3. Traffic Benchmarks

Optimal timing of improvement remains a key issue in highway infrastructure development. Hastened upgrades or expansions can lead to waste of scarce resources, while deferred upgrades or expansions cause severe congestion and increased number of crashes, adversely affecting the environment and the economy. Our experience in highway planning procedures suggests that there are no set benchmark volumes. Instead, the feasibility study is the common approach to address the issue of timing for widening or constructing a new facility along a given arterial corridor. We have, however, explored possible alternative ways such benchmarks can be established.

#### *Benchmark Volumes Based on Design Standards*

**Design Traffic Volume:** Design traffic volume is the average daily traffic (ADT) projected to some future design year, which is typically 20 years into the future (TRB, 2000). With design traffic volume thresholds for arterials and expressways and traffic growth rates, the benchmark traffic volume of the base year for an arterial to be widened or to be upgraded can be estimated. For instance, in China, the minimum design traffic volume for both 6-lane arterials and 4-lane expressways is 25,000 pcu/day. If we assume the design year is the 20th year in the future and the traffic growth rate is 3% annually, then for an arterial to be widened to 6-lane or to be upgraded to an expressway, the base-year traffic volume should be at least 13,842 pcu/day. Thus, 14,000 pcu/day can serve as a benchmark traffic volume for that arterial to be widened or upgraded. Similarly, if the base-year traffic volume is greater than 34,000 pcu/day, it may be upgraded to an expressway since the traffic volume in the design year exceeds the maximum design volume for arterials, 55,000 pcu/day.

**Design Level of Service:** The level of service (LOS) reflects the operating conditions of the road in terms of traffic performance measures related to speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience (TRB, 2000). Design LOS is the minimum LOS that a highway should provide before it reaches its design year. In the U.S., there are six levels of LOS, from LOS A (least congested) to LOS F (most congested). Typically, there is a specified design LOS for each class of highway at the planning stage (AASHTO, 2004). In general, for both freeways and arterials in rural areas, the design LOS is B; while for urban areas, it is C. For expressways and Class I arterials in China, the LOS is Level 2 (MoC, 2003), which corresponds to Level C in the U.S. standard.

A highway can be considered for widening or upgrading if its actual LOS is worse than its design LOS. If the traffic distribution and the design LOS for an arterial are known, the benchmark traffic volume for an arterial to be widened or upgraded can be estimated. For instance, in China, the maximum service flow rate for a 4-lane Class I arterial with a design free-flow speed of 80 km/h under LOS Level 2 is 1050 pcu/h/ln. If the maximum hourly volume for rural facilities ranges between 16% to 30% of the ADT (AASHTO, 2004), then the corresponding benchmark traffic volume would range between from 14,000 pcu/day to 26,500 pcu/day. In India, the LOS B is recommended for the design LOS of major arterials. The design service volume under LOS B for 4-lane divided carriageways at plain area is 35,000 pcu/day to 40,000 pcu/day. Thus, if the existing traffic volume reaches 35,000 pcu/day, the arterial may be considered for widening or upgrading. It should be recognized that this method is an approximate approach to estimate benchmark volumes since the maximum service flow rate is just one of the critical factors that determine the LOS.

#### *The Use of Feasibility Study in Arterial Upgrading Decisions*

In most countries, a feasibility study, including comparison of alternatives, economic analysis, environmental impact assessment, and a financial feasibility analysis, is required for any major highway investment. A review of a number of feasibility studies, conducted in China and the U.S.,

indicated that, for similar highway upgrading projects, their base-year ADTs differed. This suggests that in practice, at least in China and the U.S., there are no benchmark volumes. While general guidelines could be established for traffic volume benchmarks for expansion/upgrade of major arterials based on design traffic volume and design level of service, it is still necessary to conduct a detailed feasibility study to evaluate possible alternatives in the context of all costs and consequences for a specific corridor.

A framework based on economic analysis was considered to determine the base-year traffic volume at which a specific arterial should be evaluated for widening or upgrading to an expressway using life-cycle cost analysis (LCCA) (Sinha and Labi, 2007). The equivalent uniform total annual life-cycle cost (EUAC) in perpetuity can be used to evaluate three alternatives: (1) Do-Nothing. (2) Widening. (3) A “Green Field” Expressway. The life cycle cost includes agency cost and user cost. Agency cost typically includes initial construction cost, rehabilitation cost, maintenance cost, operation cost, and reconstruction cost; while user cost includes vehicle operating cost (VOC), travel delay cost, and crash cost. The life-cycle cost associated with each alternative can be expressed as a function of base year traffic volumes. The breakeven points between each pair of alternatives can then be established as the benchmark traffic volumes when widening or upgrading can be feasible. The framework was tested using arterial corridor data from the state of Indiana in the U.S. and several rational assumptions (Sinha et al., 2011); the benchmark volume for a 4-lane arterial to be widened to 6-lane arterial on the same alignment was about 15,000 pcu/day. For constructing a parallel toll expressway, the benchmark volume was about 23,000 pcu/day. It should be recognized that benchmark volumes would vary from corridor to corridor and region to region, depending on the system data and the assumptions. Furthermore, the optimal timing for actual construction may not be the breakeven volume year. Instead, it should be the year in which the net present value is maximum (Bhandari and Sinha, 1979).

*Pertinent Lessons for India: Traffic Benchmarks*

*Decisions to widen or upgrade major arterials, such as national highways in India, depend primarily on the level of service being provided along with many other factors including existing traffic volume; number of intersections; their control types and cross traffic volumes; design traffic volume; design level of service; economic impact; land use and environmental impact; and social and political considerations. Existing traffic volume influences many of these factors, directly or indirectly, but cannot be the sole indicator for making decisions regarding widening or upgrading. Hence benchmark volume maybe used only as a trigger for further investigation and analysis.*

## 4. Interstate Movement of Commercial Vehicles

Free movement of commercial vehicles, including trucks and interstate buses, across states/provinces is essential for interstate trade and commerce. Free movement indicates that there are no barriers against travelling across jurisdictional boundaries. Appropriate regulatory and institutional frameworks are necessary to ensure free movement. These frameworks are generally established through reciprocity agreements among states/ provinces. Frameworks can be developed as bilateral reciprocity agreements between a pair of states, multilateral involving a group of states or universal covering all states/ provinces within a country or even a group of countries in a region. For obvious reasons, a universal agreement on regulatory and institutional frameworks is most desirable. Such an agreement substantially reduces the burden of paperwork for commercial vehicle operators as well as for governmental agencies.

In order to improve commercial vehicle productivity and to reduce interstate freight and passenger transport cost, interstate highway commercial vehicle movement should be seamless, in addition to being free flowing. Seamless travel means no or minimal wait as a vehicle travels across jurisdictions, and it can be achieved using emerging technologies and through mutual agreements among states/provinces.

### Objectives related to Interstate Movement of Highway Commercial Vehicles

Objectives can be both at the national and at the state level as discussed below:

- Interstate Trade and Commerce - It is a critical national objective as it is basic to economic growth and vitality. Lack of free-flowing and seamless freight movement across states can severely affect national economy.
- Commercial Vehicle Productivity - Less time and resources in travel through states can be directly translated to an increase in industry productivity. While this objective is generally applicable nationwide, it can also represent the goals of individual base states.
- Revenue Collection - Each state expects to collect its share of registration, fuel tax and other taxes and fees, if applicable to interstate commercial vehicles.
- Vehicle Safety - This objective is to minimize possible safety hazard while in transit due to defective equipment. A vehicle breakdown can also disrupt traffic flow causing delay.
- Driver Safety - Driver's safety on the road is salient to ensuring that the driver is in good health and in compliance with all necessary driving requirements.
- Community Welfare - Community safety, health and public welfare is another important objective. Possible crashes due to defective vehicles or impaired drivers and possible disruptions caused by spills of hazardous materials or excessive vehicle noise can severely affect the communities along the highway.
- Infrastructure Integrity - As heavy vehicles cause much damage to roads and bridges, there are concerns about overweight vehicles.

### Reciprocity Agreements

This section discusses the agreements or compacts allowing free-and-seamless highway freight

movement across states/provinces in North America. These agreements evolved over many years and can be considered “best practices.” While references are made to trucks, the agreements can be equally applicable to interstate buses, both private and quasi-public, where appropriate. We also cite rules and procedures from another geographically large country, Australia.

**International Registration Plan:** The international registration plan (IRP) is an agreement or compact which provides for registration reciprocity among states/provinces in North America. It represents the basic regulatory and institutional framework that permits interstate movement of commercial vehicles.

The IRP is managed by the states and provinces without any significant federal involvement. As of now, all continental states in the United States and all provinces in Canada are part of the plan. Mexico used to be part of the IRP but recently went out because of the inability of Mexican trucks to comply with safety and environmental requirements (IRP, 2011).

The plan was first created in the late 1960s and updated in the 1970s by representatives of the American Association of Motor Vehicle Administrators and representatives of the interstate motor carrier and truck rental and leasing industries. The updated plan was envisioned to replace the system of registration reciprocity through bilateral or a few multilateral agreements. Such a system was found to be inadequate in meeting the ever expanding needs of interstate and international commerce (IRP, 2011).

Under the plan, truck registration fees are collected by member jurisdictions and shared equitably. Equity is achieved when revenues collected from registration of trucks and carriers are shared among member jurisdictions on the basis of fleet miles operated in those jurisdictions. All registration fees are collected in a carrier's base state (IRP, 2011). The base state is that state in which the firm's main office is located or sometimes the state in which it operates the most. After paying the fees, the carrier receives one license plate from its base state and one cab card listing all the jurisdictions in which the carrier is registered. This system allows the carrier to operate in all jurisdictions in which it is registered (Sinha et al., 1983). The base states are responsible for the collection and distribution of fees from carriers to jurisdictions.

A truck registered under IRP will only display the one-registration plate issued by the base state. Without IRP an interstate carrier must install a backing plate showing decals or permits from the jurisdictions in which it operates or carry multiple plates or cab cards. The IRP provides an opportunity for improved productivity for trucking industry, as trucking firms could meet all of their registration obligations by going through proper registration in a base state. Firms would no longer have to register separately in member states. An added benefit from the plan is the increased flexibility of routing and scheduling that trucking firms would realize. This eventually results in more efficient trips.

International Registration Plan Incorporated (IRPI) is the official administrative body charged with responsibility for the duties required to administer the agreement in the US and Canada respectively. IRPI acts as the repository for the agreement, notify members of changes in agreement status, and provide interpretations of questions or policy procedures relevant to the agreement based on a three-fourths consensus of member jurisdictions.

Under the IRP, each member jurisdiction is expected to submit an annual report to the repository by March 1 of each year (IRP, 2011). The report is expected to detail each member's jurisdiction's plan activity for the past calendar year.

For the purposes mitigating invasion and cheating on the part of carriers, the base jurisdiction, where a carrier applies for registration under the IRP, audits on average 3% of the number of fleets registered annually under its jurisdiction. The carrier is expected to preserve all operational records on which the carrier's application was based up to 3 years after the close of the registration period. Failure to maintain such records and refusal to submit the operational records to the base jurisdiction 30 days after the request for records will result in a penalty. The penalty, called an assessment, is determined from the base jurisdiction's estimate of the carrier's true liability based on evidence provided by the carrier or available to the base jurisdiction from its own or other sources.

**The Case of Australia:** In Australia, the Federal Interstate Registration Scheme (FIRS) started in 1987 (DIT, 2011) to provide consistent charges and operating conditions for heavy vehicles engaged mainly in interstate operations. A vehicle registered under FIRS may not be used for intrastate work.

State and territory road transport authorities administer FIRS on behalf of the Australian Government. Registration of carriers must be done in a base state or province. Vehicle registration is subjected to the relevant Australian design rules and other standards. Like state registration, vehicles must comply with relevant performance requirements. FIRS vehicles must have compulsory third party insurance for the period of registration.

To eliminate inefficiencies resulting from inconsistent state and territory requirements, streamline the regulatory arrangements and reduce the compliance burden for trucking industry, and reduce transport costs of all heavy vehicles in Australia, an independent National Heavy Vehicle Regulator (NHVR) under the draft National Heavy Vehicle Law was established. The regulator will be responsible for regulating all heavy vehicles over 4.5 tonnes and will become operational in 2013. The law will help to mitigate the risk of heavy vehicles to public safety, reduce heavy vehicle damage to road infrastructure, and reduce the adverse effect of the operation of heavy vehicles on environment. The law would establish the federal heavy vehicle regulation, heavy vehicle registration scheme and a heavy vehicle licensing scheme (IA, 2011). The draft law has similarity with International Registration Plan (IRP) used in North America.

**International Fuel Tax Agreement:** Over the years, trucks were required to purchase fuel tax permits for operating in a particular state in the United States. This was because each state had its own fuel tax system for trucks. To ensure compliance, many states established ports of entry with the responsibility of issuing fuel tax permits and enforcement of fuel tax collection. This structure of collection was complex and cumbersome for both the states and the trucking industry. For example, trucks moving from state to state would need to carry a special plate on which each state's permit sticker was attached.

To simplify the reporting of motor fuel taxes for interstate carriers, the International Fuel Tax Agreement (IFTA) was adopted in 1996 (IFTA, 2011). IFTA is a reciprocity agreement, complementary to IRP, between member states and provincial jurisdictions.

Currently, the participating members are the states of the United States (except Alaska, Hawaii and District of Columbia), Canadian provinces (except Yukon and Northwest Territories) and none in the United Mexican States (IFTA, 2011). This agreement has the purpose of encouraging the most efficient use of the highway system by simplifying the administration of motor fuel use taxation for trucks across several jurisdictions. In order to meet the above goal, IFTA has an established arrangement where truck motor fuel use by carriers are reported quarterly to the base state and the amount of fuel tax paid in that quarter is distributed among participating members on the basis of fleet distance traveled in those member jurisdictions.

The advantages of using IFTA include the use of a single motor fuel tax license, use of one set of permit/decals that enables carriers to travel in all member jurisdictions; use of a single fuel tax report; the capacity to credit the fuel tax overpayment for one jurisdiction against the tax liability for another jurisdiction, which reduces or possibly eliminates a payment and ability to remit one check, or receive one refund from the base jurisdiction.

Like IRP, IFTA makes trucking trips efficient, enhancing productivity and increasing flexibility of routing and scheduling for the trucking industry, because trucking firms will only have to register in their base states. Furthermore, enforcement of trucking laws becomes easier to enforce because the cab card, which must be available at all times in the vehicle, provides all the information required by the law enforcement official. Information on the cab card includes vehicle type, fees paid, special restrictions, and any other information required by that jurisdiction.

In Australia, the federal government handles the fuel taxes and it does not therefore have an agreement similar to IFTA (DIT, 2006).

**Commercial Vehicle Operations Using ITS:** The use of intelligent transportation system (ITS) in commercial vehicle operations (CVO) can significantly enhance regulatory processes and this can make interstate truck movement seamless. To facilitate electronic business transactions between motor carriers, state agencies and other parties, the U.S. Federal Motor Carrier Safety Administration (FMCSA) designed the commercial vehicle information system and networks (CVISN) as a component of the CVO. Electronic registration and permitting at state agencies allows carriers to register online, decreasing the turn-around time associated with permit approval. Also the electronic processing of driver and vehicle safety information can eliminate or minimize inspection and enforcement requests at state borders. A commercial vehicle can thus travel seamlessly through state boundaries once it is inspected and cleared at the origin state and the information is electronically transmitted to other states along the proposed trip.

The CVISN program includes a collection of information systems and communications networks that support CVO. These systems and networks include information systems owned and operated by governments, motor carriers, and other parties.

As of now, only about 20 states have completed core deployment of CVISN and are working on expanding the core capability. About 30 states and the District of Columbia are in the process of deploying the core capability. A few more states are in the process of planning and design of their core CVISN capability.

Electronic screening promotes safety and efficiency for commercial vehicle operators. Trucks equipped with low-cost, in-vehicle transponders can communicate with check stations. Communication equipment at the roadside can automatically query regulatory data as trucks approach these stations and issue a red or green light on in-vehicle transponders, so drivers know whether to continue on the mainline (bypass) or report to the station for possible inspection. The ITS/CVO will streamline not only administrative aspects of interstate highway freight movement, but will also provide much benefit to the trucking industry, improving its productivity and thus adding to increased economic activity.

*Pertinent Lessons for India: Interstate Movement of Commercial Vehicles*

*Bilateral agreements between two adjacent states or multilateral agreements among a number of states in a region can provide the reciprocity necessary for base state commercial vehicles to freely travel within the states included in the agreement. However, in a deregulated market, commercial vehicles have the opportunity to do business in a much larger network and bilateral or even*

*multilateral agreements are insufficient. A universal reciprocity arrangement that is agreed between all jurisdictions and the commercial vehicle industry is more effective in ensuring free-flowing and seamless transport throughout a country or even a multi-national region.*

*An important element of both the IRP and IFTA is that it has been organized by the trucking industry and states with minimal federal involvement. While IFTA is a rather recent arrangement, the IRP has been around for many decades and it has worked well. It is a mature framework that can be used as an example to other countries and regions.*

*With the increasing use of ITS technologies in commercial vehicle operations, ITS/CVO, is emerging as an agreement among states and provinces with the capability to eliminate or minimize the need for inspection and enforcement by states of such requirements as driver and vehicle safety and other requirements by inspectors in downstream states once the base or origin state has already done necessary inspections and transmitted the information to the ITS/CVO system. Ultimately, ITS/CVO might perhaps serve as a part of an all-purpose reciprocity agreement that would take care of registration, fuel and other taxes and fees as well as make sure that all necessary compliance requirements are met. When the CVO becomes fully functional in its current framework and state agencies as well as the commercial vehicle industry become comfortable with its use, CVO could automate all functions of registration, fuel tax collection and enforcement of safety and other requirements. Until that happens, both the IRP and IFTA provide possible frameworks for reciprocity among states/provinces allowing free interstate highway commercial vehicle movement.*

*Frameworks reviewed are voluntary agreements among individual state agencies and the industry. It is important that the appropriate state agencies realize that there are substantial benefits in such a compact. The commercial vehicle industry must also be convinced of the monetary savings such an arrangement can provide. Both the state agencies and the industry therefore need to be organized and be sufficiently informed. The national government typically provides only guidance and serves as a facilitator.*

*It would be advisable to start with the basic permitting process and registration as the initial reciprocity agreement. Once that system is in place and operating smoothly, other items can be added to the compact.*

*As all the agreements discussed in the paper would require the travel and route data of trucking firms, there may be issues regarding privacy of business data. Appropriate measures must be made to protect commercial data and privacy and the trucking firms must feel convinced that such measures are sufficient.*

*For CVO, there will be some upfront costs for both state agencies and commercial vehicle operators. If there are many small firms with limited resources, it may not be feasible for them to join in such a compact. State agencies must also consider the benefits and costs.*

*ITS/CVO can be an effective means to accomplish the objectives of a Corridor Management System.*

*For the implementation of any reciprocity agreement with appropriate enforcement provisions, the cooperation of state agencies will be of paramount importance. Agencies will include not only those responsible for registration and permits, but also law enforcement agencies. In order to minimize threats to implementation, countries have also undertaken careful outreach programs.*

## 5. Policies to Encourage Energy Efficient Vehicles on the Road

A large number of energy efficiency initiatives with strong financial rates of return remain unimplemented in the world at large, but especially in developing countries and emerging markets (Taylor et al., 2008). Policies may be intended for at least one of the following objectives (i) to improve the energy efficiency of existing vehicles (ii) to encourage the purchase of fuel efficient vehicles, and (iii) to improve the operational efficiency of existing on-road vehicles.

The issues of vehicle fuel efficiency and GHG, or more specifically, CO<sub>2</sub> emissions are intertwined. Some countries have adopted policies with primary emphasis on GHG or CO<sub>2</sub> reductions, while others have targeted the improvement of fuel efficiency as the starting point. We have considered policies and measures that have been found effective in achieving both vehicle fuel efficiency improvement as well as reduction of CO<sub>2</sub> emissions. To accomplish this dual-objective, some countries have chosen to have mandatory fuel efficiency standards as the main measure to reduce fuel consumption and thus to reduce CO<sub>2</sub> emissions (probably on the assumption that the rebound effect is minimal), while other countries have used fuel prices and user fees as a means to encourage the use of fuel efficient vehicles and thus to reduce fuel consumption and CO<sub>2</sub> emissions.

### Mechanisms for Policy Options

There are five core areas where international experience provides examples that might be helpful to consider: financial measures; regulatory standards; inspection and maintenance program; public outreach; and traffic management. They have been applied in various forms, in a number of countries, including the US, UK, Canada, Australia, Japan, China, Singapore, Hong Kong, and South Korea (Onoda, 2008; APEC, 2009; IEA, 2009, Kojima and Ryan, 2010).

**Financial Incentives and Disincentives:** Initiatives involving financial measures can be grouped under the following mechanisms:

- Differential taxes and charges based on fuel efficiency or greenhouse gas emissions (or proxies such as engine size or vehicle weight).
- ‘Feebates’ - a set of fees (surcharges) for fuel-inefficient old vehicles and rebates for the purchase of new fuel efficient vehicles, based on fuel-efficiency, GHG emission (CO<sub>2</sub>) performance of the vehicle.
- Internalization of the external costs of highway energy consumption by increasing fuel taxes.
- Subsidies for purchasing alternative fuel vehicles or for converting traditional fuel vehicles to alternative fuel vehicles.
- Support to manufacturers to develop vehicles that use alternative fuels.
- Support for research and development into existing fuel enhancement and new fuel technologies.
- Mandate government agencies to purchase hybrid, alternative fuel, or efficient vehicles for agency fleets

**Regulatory Standards for Vehicle Fuel Efficiency:** In countries where regulatory standards for vehicle fuel efficiency have been used, it has been in the form of one or more of the following specific mechanisms:

- Foster mandatory vehicle fuel efficiency or CO<sub>2</sub> emission standards.
- Establishing automotive industry agreements on fuel efficiency and adaptation of efficient and innovative vehicle technology.

- Improve on-road fuel efficiency of vehicles by focusing on energy efficiency of non-engine components (generally not considered in official fuel efficiency tests), including tires, cooling technologies, and lighting systems.
- Developing and enforcing standards on imported or used vehicles.
- Vehicle efficiency labels/ratings at point of sale/purchase.
- Implement fuel efficiency standards for heavy duty vehicles
- Provide a mandate that two- and three-wheeled vehicles, a large source of petroleum fuel consumption and air pollution, should be retrofitted with modern engine improvements and alternative fuels that enhance energy efficiency and reduce emissions.

**Inspection and Maintenance Programs:** Inspection and maintenance (I/M) programs are a common initiative in many countries to promote greater fuel efficiency and ensure that vehicles meet emissions standards. I/M programs have been implemented through a variety of specific mechanisms such as:

- Enforcing operational efficiency of used vehicles through periodic inspection and maintenance programs.
- Mandatory vehicle emissions inspection, targeted primarily to local air quality.
- Encouraging the retirement of old vehicles through both mandatory and voluntary programs.

The enforcement of periodic inspection and maintenance requirements has been accomplished as a part of annual registration process or the use of windshield decals indicating compliance. In the U.S., universal I/M programs were discontinued after public complaints and are currently administered only in metropolitan areas that are not in compliance with EPA air quality standards. Some countries have experienced that I/M programs can become burdensome requirements for vehicle owners and thus can lead to evasion and attendant corruption.

**Public Outreach and Awareness Programs:** The mechanisms of public awareness campaigns, through billboards, television, print media, radio, and in-vehicle systems, have included the following:

- Provision of information to car purchasers on vehicle performance, e.g. fuel consumption labelling on vehicles, including fuel consumption data in vehicle advertisements.
- Standards/labelling requirements for non-engine components, such as tires, cooling units and lighting, etc., which impact on fuel consumption.
- Communicating the range of operational efficiency of vehicles and its monetary significance to consumers/drivers, such as in-car feedback instruments for eco-driving.
- Heavy vehicle environmental rating scheme.

**Highway Traffic Management:** Policy initiatives in this area are directed at minimizing stop-and-go operations and frequent speed changes. Fuel efficiency can be improved if a relatively smooth traffic flow can be maintained. Many countries are in the process of pursuing the following:

- Implement intelligent transportation systems in order to minimize delay and idling.
- Rapid incident detection and clearance at low capacity highways
- Improve highway, street, and intersection design standards that foster smooth flow of traffic.
- Adopt demand management programs.
- Add physical capacity by adding lanes, bypasses, or other improvements.

*Costs and Effectiveness of Policy Implementation*

ATC (2008) referred to a report from European Conference of Ministers of Transport (ECMT, 2006)

that indicated that while all policy options were effective albeit at different degrees, financial incentives and disincentives had the greatest impact in terms of outcomes related to energy efficiency. Automotive industry agreements on the fuel efficiency of new cars was ranked second highest in terms of impact, restructuring of vehicle taxation into a differential tax system was ranked third and improving on-road fuel efficiency through consumer awareness campaign was ranked fourth highest. Initiatives to promote eco-driving, i.e., fuel efficient driving, particularly through training programs for both car and truck drivers, were found to offer significant cost-effective savings while fuel efficiency feedback devices in vehicle's (e.g., shift indicator lights and tire pressure monitors) also proved effective.

The cost of implementation can vary widely across the different types of initiatives and also across countries. In many cases, the largest expense item is the cost of administering the initiative. Public outreach and information dissemination costs can be significant for print and electronic media but can be lower when online resources, such as websites, are used. Also, apart from the costs incurred by the government, other costs may fall on consumers.

A number of developing countries, including Malaysia, Indonesia, Peru, Mexico, Philippines, Thailand, and Vietnam, have policies to encourage energy-efficient vehicles on roads. However, their main focus is to increase the energy efficiency of the existing vehicles by traffic demand management techniques and by inspection and maintenance program (APEC, 2009).

*Pertinent Lessons for India: Policies to encourage energy efficient vehicles on the road*

- *Policies can be targeted to existing vehicles, new vehicles or existing on-road vehicles.*
- *There are five core policy areas: financial measures; standards; inspection and maintenance; public outreach; and traffic management.*
- *Issues of vehicle fuel efficiency and GHG emissions are intertwined. Some countries have chosen mandatory fuel efficiency standards as the starting point to accomplish both objectives, while other countries have used pricing as the primary focus.*
- *Financial measures, involving incentives and disincentives, were found to have the greatest impact.*
- *Possible barriers to implementation, identified in Table 1, are pertinent as India considers available options to encourage energy efficient vehicles on the road.*

Table 1: Barriers to Implementing Vehicle Energy Efficiency Initiatives

<b>Barrier</b>	<b>Examples</b>
<b>Market</b>	- Market organization and price distortions prevent customers from appraising the true value of energy efficiency. - Split incentive problems created when investors cannot capture the benefits of improved efficiency. - Transaction costs (policy or measure implementation costs are high relative to expected benefits).
<b>Financial</b>	- Up-front costs and dispersed benefits discourage consumers from buying new vehicles - Vehicle manufacturers' perception of energy-efficiency investments as complicated and risky, with high transaction costs
<b>Information and Awareness</b>	- Lack of sufficient information and understanding, on the part of consumers, to make rational consumption and investment decisions.
<b>Regulatory and institutional</b>	- Incentive/ disincentive structures are not at a level to affect consumer behavior - Institutional bias towards supply-side investments.
<b>Technical</b>	- Lack of affordable energy efficiency technologies suitable to local conditions.

Barrier	Examples
	- Insufficient capacities to identify, develop, implement and maintain energy-efficiency investments.
<b>Cultural</b>	- Lack of institutional structures to closely monitor existing and new inspection and maintenance initiatives to reduce the possibility of corruption and evasion.

*Adapted from: Energy Efficiency Governance Handbook ([http://www.iea.org/papers/2010/gov\\_handbook.pdf](http://www.iea.org/papers/2010/gov_handbook.pdf))*

## 6. Mechanisms for Direct Charging

Most countries have long used indirect highway user fees primarily through fuel taxes as the main source of revenue for highway construction and preservation. In recent years the sustainability of fuel tax based financing has been questioned as fuel efficiencies are increasing and vehicles with alternative energy are being encouraged, causing serious decline in highway funding. In addition, fuel taxes are often considered as too low, and tax structures are distorted, economically inefficient, and inequitable; leading to excessive road use, particularly in urban areas. China, India and other countries involved in major highway infrastructure development are now increasingly using direct user charging, primarily through tolling.

### Direct User Charge Mechanisms

In addition to tolling, there are various other mechanisms of charging for road use, including distance and/or weight based charges, as presented in Table 2. They can be used not only to generate revenue, but also to satisfy other policy goals— e.g. to reduce congestion, to lower energy consumption, air pollution and GHG emissions. Direct road user charges may also be used to facilitate a shift in the distribution of travel modes; for example, to improve the ridership and thus the financial situation of public bus or rail services, or even to modify the fraction of motorized to non-motorized traffic in a specific geographical area. Thus, DUC can helpfully lead to shifts of some vehicle traffic to other times of day, routes, and/or modes, depending on policy objectives. Direct user charging can at the same time help governments ensure greater equity in highway cost allocation, particularly by internalizing the principal externalities (congestion, air pollution, noise) of private road vehicles more closely than they are by the typical indirect taxes on fuel or vehicle registrations. Indeed, in the case of Singapore, the most important example of road pricing yet implemented, Willoughby (2000) argues that direct charges to reduce congestion have gone beyond road cost recovery to help reduce the level of other taxes typically seen in public finance, which would have created greater economic distortions.

Table 2: Direct Charging Mechanisms and Objectives

<b>Name</b>	<b>Description</b>	<b>Objectives</b>
Road Toll	A fixed fee for using a specific road at a specific time.	To generate revenue.
Congestion Pricing (Time-Variable)	Fixed or variable fee for road use at a specific time. Variable fees are generally higher at congested areas/corridors and at peak periods.	To reduce traffic congestion, maximize throughputs, and generate revenue.
Cordon Fees	Fees charged for driving in a particular area of a highway network, typically, a central business district.	To reduce congestion in major urban centers, improve road service characteristics, and generate revenues.
Hot Lanes	An HOV lane that allows use by a limited number of low-occupancy vehicles for a fee.	To reduce congestion at general-purpose lanes, offer improved service for a fee, and generate revenue.
Distance- Or Weight-Based Fees	Fee based on the number of miles a vehicle is driven, or the number of miles a certain weight is hauled.	To encourage efficient road use, including inter-modal allocation, and generate revenue.
Road Space Rationing	Revenue-neutral credits used to ration peak-period roadway capacity.	To reduce severe congestion at urban centers or major roadways.

*References: VTPI, 2010; ICCT, 2010; Goodwin, 1997*

**Direct-User Charge Mechanisms – Dimensions:** Mechanisms of direct user charging can be reviewed using several parameters: the highway **facility type** or coverage for which the fee is charged; the **point** at which payment is made; the **quantitative basis** for the charge; and the **technology** applied to collect the payment. *The highway facility type or coverage for the DUC* may be a general toll highway, tunnel, or bridge; a toll lane dedicated to special vehicles such as trucks, commercial vehicles, or low-occupancy vehicles; a highway earmarked for major rehabilitation or expansion, designated express lanes; or a cordoned urban area (Dornan and March, 2005). Traditionally, toll collection mechanisms involve payment at a point, barrier, or cordon for entry to a particular highway facility, such as a road, bridge, or tunnel.

**The quantitative basis for the charge:** Direct-user charges may be distance-based (the user fee is directly related to the length of facility used, such as VMT fee or weight-distance fee for trucks; time-based (user fee is directly related to the time spent using the facility); or instance- or point-based (user is charged for each use of the facility, regardless of the length of time or extent of system used). Differences in the charge basis translate into differences in technology used, e.g., manual or low-tech equipment is typically used for instance-based charging. Using more sophisticated electronics, toll collection systems may charge by metering time or distance, or some combination of instance, time, distance, and weight.

**Technology used to implement the direct charge:** Direct charging can be paid using off-vehicle or in-vehicle systems or some combination of the two. For each of these, one or more technologies are typically used (Table 3). The lowest technology is a simple windshield display and manual monitoring to ensure compliance; this was the method used for more than 20 years in the pioneering case of Singapore (Menon and Keong, 1998). Enforcement mechanisms may include police enforcement in the area or corridor of direct charging or manual collection at toll booths. More advanced technologies commonly used today include electronic payment, artificial intelligence-based automatic vehicle detection that reads license plates, and the use of global positioning systems (GPS). These technologies generally provide greater user convenience and greater flexibility to adjust user prices, but can also have higher installation cost for the agency and the users.

Table 3: DUC Fee Collection – Technology/Equipment Options (VTPI, 2010)

	<b>Description</b>	<b>Equipment Cost</b>	<b>Operating Cost</b>	<b>User Inconvenience</b>	<b>Price Adjustability</b>
Windscreen-Display Pass	Motorists must purchase a pass to enter a cordoned area or to use a highway.	Low	Low	Medium	Poor to medium
Manual Payment Booth	Motorists stop and pay at a booth.	High	High	High	Medium to high
Electronic Payment	An electronic system bills users as they pass a specified point in the road system.	High	Medium	Low	High
Optical Vehicle Recognition	An optical system bills users as they pass a point in the road system.	High	Medium	Low	High
Global Positioning System (GPS)	GPS is used to track vehicle locations/distance traveled. Data automatically transmitted to central computer that bills user.	High	Medium	Low	High

### Costs of DUC Implementation

Estimated collection costs as a fraction of toll revenues are: 21% in Singapore, 22% for the Stockholm Trial, and 50–60% for London (Palma and Lindsey, 2011). For the proposed cordon in San Francisco, high-level estimates are \$45 million for operating costs, \$20 million for capital amortization, and \$145 million for revenues after discounts (San Francisco County Transportation Authority, 2010) implying a cost-to-revenue ratio of 45%.

Compared to area-based urban schemes, operating costs as a fraction of revenues are lower for the Heavy Goods Vehicles (HGV) schemes in Europe: 4% for Switzerland, 9% for Austria, and 16% for Germany (Broaddus and Gertz, 2008). These lower percentages are attributable in part to the relatively high per-kilometer fee that trucks pay and the long distances they travel. The costs of satellite-based regional or national schemes that cover all vehicles are even harder to estimate - especially since the costs are sensitive to technology choice (Glaister and Graham, 2008). The total capital cost alone for the United States is estimated to be approximately \$10 billion (NSTIFC, 2009). Palma and Lindsey (2011) reported that the Dutch government had set a goal to limit administrative costs for the Dutch Mobility Plan to 5% of revenues.

### Benefits of DUC

Limited evidence suggests that well-designed schemes can yield significant net economic benefits. Small et al. (2006) estimated the benefits from tolling a two-lane facility similar to State Route 91 (SR-91) HOT lanes in Orange County, California where it was found that optimal tolling of both lanes yielded a gain of nearly \$3 per trip. Moreover, operating one lane as a HOT lane and leaving the other lane free yielded a gain of \$2.25 per trip (Palma and Lindsey, 2011).

Transport for London (2008) in its sixth annual report, stated that estimated gross annual benefit of the original London congestion pricing scheme stood at £ 268 million (\$418 million), while total costs were £ 131 million (\$204 million), resulting in **a net benefit of £ 137 million (\$214 million) and a benefit–cost ratio of 2.04**. Stockholm’s congestion pricing scheme began as a 7-month trial in 2007 and, after a successful referendum, became permanent in 2007. Based on results of the trial, Eliasson (2009) estimated annual benefits net of operating costs to be about SEK 650 million/year (\$94 million) and investment and startup costs of about 1.9 billion SEK (\$275 million) yielding a social surplus **pay-off period of only 4 years**. Singapore’s Electronic Road Pricing has not been put to a comprehensive benefit–cost test, but the system is widely held as a successful model. (Palma and Lindsey, 2011)

The Puget Sound Regional Council in the state of Washington in the United States considered several direct user charging alternatives for its long-range transportation plan, ranging from HOT lanes, tolling of the entire freeway network with and without variable pricing, and implementation of a regional VMT (vehicle miles of travel) fee. The analysis found the VMT fee alternative to be most cost-effective. This alternative would also provide the highest emission reduction benefits (FHWA, 2011).

### Possible Adverse Effects of DUC

A recent study of congestion pricing by the United States Congressional Budget Office (CBO, 2009) noted a number of possible adverse effects including distributional effects, congestion on alternative routes, transaction costs, and implementation difficulties. It was also noted that a key factor that hinders the adoption of congestion pricing is the concern about the distribution of benefits between high-income and low-income road users.

The cost of collecting charges and the cost of highway users’ wait times are significant

disadvantages. Advanced automation technologies have helped overcome these challenges. However, implementation difficulties, such as determining appropriate congestion charges, adopting charges that fully reflect the cost of congestion, and maintaining data confidentiality, still pose a challenge to decision makers.

### Country Case Synopses

As mentioned earlier, Singapore was first to implement direct user charging for road use in 1975. Electronic toll collection (ERP) was introduced in 1998 making the system capable of automatically imposing a demand-sensitive congestion toll on every vehicle without requiring drivers to slow or stop. Privacy and billing issues were overcome by using less intrusive systems with automatic toll collection. Motorists insert a CashCard into the In-vehicle Unit (IU) when they are on the road. The IU costs about \$90 and is installed in front of the driver's seat. The IU is programmed to connect to the computers on the toll gantries and the dynamic toll is automatically deducted. Charges are based on vehicle type. Enforcement is strict. Entry into restricted zones without appropriate CashCards attracts a fine of \$40 and violating vehicles are ticketed. The automated system, while helping prevent bribery and forgery of CashCards, nevertheless has limitations that are of concern to the general public. For example, CashCards must be placed into the IU at least 10 minutes before the first gantry to properly communicate with gantry computers. To address this problem, plans are being considered for introducing intelligent ERP-compatible vehicles that facilitate the direct charging process. Officials have recognized the need for continuous upgrades of the system so ERP performance can be sustained.

Following Singapore, various road pricing schemes in several countries, including Norway, Sweden, the United States, and United Kingdom have been developed, but none yet implemented or has gone as far as Singapore in employing the road pricing tool to shape its total transportation and land use environment. In Norway, the city of Bergen implemented a cordon charge for entering the central area in 1986, and Oslo and a number of smaller Norwegian cities followed suit. However, charges were low and mainly intended to raise money for investment in transport infrastructure. Subsequent schemes in London (in 2003) and Stockholm (in 2006) were designed primarily to reduce congestion. London experienced traffic volume and congestion reductions of 18% and 30%, respectively. Stockholm achieved a 20% reduction in traffic. Implemented as a trial, DUC was made permanent following a narrow victory in a referendum of Stockholm residents.

A number of other countries have implemented schemes that involve direct-user charging. These include pricing for express lanes in the United States and for heavy vehicles in Austria, Germany, and Switzerland. However, the Netherlands is the only country that has seriously considered nationwide implementation of comprehensive road use pricing (<http://www.internationaltransportforum.org/jtrc/RoundTables/RTfeb10vanWortel.pdf>) to supplant traditional road transport tax structures, but the fall of its coalition government in February 2010 (primarily over unrelated issues concerning overseas military commitments) led to the stillbirth of the proposal, and it is not clear that the scheme will regain political support sufficient to enable its enactment.

Over the past few years, several other major DUC proposals have been aborted due to public outcry or political opposition. Examples include the cordon tolling schemes for Edinburgh and Manchester that were rejected by public referenda in 2005 and 2008, respectively; and an online petition to the UK government in early 2007 that attracted more than 1.8 million signatures opposed to road pricing. These developments effectively terminated plans for a national scheme in the UK, at least for now. In New York City, a proposed cordon toll plan was stopped in its tracks by the New York state legislature in April, 2008, when it declined to vote on the proposal.

### Pertinent Lessons for India: Direct Charges

*The review of international experience shows that while direct user charges can be a tightrope walk for a government, a successful DUC scheme can be established with adequate planning, public relations, and consideration of stakeholder perspectives. To effectively preempt the threats or to overcome them as they arise, it can be useful to consider the following (Hau, 1992; World Bank, 2004; March, 2005; FHWA, 2010 and 2011; Palma and Lindsey, 2011):*

- *Prior to the implementation of direct charges, it is desirable to conduct an appropriate large-scale demonstration project, if one does not exist already, in order to cultivate and nurture public acceptance, confidence and trust in the system.*
- *While implementation of direct user charging using manual tollbooths may be relatively less expensive, particularly in countries with low wages, manual tollbooths may render the system prone to possible corruption.*
- *Ideally, the charges should be dynamic and thus should be different for peak and off-peak periods. Prices at any time should be displayed boldly several miles prior to the entry of the facility. Average prices for peak and non-peak periods should be advertised in the media.*
- *Effective systems for users to select either manual or electronic toll payment.*
- *Incentives for users to choose electronic tolling can be useful.*
- *A transparent system of collection and disbursement of funds from the direct-user charging scheme improves the confidence of the general public.*
- *Linking the pricing structure to the benefits received by the user contributes to public acceptance and helps avoid the potential negative impacts of traffic diversion.*
- *Public outreach and communications are key components of the program at every stage: before making the implementation decision, during the program design process, and during the operational phase.*
- *Open-source system design offers long-term advantages by leveraging market competition to manage implementation and operations costs, ensure system flexibility and scalability, and establish a foundation for system interoperability.*
- *Interoperability among local areas is recognized as a critical issue.*
- *Equity and privacy concerns can be addressed through exemptions, revenue use, technology, and business rules.*
- *Direct-user charging through toll roads is well established and there is generally a sufficient level of public acceptance. However, area-wide distance-based user charges or such mechanisms as HOT lanes are relatively new concepts and do not always enjoy public support. Also, while weight-distance charges are being implemented for heavy commercial vehicles in Europe, the trucking industry in the United States has been strongly opposed to such schemes, making implementation difficult, if not impossible.*

## 7. Use of ITS to Enhance the Operational Efficiency of the Road Network

Intelligent Transportation Systems (ITS) represent applications of emerging information and communication technologies to improve the operational aspects of highway transportation. ITS has been deployed by many countries to provide a number of services including the provision of real-time information to drivers to assist them in choosing the optimal mode or route, electronic toll collection, prompt detection and clearance of incidents, quick provision of relevant traffic or administrative information to vehicles of all types (emergency, commercial, transit, construction and maintenance, and general), security monitoring, and parking management. ITS is known to improve safety, mobility, and the quality of service and highway operations in general, and reduce environmental impacts (Sinha and Li, 2000).

### ITS Technologies

ITS technologies, which can be categorized into hardware, software, and networking protocols and systems, include surveillance (sensors and detectors), communications (wirelines or wireless), traveler interface, control strategies, navigation/guidance, and data processing (Cassidy and Sinha, 1991). Common modes of communication include fiber-optic or wire lines, cellular phones, satellite transmission, and infrared and microwave transmission. For travelers, interfaces include variable message signs, touch screen, keypad/keyboard, voice recognition, voice output, cell phone screens, and head-up displays in vehicles. Control technologies may include traffic signals and navigation/guidance systems. For data processing, technologies include traffic assignment and route selection algorithms, driver/vehicle/cargo scheduling systems, and real-time prediction models for traffic conditions (Sinha and Li, 2000).

### Focus Areas of Its Application

Based on the experience of ITS deployment around the world in the past few decades, it is our judgment that the following three broad application areas have the greatest potential to improve the operational efficiency and safety of highway systems such as India's. Listed below are areas and their respective sub-areas: (1) Advanced Traffic Management Systems (ATMS) which includes Incident Management, Electronic Toll Collection, Arterial Management, and Traffic Demand Management; (2) Advanced Traveler Information Systems (ATIS) which includes Variable Message Signs, Internet/Mobile applications, and Call Centers, and (3) Commercial Vehicle Operations (CVO) involving Credentials Administration, Safety Assurance, Electronic Screening, Carrier Operations and Fleet Management, and Security Operations.

### **Advanced Traffic Management Systems**

**Incident Management:** These encompass surveillance and communication technologies that help decrease the times required for incident detection, response, and clearance. Automatic incident detection systems have been deployed in countries worldwide including the United States, Europe, South Korea, and Malaysia, often as part of an overall system for advanced freeway management. Features of incident management include Call centers, Call-ins, and highway or freeway service patrols. The cost-effectiveness of service patrols is high (4.6:1 to 42:1, average 13.3:1 (Baird, 2008)).

**Electronic Toll Collection (ETC) Systems:** ETC consists of a system of hardware, software, and computer networks that work together to electronically charge the accounts of registered passing vehicles often without requiring them to stop at the toll booth. Enforcement of ETC systems is accomplished using a transponder mounted on vehicle window or bumper; a gantry-mounted antennae or tag reader that communicates with the transponder of the passing vehicle to verify and

collect payment. ETC is now widely deployed worldwide.

A review of experiences worldwide indicates a large variation in the techniques for enforcing ETC. At some agencies, non-paying vehicles are captured by a camera and subsequently receive a fine or a notice giving them a number of days (often, 1 week) to pay the toll otherwise pay a fine. Others use police patrols at toll gates. This has been found to be effective but expensive (and thus impractical) on a continuous basis. To reduce the cost of police patrols, certain countries use only random police presence at toll gates. At other agencies, violators are prevented physically from proceeding. The speed at the ETC lane is controlled to low speeds, and a physical barrier, such as a gate arm, ensures that only paying vehicles pass through the toll booth.

**Arterial Management Systems:** These primarily involve the use of Adaptive Traffic Control Systems (ATCS) that optimize signal timing based on detected traffic volume and thus, reduce in intersection delay (Martin et al., 2003).

**Travel Demand Management Systems:** Demand management systems include a wide variety of intelligent applications that focus on managing fluctuations in demand for travel in order to minimize congestion, such as ramp metering, managed lanes, temporary shoulder use and speed harmonization. There are various types of managed lanes including High Occupancy Vehicle (HOV) lanes and High Occupancy Toll (HOT) lanes.

#### **Advanced Traffic Information Systems**

Advanced Traveler Information Systems (ATIS) provide real-time information on traffic conditions to travelers prior to, and during their trip (FHWA, 1997). Technologies that are typically used in ATIS include (Stephanedes, 2003) navigation and route guidance systems, communication networks that transmit traffic information, variable message signs (VMS), call centers, vehicle-built hazard warning systems, and internet and mobile applications.

#### **Commercial Vehicle Operations**

The role of ITS in commercial vehicle operations (CVO) is critical to the productivity and efficiency of the trucking and interstate busing industry and to economic development in general. ITS applications in CVO are designed to enhance commercial vehicle safety, communication between carriers and agency, fleet management, and facilitate regulatory processes. At this time, deployment of such systems in developing countries has been rare. Principal reasons are the cost and complexity associated with the logistics of installing individual vehicles with appropriate technologies and the extensive administrative procedures needed for the entire deployment. Nevertheless, the benefits of ITS deployment in CVO can be very significant. It can be, therefore, worthwhile to develop a long range implementation plan to deploy ITS in CVO.

#### *ITS in Transitional and Developing Countries*

**The Experience of China:** The Chinese authorities have invested heavily in the development of ITS; in 2009, 1,063 ITS projects worth \$33M were under way throughout the country. These projects include law enforcement and traffic management in the National Trunk Highway System, a national ETC network, adoptive traffic signals (SCATS) in some major metropolitan areas, and the use of SCOOT in Beijing to control 2-wheeler and motor vehicle traffic. Regarding Commercial Vehicle Operations, although China has the highest port productivity in the world and trucks are the main means of moving freight to ports, “enforcement of the standard vehicle configuration regulation is weak, and integration of technology into trucking operations appears to be limited” (Cole et al., 2008).

**The Experience of Malaysia:** One of the most advanced highway management systems in Southeast

Asia is the Integrated Transport Information System (ITIS) for Klang Valley, Malaysia, which started operating in 2005. Malaysia's ITIS has two basic components: the Advanced Traffic Management System (ATMS) and the Advanced Traveler Information System (ATIS). In spite of the promising architecture of this system, it has been argued that integrated network management has not been effective. The reasons given are that the multiplicity of administering agencies has led to localized distribution of data and information and because there is a lack of collaboration among public and private agencies (Hossain, 2007). Malaysia is also one of the first countries in Southeast Asia to deploy electronic financial transaction systems on its expressways network in 1994.

**The Experience of Thailand:** The Bangkok Area Traffic Control (ATC) project installed SCOOT in 1994 to tackle congestion and subsequently expanded to include intersections in the Bangkok downtown perimeter areas. Although adaptive traffic management systems have proven to be successful in developed countries, their effectiveness in the developing world seems to be equivocal. In Bangkok, SCOOT is turned off during the peak period in favor of fixed-time or manual control because the traffic enforcement officials believe that the use of SCOOT tends to exacerbate traffic congestion at those times of the day (Jansuwan and Narupiti, 2005).

**The Experience of South Korea:** South Korea's ITS Master Plan involves a \$3.2 billion investment from 2007 to 2020 (\$230 million on average per year). It has been estimated that the deployment of advanced traffic management systems has led to annual savings of \$109 million in terms of safety, travel time and environmental pollution. The advanced traveler information systems provided an annual savings of \$136 million (Ezell, 2010) and the total savings from Hi-Pass toll collection system in the Korean expressways is expected to be approximately \$1.2 billion over a ten-year period (KEC, 2008).

**The Experience of Brazil:** An extensive real-time traffic control system is operating in Sao Paulo Metropolitan Region area for about two decades along with stationary speed control and vehicle identification devices that can also enforce truck restriction in certain corridors. In a bid to decrease traffic crashes, Brazil has installed, since 1995, loop detectors, radars and cameras in rural areas and intelligent speed humps and red-light enforcement systems in urban areas. An evaluation study for the cities of Brasilia, Sao Luis, and Londrina, showed reductions of crash injuries by 19% to 98% and crash fatalities by 7% to 83% (Cannell and Gold, 2001). Since 1994, a system that uses GPS technology (OmniSAT) has been widely used in Brazil for freight tracking; the system offers immediate communication between the vehicle and the control center. There is anecdotal evidence that this has led to increased security and productivity in the country's freight industry (Yokota, 2004c).

**The Experience of South Africa:** ITS projects in South Africa include urban traffic control, public transport (electronic ticketing, automatic vehicle location), and electronic toll collection (Vanderschuren, 2006), as well as an incident management system on freeways and ramp metering. The results indicated that the ramp metering implementation led to a 44.5% increase in speed and a 29.5% decrease in journey time on average (Mkhize and Thomas, 2005). Carolus (2002) compared the benefit/cost ratio of a specific physical investment (lane addition) and an ITS project comprising deployment of VMS, CCTV surveillance cameras, incident detection equipment, and a control center in the city of Cape Town. The ITS project indicated a higher cost-effectiveness compared to the physical improvement project.

**The Experience of India:** Large cities in India have also initiated the use of ITS technologies to deal with traffic congestion and safety problems. For example, an adaptive traffic control system has been deployed in Delhi using SCOOT. At Pune, the installation of Composite Signal Control Strategy (CoSiCoSt) at road junctions led to reduction in average delay by 11-30% and increase in average

speed by 2-12% (Muralidharan and Ravikumar, 2007). With regard to Electronic Financial Transaction Systems, the Ministry of Road Transport and Highways announced on July, 2010 the adoption of passive Radio Frequency Identification technology for electronic toll collection on national highways. The adoption of this technology is expected to ensure seamless travel across the country and also plug leakages in the toll collection system. Moreover, a prepaid system for toll collection is also under consideration, and vehicles recharge their accounts periodically. Upon passing through a toll plaza, the account gets debited with the applicable amount. The implementation of the new system is expected to begin in May 2012.

*Pertinent Lessons for India: Use of ITS*

*Intelligent Transportation Systems (ITS) has been deployed successfully in a number of developed countries and the cost-effectiveness of these initiatives has been evident in both developed and developing countries. Purposes for which ITS have been deployed generally include freeway/highway management, urban traffic management, and for provision of real-time information to travelers. As most of these systems have started operating relatively recently in developing countries, their long-term effectiveness is yet to be ascertained although some early indications are evident. Outcomes of evaluation studies from these countries, as well as evidence from the U.S., Europe and Japan, where such systems have reached some degree of maturity, suggest that the following lessons can be derived for possible future directions:*

- *The on-going advances in information and communication technologies continue to lower the cost of ITS deployment (Yokota, 2004b).*
- *As the road network in many developing countries is now being built or expanded, ITS can be installed at the same time that the road infrastructure is constructed, thus avoiding the extra cost of retrofitting to accommodate ITS technologies at a later time when they are needed (Yokota, 2004b).*
- *In countries where the institutional frameworks and physical infrastructure are currently being developed, a phased approach is desirable for ITS implementation*
- *Low-cost incident management systems, such as freeway/highway service patrols and call centres are the most cost-effective ITS deployed worldwide, as they combine low cost of system acquisition and operation. For many developing countries with very high numbers and rates of traffic fatalities, service patrols and call centres can be very effective of ITS in reducing the number of fatalities and the occurrence of secondary incidents.*
- *ETC systems, where they have been applied, have provided significant benefits in terms of congestion reduction, particularly at toll roads passing through metropolitan areas, and ensure transaction security.*
- *Adaptive Traffic Control Systems, initially designed and developed in Europe, U.S. and Australia for traffic conditions that do not resemble the conditions faced in developing countries, have been equivocal in their benefits. As such, these technologies must be reviewed carefully before they are adopted. The cost of these systems is high, and their effectiveness can be considered moderate, and depends on the congestion level (for example, in Bangkok, where the congestion level is very high, adaptive traffic control has no or negative effects).*
- *Demand management strategies and technologies are largely deployed by Europe and the U.S. but are still not widely applied in developing countries, probably because of the larger scale and design complexity of these systems.*
- *CVO seamless travel across state boundaries has significant potential in not only enhancing of governmental roles in commercial vehicle administration, safety, and security; but also for improving the private sector's management and monitoring of commercial vehicle fleets, industry productivity, and ultimately, enhanced economic development.*
- *Lack of collaboration among public or private organizations is one of the reasons for relatively less successful ITS deployments. The problem is further exacerbated when the*

*system architecture is sophisticated and operation is complex. This suggests that an initially simple ITS architecture and gradual phasing-in of ITS components is preferable.*

- *The complex undertaking of ITS development and deployment must be preceded by a thorough inventory of the existing transportation system supply coupled with a candid assessment of the institutional, technological, and human resource capacities of the implementing agency (Yokota, 2004).*
- *A public awareness program for ITS can be helpful, as demonstrated in countries in Europe, Asia, and Latin America.*

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# Summary Paper on Road Safety

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Improving Road Safety Performance: Lessons from  
International Experience

**Tony Bliss and Jeanne Breen**

**February 2012**

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## Nomenclature

The term **results focus** is used in this paper to describe a country's ambition to improve its road safety performance and the means agreed to achieve this ambition. In its ultimate expression it concerns a strategic orientation that links all actual and potential interventions with safety results, analyzes what can be achieved over time, and sets out a performance management framework for the delivery of interventions and their intermediate and final outcomes.

**Final outcomes** can be expressed as a long-term vision of the future safety of the road traffic system (e.g. as in Vision Zero in Sweden or Sustainable Safety in the Netherlands) and as short to medium-term targets expressed in terms of social costs, fatalities and serious injuries in absolute terms, and also in terms of fatal and serious injury rates per capita, vehicle and traffic volume.

**Intermediate outcomes** are linked to improvements in final outcomes. Typical measures include average traffic speeds, the proportion of drunk drivers in fatal and serious injury crashes, safety belt wearing rates, helmet wearing rates, and safety ratings of the vehicle fleet and road network.

## Disclaimer

This paper has been prepared by the Bank's consultants, Tony Bliss and Jeanne Breen. It draws heavily on the road safety management framework presented in the Bank's country road safety guidelines for the conduct of road safety management capacity reviews and the specification of lead agency reforms, investment strategies and Safe System projects.<sup>1</sup> It has also been guided by the findings and recommendations of the recent OECD review of road safety strategies in good practice countries which promote the same results focus for the management of road safety performance over the coming decades for high-income and low and middle-income countries alike.<sup>2 3</sup> However, any findings, interpretations and conclusions expressed herein are those of the authors and do not necessarily reflect the views of the World Bank. Neither the World Bank nor the authors guarantee the accuracy of any data or other information contained in this publication and accept no responsibility whatsoever for any consequence of their use. The Paper does not endorse any specific country model as being applicable to India.

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<sup>1</sup> Bliss T & Breen J (2009). *Implementing the Recommendations of the World Report on Road Traffic Injury Prevention. Country guidelines for the Conduct of Road Safety Management Capacity Reviews and the Specification of Lead Agency Reforms, Investment Strategies and Safe System Projects*, World Bank Global Road Safety Facility, Washington DC.

<sup>2</sup> OECD, International Transport Forum (2008). *Towards Zero. Ambitious Road Safety Targets and the Safe System Approach*, Joint Transport Research Centre, OECD/ITF, Paris.

<sup>3</sup> Exploring good practice that best reflects the evolving results focus on eliminating road deaths and serious injuries means that this report does not cover successes over recent decades achieved in low and middle-income countries that may be of interest to the National Transport Policy Development Committee. For example, countries such as Poland and Chile have demonstrated elements of the good practices discussed in this report, but these are less well documented in terms of quantified assessments of performance gains achieved. More information could be sought on country experience that more closely reflect India's current development status, but for the purposes of this report the emphasis has been placed on generic aspects of good road safety management practice which merit further attention.

# 1. Introduction

This Resource Paper has been prepared by the World Bank for the National Transport 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. This paper focuses on the issues of managing road safety performance in a context of rapid motorization and diverse and vulnerable road user groups that reflects the situation in fast growing economies.

Road safety is a high-profile development priority for India that demands immediate and sustained action. Road fatalities in low and middle-income countries are projected to increase by more than 80% over the first two decades of the 21st century, whereas high-income countries are expected to show continuous fatality reductions. The outlook is ominous for India, as road fatalities in the South Asia region are projected to increase by 144% over this period.

Over the next 20 years India must meet the challenges of bringing its road trauma sustainably under control, if it is to avoid the fatalistic pathway taken by high-income countries during the 20th century, where for far too long road deaths and injuries were accepted as an inevitable price of economic growth and traded off for mobility gains. To contribute to the achievement of the ambitious Decade of Action goal the South Asia region must account for 20% of the desired results, with India being responsible for 80% of the 2020 regional target.

Road safety innovation in India will be crucial to success, as it will be difficult to justify the adoption of safety measures and associated standards and rules that historically lacked effectiveness in high-income countries. *Positive steps to address India's road safety crisis have already been taken to map out a pathway ahead, but much remains to be done.*

While the essential dimensions of good practice transport policy frameworks can be identified, economic, social, cultural and historical factors shape the development of national transport systems and the unique characteristics of country settings are influential in determining policies and performance outcomes. The design and delivery of an effective road safety strategy for India must address these challenges. Hence this Resource Paper focuses on the generic elements of good practice and indicates countries that could merit closer scrutiny in the context of the policy deliberations of the National Transport Development Policy Committee.

## 2. Good practice transport policy frameworks

Good practice regional and national transport policy frameworks address all modes and related factors influencing their sustainability, including road safety. Countries with the safest road networks have systematic policies and institutional arrangements in place that cover all elements of the road safety management system which can be viewed as a production process with three interrelated levels: institutional management functions which produce interventions that in turn produce results. Opportunities for efficient and effective public private partnerships are evident across all elements of this system, although these are not well documented in the literature and would require field investigations to explore their performance in depth. The elements of good practice covered in this Resource Paper include:

- ***Sustainable transport goals:*** Good practice regional and national transport policy frameworks address all modes and related factors influencing their sustainability, including road safety. *Improving road safety is a growing transport sector priority, as reflected in the strategic goal statements of good practice countries (e.g. European Union, Sweden, United Kingdom, United States, etc.).* There has also been a growing recognition in transport policy formulation of the importance of aligning road safety priorities with other sustainable development goals, especially those for urban areas, to capture the associated co-benefits of integrated initiatives. Further, the increasingly adopted safe, clean and affordable mobility goals for transport policy at national and international levels are challenging the status quo and seeking integrated solutions that address competing societal goals.<sup>4</sup>
- ***Road safety management system:*** Countries with the safest road networks have systematic policies and institutional arrangements in place that cover all elements of the road safety management system which can be viewed as a production process with three interrelated levels: institutional management functions which produce interventions, which in turn produce results. In building national road safety management capacity, the sequencing of initiatives is vital to sustainable success. It is important to avoid promoting good practice interventions without also considering their means of implementation.
- ***Public private partnerships:*** Opportunities for efficient and effective public private partnerships are evident across all elements of the road safety management system, although these are not well documented in the literature and would require field investigations to explore their performance in depth. In the case of the planning, design, operation and use of the road network, contractual incentives can be created for private road operators to provide safe services. Post-crash services concerning the recovery and rehabilitation of road crash victims are also amenable to public private partnerships within the broader health sector framework as demonstrated in some of the Indian States in relation to services improving access to the emergency medical system. The Resource Paper provides examples of efficient and effective public private partnerships for road safety (e.g. national road safety advertising, back office speed camera support, vehicle certification and testing services, driver licensing and testing services).

### *Issues and Lessons for India*

*While the essential dimensions of good practice transport policy frameworks can be identified, economic, social, cultural and historical factors shape the development of national transport systems*

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<sup>4</sup> World Bank (2008). *Safe, Clean and Affordable Transport for Development: The World Bank Group's Transport Business Strategy for 2008 – 2012*, Transport Sector Board, Washington DC.

*and the unique characteristics of country settings are influential in determining policies and performance outcomes. The design and delivery of an effective road safety strategy for India must address these challenges. For example in two of the world's best performing road safety countries, the United Kingdom and the Netherlands, the Ministry of Transport directs the overall transport sector strategy and related policy making, as well as playing the lead agency role for road safety but this is not to suggest that arrangements like this would necessarily be appropriate in India.*

*Clearly it is useful to closely examine the lessons that could be learned from good practice countries. However, to benchmark institutional responsibilities and accountabilities for road safety performance against the practices of countries like the United Kingdom and the Netherlands it would first be necessary to establish a baseline understanding of the current legal, institutional and regulatory frameworks governing the transport sector in the India, as well as taking account of the risks faced by its diverse road user group and communities impacted upon in the road environment. It is only with this knowledge that meaningful lessons can be learned from good practice countries. Hence this Resource Paper focuses on the generic elements of good practice and indicates countries that could merit closer scrutiny in the context of the policy deliberations of the National Transport Development Policy Committee.*

### 3. Critical success factors

This Resource Paper identifies factors critical to the success of effective national strategies and programs. In particular, it identifies the following as critical success factors:

- **Lead agency accountability:** Countries that perform well have lead agencies directing the national road safety effort and being transparently held to account for overall road safety performance. While lead agencies may not have direct responsibility for the delivery of key road safety interventions they are usually legally empowered to make strategic policy decisions, manage resources and coordinate efforts across all participating sectors of government, the private sector and NGO community.
- **Ambitious vision and performance targets:** The road safety results focus of good practice countries has evolved over the last 50 years and become driven by scientific principles, targeting of programs, increasingly ambitious goals and accountability for performance. *A new frontier has been defined for the safety performance of roads and increasingly this is being reflected in the vision statements of countries and related regional bodies (examples provided in the Resource Paper include OECD, Sweden, Western Australia, EU Council of Ministers, New Zealand, etc.).* Successive strengthening of road safety governance and policy-making can be traced through the evolution of the results focus in high-income countries over the last 50 years culminating in the *Safe System* goal of eliminating road crash deaths and serious injuries. The tools and accumulated practices used to support the results management framework for the *Safe System* approach are the same as those used in the past to prepare and implement targeted national plans, but the interventions are now shaped by the ultimate level of ambition with innovation becoming a priority to achieve results. *The Resource Paper provides examples of interim quantitative targets in OECD countries, e.g. Australia, European Union, Finland, New Zealand, etc.)*
- **Integrated evidence-based interventions:** Good practice countries are characterized by their implementation of integrated packages of road safety interventions that address all elements of the road traffic system and have demonstrated significant performance gains. Interventions are shaped to achieve the desired focus on results and they address the safe planning, design, operation and use of the road network; the entry and exit of vehicles, users and commercial operators to this network; and the recovery of crash victims and their rehabilitation; and they specify standards and rules to achieve this safety and seek compliance with them. A country's current level of performance, stage of economic development, rate of growth and institutional road safety management capacity can influence the effectiveness and efficiency of its interventions. Yet it is also clear that irrespective of the broader parameters identified, where good practice countries have conducted comprehensive assessments of past and projected performance, three broad categories of interventions are responsible for the bulk of the safety gains made or to be made.
- **Sustainable funding and rigorous investment screening:** Long-term funding commitments and use of rational resource allocation tools are essential features of road safety management systems in good practice countries. Effective road safety programs require considerable investments to be sustained over decades and the level funding required is often not recognized or underestimated. Various mechanisms for securing and allocating road safety investment funds can be identified, but there are no preferred models for this and with some exceptions in good practice countries road safety programs are generally funded within the

broader public sector budgeting process. *Examples of safety funding and resource allocation models in good practice countries include earmarked funding for Safe System road safety engineering, earmarked taxes and insurance levies, road funds and road safety funds, and resource allocation frameworks.*

- ***Devolution of service delivery:*** Good practice countries devolve responsibility for the delivery of road safety interventions to the appropriate levels of government, business and the wider community, within a robust performance management framework. While the devolution of road safety service delivery arrangements is not well documented in the literature, especially for countries like India with Federal systems, it is still evident that good practice requires this to be addressed within an overall strategic framework that sets out a clear vision and performance targets and related responsibilities for all partners concerned. *This Resource Paper provides examples of national, regional and local service delivery e.g. establishing a legal duty for road safety at regional and local levels, requiring regional and local targets within a national target framework, regional and local coordination, amongst others.*
- ***High-level coordination:*** Coordination structures and processes in good practice countries are focused on targeted results and work actively and regularly to contribute to their achievement. Coordination structures must reflect the institutional frameworks of the country concerned, but good practice models suggest that these should engage at four fundamental levels: the ministerial level, the agency head level, the agency senior management level, and the broader business and community partnership level. The core working relationships should be between the senior management and agency head levels, with active consultation with business and community partners, and regular reporting to the ministerial level. Examples of good practice models for this can be found in the World Bank guidelines.<sup>5</sup>
- ***Robust performance monitoring of outputs and outcomes:*** High quality performance data are available and accessible on a regular basis in good practice countries to underpin the nationwide management of road safety results. Such data are crucial and their collection and distribution require substantial investments in surveys, systems and analysis tools on a sustained basis. *This Resource Paper provides examples of performance measures collected and used in good practice countries, categorized in terms of risk exposure measures, final and intermediate outcome measures and intervention output measures.* Intermediate outcome measures are of great importance as they can be linked to final outcomes and are more easily gathered on a reliable basis than fatality and injury data. They are particularly useful for the setting of measurable targets and tracking of performance.
- ***Ex-post evaluation and independent peer review:*** Road safety interventions in good practice countries are subjected to ongoing scrutiny and evaluation to assess their performance and contribution to the achievement of program goals and objectives. Linked to the collection of high quality exposure, output and outcomes data is the constant review and questioning of results, periodically supported by more objective evaluations at suitable multi-year intervals to assess the effectiveness and efficiency of key policies and programs. Independent peer

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<sup>5</sup> Bliss T & Breen J (2009). *Implementing the Recommendations of the World Report on Road Traffic Injury Prevention. Country guidelines for the Conduct of Road Safety Management Capacity Reviews and the Specification of Lead Agency Reforms, Investment Strategies and Safe System Projects*, World Bank Global Road Safety Facility, Washington DC. See Annex 2, pages 82 – 99.

reviews have assisted this process and injected new energy and insights into country efforts to improve their road safety performance. Such evaluations and peer reviews in good practice countries serve to emphasize the open and scientific approach taken to road safety management and undercut the tendency for policies and programs to be shaped by public and political opinion rather than the evidence that can be gathered through objective monitoring, evaluation and peer review processes.

- ***Maintaining program momentum with new and intensified measures:*** Good practice countries recognize the need to continuously introduce new and intensified road safety measures to overcome increasing exposure to risk, diminishing returns in existing programs and the emergence of new risks previously not encountered. In the face of rapid motorization and sustained traffic growth there can be no easing off in policy and program efforts if the goal is to keep reducing road deaths and injuries, as even if risks can be reduced and maintained at a lower level growing exposure to these risks will see deaths and injuries pulled back upwards. Account must also be taken of shifts in traffic mixes and new technologies introducing new risks that must be countered.
- ***Research and development and knowledge transfer:*** Research and development and knowledge transfer is central to the success of good practice countries and underpins their continuous improvement in results. There has been a long history of scientific road safety research and successful transfer of the knowledge gained in leading road safety countries and it has been a highly visible feature of their road safety strategies and programs. The sustainability and independence of this research function has been important to its success, as has its linkages with the conduct of demonstration projects to support the development of innovative measures to improve road safety results. Nevertheless, it is still possible to credibly conduct effective research with in-house capacity, provided it is well resourced and tasked with seeking objective scientific results. *This Resource Paper provides examples of research and development and knowledge transfer, viz. independent research carried out in Australia and the Netherlands, in-house research capacity in Great Britain, and Safe System demonstration projects and guidelines in Sweden, the Netherlands and State administrations in Australia.*

#### *Issues and Lessons for India*

*It is a remarkable fact that over the last three or four decades high-income countries have continuously improved their road safety results and India is now facing this challenge. The best performing countries continue to impress with sustained innovation overcoming the diminishing returns setting in with cumulative interventions over time, ongoing traffic growth and changing traffic conditions. For example, with its road toll trending down below three deaths per 100,000 people Sweden leads the way and remains on track to achieve its long-term goal of eliminating deaths and serious injuries on its roads. The United Kingdom and the Netherlands have shown similar results. Sustained performance gains like this demonstrate that road deaths and injuries are predictable and preventable and it is possible in retrospect to identify factors critical to the success of effective national strategies and programs.*

## 4. Building road safety management capacity

**Long-term, whole of government view:** Good practice countries plan ahead for substantial road safety performance gains to be made over periods of at least a decade and beyond and engage all relevant government agencies and partners and stakeholders in the planning and delivery processes. It is important that a long-term, whole of government view is developed to recognize and accept the intergenerational nature of road safety planning and ongoing commitment required from all parties responsible for achieving success.

**Learning by doing:** To overcome the barriers presented in India by weak road safety management capacity the successful introduction of new road safety strategies and programs requires a staged process to investment and policymaking that is grounded in a ‘learning by doing’ process. An example of this approach is provided by the World Bank’s shift to *Safe System* road safety projects which aim to anchor country capacity building efforts in systematic, multisectoral, measurable and accountable investment programs that simultaneously build management and policymaking capacity while rapidly achieving improved safety results in targeted high-risk corridors and areas.

A crucial feature is that their management arrangements are designed to strengthen the vital lead agency contribution to directing and sustaining the production of improved road safety results and maximize the potential for the lead agency to rapidly assert itself in this role and build its national road safety management capacity accordingly. *Examples of building road safety management capacity for China and Argentina are provided.*

**Targeting the network:** To produce rapid results roads safety programs must target high concentrations of crash deaths and injuries in the road network where the biggest gains can be made. This is a pragmatic view that avoids the problems associated with spreading road safety efforts too thinly and diluting the potential for early success, especially when delivery capacity on the ground is weak. *This Resource Paper provides examples of high return investments made by countries such as Sweden, the Netherlands, the US, New Zealand and Australia.*

### Issues and Lessons for India

*Countries experiencing poor road safety performance cannot expect to quickly emulate the road safety management capacity evident in good practice countries, as this has been built up over decades of accumulated experience and evidence. Given what is now understood about factors critical to success, however, it is possible for India to make safety improvements more rapidly than high-income countries achieved during the first century of motorization. The fatalistic view that road deaths and injuries are inevitable and simply the fault of the victims must be rejected, as is the case now in good practice countries. Discussions concerning specific road safety interventions must be extended to include their systematic means of delivery, as without strong capacity to achieve this proven good practice interventions will fail.*

*By way of conclusion this Resource Paper outlines key elements of the approach being promoted by the World Bank to address this urgent and high priority issue. A central issue for India is how to accelerate the process of shifting from weak to strong institutional management capacity to govern improved road safety performance on a sustainable basis. Guidance for the way ahead in India can be found in the World Bank’s shift to “Safe System” road safety projects which aim to anchor country capacity building efforts in systematic, measurable and accountable investment programs that simultaneously build management and policymaking capacity while rapidly achieving improved safety results in targeted high-risk corridors and areas.*

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# Summary Paper on Urban Transport

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Urban Transport Overview and Issues Paper

**Ken Gwilliam**

**February 2012**

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# **1. Introduction**

In response to the terms of reference for the World Bank assistance to NTDPC draft versions of six specific topic papers have been prepared. These were discussed at a meeting with the full committee on July 18. In addition to suggesting some changes and clarification in the topic papers the group requested that they should be accompanied by an overview paper. That paper should identify the major issues which have been faced by cities in other rapidly growing low and middle income countries and assess the effectiveness of the measures which had been adopted to address these issues. This paper responds to that request, cross referencing the treatment of the issues in the six topic papers and a separate case study paper, and dwelling in a little more detail on issues not covered in the topic papers.

## 2. Issue identification – the representative city

Each city has its own distinct history, characteristics and problems. But for the purposes of identifying and structuring the discussion of the major issues we have combined them in a description of a prototypical low income developing city. Within this description we highlight the specific problems which are presented in more detail in the succeeding sections.

The starting point in our prototype city is a process of rural to urban migration which puts pressure on the existing settlement capacity. Migrants are usually very poor and forced to settle at the cheapest possible locations, either on the peripheries of cities, where public transport facilities are poorest, or at very high densities in urban slums. These settlements not only involve social problems but also create transport pressures of various kinds. The first issue to be faced is thus that of *managing land development*.

A consequence of low incomes, of the indigent population as well as of immigrants from rural areas, there is initially a high dependence on non-motorized transport – walking for the very poorest and possibly cycling for those who can afford a bicycle. But as incomes increase more people will wish to use motorized transport – initially public and eventually personalized. As movements use a range of modes traffic becomes increasingly mixed. This process generates four inter-related problems.

First, there is a *road safety* problem. It is well established that as the number of motor vehicles per capita increase the fatality and injury accident numbers increase. While accidents per vehicle tend to fall with increasing vehicle population fatalities and injury accidents per capita of population increase. India is on the cusp of this trend.

Second, there is the problem of *facilitating non-motorized transport* which is in danger of being driven out by safety concerns. A kind of “forced motorization” is already occurring in many countries, appears to be at risk in some Indian cities

Third, there is a problem of traffic *management* which becomes particularly acute when there is a wide mix of modes. Few developing country cities have a well-developed traffic management function, which often lies entirely in the hands of the police.

As income growth progresses more and more people aspire to private motorized transportation. Initially the most affordable form available will be the motorcycle which is affordable and flexible. In cities like Hanoi and Kuala Lumpur this has already usurped the role of the pedal cycle and offered levels of private motorized vehicle ownership comparable to those of western cities with income levels several times higher. But it has three disadvantages of being relatively unsafe, environmentally damaging, and also being a precursor of a level of private automobile ownership and use which is not sustainable on available road space. There therefore develops a multi-faceted problem of *policy for the motorcycle*.

The development of motorized public transport has often been initially a private sector response to perceived demand for faster and more comfortable movement than can be achieved by walking or cycling. Initially this is often based on whatever type of vehicle can most economically be procured or converted for passenger carriage. This intermediate public transport is often the most advanced mode which is affordable to large sections of the community. But within mixed traffic systems IPT is often seen as a major impediment to flows, both because of the low power and speed of some of the vehicles used and because of the behavior of the operators (stopping at random, competing

aggressively on the road for customers). The issue of *the role of intermediate public transport* is how to reconcile the two issues.

As incomes increase further so does car as people transfer from walking through cycling and motorcycling to private car use. As the private car uses more space per traveler than the other modes this puts pressure on road space and leads to congestion - the self-defeating consequence of a mass pursuit of private mobility. As the car owning group is inevitably relatively high income this typically leads to political pressure to increase road space and to better management of the road system to facilitate the movement of cars. This raises policy questions about *road system investment, management and maintenance.*

As slow and uneven paced running increases fuel consumption, this is also typically the stage in urban transport development when environmental policy issues – particularly local air pollution – come to the fore. In many countries the initial response to this is technological, with *choice of transport fuels* often appearing as the focal issue.

When, as in Delhi, a strategy of cleaner fuels does not appear to be sufficient, public policy has then frequently turned to the strategy of shifting trips from private to public transport – or at least to halting the prevailing shift in the opposite direction. Where an attractive public transport alternative does not exist, the task is seen as that of *public transport development.*

Even where public transport is well developed, if car ownership is already high it has been very difficult to attract people out of their cars, particularly if the car gives them the benefit of a door to door trip, while public transport does not. It is becoming increasingly recognized in Western European countries providing for this is to some extent self-defeating (as congestion mounts) and environmentally damaging. Hence there is an increasing emphasis on *transport demand management.*

There is a “chicken and egg” problem here. Traditional road based public transport is even more adversely affected by road congestion than the private car. So some restraint of private car use appears essential. But restraint may not be politically acceptable unless there is an attractive public transport alternative already in place. To break out of that vicious circle it is necessary to be able to develop a public transport system which is immune to road congestion. Hence the focus, in developing as well as developed countries on segregated mass transit, where the critical issue is the *choice of mass transport mode.*

In many cities national rail undertakings have routes travelling in to the city, often on alignments which would appear to fit well within an urban public transport network strategy. But these are rarely well exploited. There thus appears to be a significant issue concerning *surface suburban rail services.*

The increasing recognition of the interdependence of all of these aspects of urban transport has led to a renewed focus on *urban transport institutions* to secure jurisdictional and functional integration of policies.

And as the recognition of the magnitude of the problem has developed it has been recognized that more attention needs to be given to the *financing of urban transport strategy* elements. We continue now to examine the experience of developing countries in addressing each of these issues in turn.

### 3. Managing land development

Cities in the market based economies have tended to develop rather similar structures. Starting from a situation in which heavy industry was located in the center, as economic development progresses, stricter environmental regulations and higher land prices within the urban area have led to the relocation of industrial plants to the city outskirts and a concentration of the city core on commercial activity. This has been accentuated by land use control policies of separating residential areas from industrial for environmental reasons. With income growth, population spread outwards in search of better and more spacious residential environment. With service sector employment still concentrated in the urban core area commuting distances increased and the lower residential low densities favored private transport over public. Changes in industrial technology in recent years have reduced the need for such separation and there has been a shift towards a more balanced mix of housing, jobs, and shopping opportunities within each local community. In the developing world the leading proponent of such a policy was the city of Curitiba under the leadership of Mayor Jaime Lerner. By a combination of mixing land uses and encouraging increased density of occupation within a few strategic corridors the city was able to maintain a high public transport share of movement and to reconcile increasing incomes and car ownership with a relatively low level of car use. And in doing so it has maintained the financial viability of the public transport sector and kept the transport energy consumption per capita in check.

Densification is only part of the story. While it is certainly the case that low density US and Australian cities have higher energy consumption per capita than cities in Asia, within the set of Asian cities energy consumption is only weakly correlated with density. What appears to be a stronger explanatory variable is accessibility to segregated public transport, which is also associated with corridors or nodes of very high density. Densely populated cities like Bangkok, which have only latterly developed mass transit systems are much more auto dependent and energy intensive.

#### Issues and Lessons for India

*Faced with continuing fast population growth, not just in the megacities, the pointers which India might take from this experience include the following:*

- *Take a pro-active view in the development of segregated mass transit corridors from the outset*
- *Ensure that the development controls support the corridor strategy by allowing higher FARs in the corridors than elsewhere.*
- *Plan “with the market” rather than against it by allowing capital to be substituted for land in areas of highest demand by allowing high FARs in such locations (which should include the main transport nodes.*

## 4. Road safety

It has been estimated that on a “status quo” policy basis road accident and fatality rates will continue to increase in India until sometime between 2030 and 2040. Only with a significant change in behavior can this be averted.

The international context for this is changing rapidly. Safety has a higher profile, and more partners are engaged than ever before. In 2004 the World Bank partnered with the WHO to produce the *World Report on Road Traffic Injury Prevention*, setting out a blueprint for action. In 2009 the World Bank produced some extensive country guidelines (Bliss and Breen, 2009) for implementing that action. In March 2010 the United Nations General Assembly resolution proclaimed a Decade of Action for Road Safety 2011–2020 with a goal of stabilizing and then reducing the forecasted level of road traffic fatalities around the world by increasing activities conducted at national, regional and global levels. Achieving this goal would save around 5 million lives and avoid 50 million serious injuries, for a social benefit of US \$3 trillion. Nearly 60% of the lives saved and serious injuries avoided would be in the East Asia Pacific and South Asia regions alone, with another 18% in Sub-Saharan Africa. The resolution requests that the World Health Organization and the United Nations regional commissions, in cooperation with other partners in the United Nations Road Safety Collaboration and other stakeholders, prepare a global Plan for the Decade as a guiding document to support the implementation of its objectives. In 2011 a Global Plan was duly produced and also in 2011 the seven multilateral development banks (MDBs) committed to a shared program of road safety activities to support the U.N. (MDB, 2011).

In content, the various initiatives have much in common. The *World Report* (2004) offered six recommendations setting out the strategic initiatives necessary to improve country road safety performance:

- Identify a lead agency in government to guide the national road safety effort.
- Assess the problem, policies and institutional settings relating to road traffic injury and the capacity for road traffic injury prevention in each country.
- Prepare a national road safety strategy and plan of action.
- Allocate financial and human resources to address the problem.
- Implement specific actions to prevent road traffic crashes, minimize injuries and their consequences and evaluate the impact of these actions.
- Support the development of national capacity and international cooperation.

The World Bank guidelines (2009) stress the importance of institutional factors, particularly the identification of a competent and adequately financed lead agency. But the main policy shift is to the adoption of the “Safe System” approach under which the setting of speed limits is determined by the intrinsic protective quality of the road sections and vehicles concerned, rather than the speed behavior of road vehicle users. The biomechanical tolerance of humans to crash impacts is the limiting factor. This approach represents a radical shift to making mobility a function of safety, rather than vice versa. Its focus on safer and reduced speeds harmonizes with other efforts to reduce local air pollution, greenhouse gases and energy consumption. And its priority to afford protection to all road users is inclusive of the most vulnerable at-risk groups such as pedestrians, young and old, cyclists and motorcyclists.

In support of this is the emergence of safety rating tools for infrastructure, which are a more systematized form of safety audit/inspection. They provide easy to understand safety ratings (from 5

star down to 1 star) which reflect the protective qualities of the roads. An interesting breakthrough with the iRAP tools has been the use of a simple value of statistical life formula (70 times GDP per capita) to assess the benefits of safety improvements to improve the safety rating of road sections which has helped to highlight ex ante the scale of safety benefits.

The UN Global Plan for the Decade of Action identified five “pillars of action” – Road safety management, safer roads and mobility, safer vehicles safer road users, and post-crash response – and encouraged member states to follow an agenda of actions which it suggested in each area.. It highlighted effective interventions to include incorporating road safety features into land-use, urban planning and transport planning; designing safer roads and requiring independent road safety audits for new construction projects; improving the safety features of vehicles; promoting public transport; effective speed management by police and through the use of traffic-calming measures; setting and enforcing laws requiring the use of seat-belts, helmets and child restraints; setting and enforcing blood alcohol concentration limits for drivers; and improving post-crash care for victims of road crashes (UN, 2011).

Capacity development is critical to all approaches. The *World Report* highlights the fundamental role of the lead agency in ensuring the effective and efficient functioning of the road safety management system. Implementing the recommendations of the *World Report* requires account to be taken of the management capacity in the country concerned to ensure that institutional strengthening initiatives are properly sequenced and adjusted to its absorptive and learning capacity. The conduct of a safety management capacity review is a vital first step in the process of a country achieving this. In practice the process of institutional strengthening must be staged. During the formative stages emphasis must be put on improving the focus on results and related inter-agency coordination. As these institutional management functions become more effective the remaining management functions are in turn strengthened.

#### Issues and Lessons for India

*The lessons for India appear to include the following:*

- *The National Transport Strategy should include the development of road safety institutions at the national level, and at the metropolitan and municipal levels*
- *The adoption of a “safe system” approach to road safety improvement will call for significant changes in behaviour in traffic engineering, traffic management and policing.*
- *Developing the institutions and competence to make serious inroads in the safety problem will call for substantial investment in training.*
- *Any effort to address the problem seriously will attract both financial and technical assistance from the international institutions.*

## 5. Facilitating non-motorized transport

The most important requirement for facilitating non-motorized transport as incomes increase and people can afford some alternative is the provision of a safe NMT environment. Primarily this means segregation of provision for pedestrians and cyclists from provision for motorized traffic. The most extensive segregated network in the developing world is the 340 km cycloruta network constructed in Bogota at the turn of the millennium. Bogotá prepared and has available a Design Manual and Good Environmental Construction Practices guidelines for public works on its cycleway system, which may be helpful to Indian cities. In 2008 the South African government published its draft proposals for NMT, which included the obligation for NMT plans to be prepared at both the provincial and local levels (South Africa Department of Transport, 2008). A similar initiative is being pursued in Botswana. The details of those proposals should be of interest in India.

The financing of NMT is dealt with in detail in the last section of Paper 1. What it demonstrates is that both segregated cycle paths and sidewalks for pedestrians are generally assumed to be part of the normal design and financing process for roads. Finance for them thus comes usually from the road budget. The \$50 million which the Bogota “ciclorutas” cost was funded from the city investment budget. Secure special funding for NMT is rare though the South African proposals require an NMT fund to be established from part of the national Road Fund revenues. Those funds are not yet established however.

A further distinguishing feature of countries where cycling plays an important role, is the provision of adequate and secure parking arrangements for bicycles at main activity points. Where cycling is the local distributor mode for a mass transit system – as in the Netherlands – cycle parking facilities are typically provided as part of the mass transit station design. This has only recently begun to be replicated in developing countries. Bogota’s Transmilenio model is now being followed in China both in new BRT systems as in Guangzhou, and rail mass transit as in the new systems in Kunming. As with cycle routes and paths, the critical issue is whether there is provision for NMT in the national and municipal design standards for mass transit developments. The involvement of the IFIs in finance of the mass transit systems appears to have been an important influence in the latter cases.

In poorer countries the cost of bicycle ownership has been a constraint on the development of NMT. An early attempt to provide credit for cycle purchase in Lima, Peru failed because of the problem of collateral with the traditional municipal bank, as did an early lease program in Tanzania. But group savings programs in Kenya were more successful, as have been promotional bicycle sales in South Africa. But progress is slow; the South African *shova kalula* program inaugurated in 2001, which now aims to roll out a million bicycles by 2014, had only introduced 72,000 bicycles by early 2011. The elimination of import duties helps, as in Kenya (Earthtec, 2007). Security of bicycle property is still a problem satisfactorily overcome in Japan and the Netherlands but not yet overcome in many poor countries. An alternative to assisting purchase which overcomes this is the development of a short term bicycle rent program as in Hangzhou, China.

### Issues and Lessons for India

*The most pertinent considerations for any Indian effort to facilitate non-motorized transport would thus appear to be:*

- *Safe segregation of road space is the most important requirement*
- *Provide bicycle parking facilities at all new rail and metro stations*
- *Require NMT plans in all cities*

## 6. Traffic management

The importance of traffic management is dealt with in section 2.2.4 of Paper 5. Most European and other developed country cities have well established traffic management units that have suitable staff and authority to comprehensively plan, design, implement, operate, and maintain as appropriate traffic management measures required adequately address traffic operations and safety on the existing urban road network. These cities have found it important to establish a single unit to assume leadership in these responsibilities to ensure a coordinated and consistent approach to efficient traffic management. The range of functions and responsibilities of well-established traffic management units vary somewhat but a typical array of functions is shown in the table below. Although this is based on developed country experience, organizationally something like this appears to be an appropriate aspiration for Indian cities.

### Typical Functions and Responsibilities of a Traffic Management Unit

Division	Functions and Responsibilities
Traffic Management Policy	Formulate and Implement city wide “Traffic Management Policy” to comply with objectives defined by the “city council” which would include, at least such areas as determination of (i) a functional road hierarchy; (ii) the appropriate balance between transport system users (private transport/public transport/NMT/pedestrians; (iv) priority programs for action and, (iv) a “5 year” investment plan”.
Traffic Research	Assemble/survey, monitor, analyze and evaluate all traffic and accident data to enable trends to be identified, problems quantified and traffic management plans and improvements to be prepared.
Traffic Management Plans and Improvements	Plan, design, implement, monitor, evaluate, fine-tune and continuously up-date traffic schemes and policies to realize the agreed Traffic Management Policy. The program would cover all motorized road based modes (cars, public transport, trucks, etc.) and all non-motorized modes (pedestrians, cycles). Plans and improvements would range from simple junction improvements or marking and signing programs through to far reaching city wide strategies such as extensive bus priority or pricing. Safety considerations are part of any scheme planning and design process but specific safety programs and accident counter measures would be a responsibility.
Traffic Control Devices	Plan, design, install, operate, and maintain all traffic control devices including (i) traffic signal systems including computer controlled systems; (ii) road markings; (iii) road signs and, (iv) enforcement devices (cameras etc.)
Traffic Regulations	Formulate traffic regulations to realize the proposed Traffic Management Plans and Improvements, for enactment by city government and for enforcement by the traffic police.
Parking Management	Prepare off and on street parking policies and programs including approval for the location of and access to parking areas proposed by others. Parking enforcement and administration (for example, where paid parking applies) would be carried out by a separate parking authority” or equivalent.
Approvals and Co-ordination	Evaluate and advise city government on all schemes (e.g., new roads) and developments (developed both by public and private sector agencies and including major new land or building developments) which have a significant traffic impact to ensure that they are consistent with agreed traffic policy. In effect carry out traffic impact studies for all major development proposals.
Consultation	Consultation with the public and stakeholders on traffic policy and on the impacts of specific schemes and measures.
Budget	Preparation of an annual budget for submission to city government for (i) implementation of Traffic Plans and Improvement Schemes; (ii) traffic operations and maintenance of control devices; and, (iii) the continuous work of the traffic management agency itself.

The resource requirements to perform these functions properly are considerable. While the organization differs between the four cities discussed in Annex 2 to Paper 5, taking together a roughly comparable set of functions – as described in the table above – attracts roughly the following levels of resource (note that the functions covered and the amount of outsourcing differ between the cities).

City	Population million	City Area KM <sup>2</sup>	Name of agency	Staff	Budget \$US million
Paris municipality*	2.5	105	Dept. of Streets and Mobility	300	65
Helsinki	0.6		Traffic Planning Division	72	5
New York**	8.0		Traffic Operations Bureau	500	135
Greater London***	7.5		Street Management Dept.	400	195

\* Excludes staff costs

\*\* Excludes costs of comprehensive traffic management schemes which are dealt with by another department.

\*\*\* Excludes expenditures on walking and cycling facilities and road safety but including all costs of bus priority measures and a proportion of the Street Management department management and technical support

Issues and Lessons for India

*The most pertinent issues for India would appear to include:*

- *All cities should have a well-staffed and resourced Traffic Management Unit*
- *The Traffic Management Unit should be responsible for traffic restraint design and traffic safety policy as well as more traditional traffic management functions*
- *Traffic management and restraint should be implemented in support of the city transport strategy, including implementing priorities for public transport*

## 7. Policy for the motorcycle

Motorcycles provide very high and rapidly increasing levels of personal motorized mobility in many Asian cities. For example, ownership rates in Hanoi are 0.5 per capita and they account for 75% of motorized trips. Each person drives 7,250 km per annum. Even with a very low proportion of land space devoted to roads, motorcycle movement is still not heavily congested. In most large Chinese cities they have overtaken the bicycle as the main mode of movement. What might appear to be a very welcome situation is shadowed by three significant disadvantages – they are dangerous, they are polluting, and they are viewed as the inevitable precursor of a level of motorization which will be insupportable. The policies which are being directed to these issues are of relevance to India.

On *safety* the main policy has concerned crash helmets. US research has shown that motorcyclists are sixteen times as likely to be killed per mile travelled than car riders, and that one in three deaths in motorcycle accidents would have been avoided by helmet use. In December 2007, Vietnam finally introduced a law mandating use of crash helmets. Fatality rates fell by an estimated 16% in the first 3 months. (Passmore et al, 20010) More significantly, it is reported that most of the post December motorcycle deaths from head injuries concerned motorcyclists who were still not wearing a helmet, were wearing one incorrectly or wearing one of inadequate quality. Levels of compliance by child passengers were still less than 50%, even though adult compliance was nearly 100%. So the lesson is – make use obligatory for all (passengers as well as drivers, children as well as adults) and have clear standards for helmet quality.

Other factors also contribute to motorcycle fatalities and injuries. In a study in Vietnam 41% of accidents were associated with speeding, while poor signing and lack of clear priorities at intersections have produced a traditional mode of motorcycle behavior which is surprisingly adept, but still dangerous. Better traffic management and effective publicity campaigns will be necessary to address this over a long period.

On *pollution* the worst offenders were 2- stroke motorcycles which are gross emitters of suspended particulate matter. Fortunately these have been largely phased out in most developing countries as 4-stroke engine vehicles began to match the 2-stroke in price. But it must not be thought that that eliminated the problem completely. In Hanoi, with 99% of its motorcycles being 4-stroke they are still estimated to contribute 43% of PM emissions, 54.5% of CO and 54.1% of unburnt hydrocarbons (NTF-PSI, 2006). Hanoi has recently established a key agency for air quality monitoring and policy development in the Hanoi Center for Environmental and Natural Resources Monitoring and Analysis. The high emissions contribution of motorcycles was tackled by establishing effective control measures. Following international best practices, a pilot operation and demonstration inspection and maintenance program for motorcycles was developed to enforce emissions standards for motorcycles. The pilot operation's star activity was a Motorcycle Clinic, implemented in the first quarter of 2007, designed to educate motorcyclists and other citizens on good maintenance practices and its correlation with environmental and effects.

In the longer term the pollution issue may be addressed by the development of electric motorcycles which are pollution free at point of use (although the overall balance, particularly on greenhouse gases, depends critically on the source of electricity generated).

*Incipient unsustainable motorization* is a more subtle problem. Hanoi is again a good example. Attempt simply to ban further purchases of motorcycles in Hanoi failed due to the possibility of buying and importing from other parts of the country, and is not to be recommended. In Vietnam central government taxation on private cars is high and the municipality of Hanoi requires demonstration that a parking space is available before a car can be registered. But the number of cars

has still been rising at 16% per annum over the last four years. In the longer term, the cities need to consider market-based methods to manage private vehicle ownership (auctioning titles).and use (congestion charges, parking charges). In this context, the development of a current vehicle registration system for all vehicles including motorcycles, which requires users to update their registration regularly (annually, every two years), will be key to enforcement efforts. Such a system is a basic tool that will also be a cornerstone of any attempts to manage traffic compliance, safety and air quality.

In the meantime Hanoi is trying to develop a mass transit system – starting with a BRT now in construction – to attract potential car purchasers. Whether the action will be timely and substantial enough remains to be seen. A similar reliance on the development of mass transit is being exhibited by Chinese cities, encouraged by large central government contributions. In 2000 only 4 cities had metros with a total of 101 km of route. By 2010 this had grown to 23 cities with approved plans for 5,148 km, which is more than all existing metro systems in Europe and North America combined.

China is also simultaneously pursuing a different track. After years of reducing the extent of segregated cycle track many of the major cities have reversed that policy and are planning for increases in segregated cycle track – often well integrated with metro development as at Guangzhou. And in this connection it allows low capacity, low speed electric bicycles to use the segregated tracks and hence avoid road congestion. This explains why, currently, there is a growing fleet of electric motor cycles.

#### Issues and Lessons for India

*The most pertinent issues for India would include the following:*

- *Motor cycle safety should be a primary concern, addressed by well enforced mandatory use of crash helmets by all motorcycle users*
- *Encouragement of electric motorcycle use should be considered for environmental reasons*
- *Bans on motorcycle purchase are not likely to be effective: attempts to prevent motorcycle ownership being a precursor of unsustainable private auto ownership and use will need to involve both car use restraints and segregated public transport development*

## 8. The role of intermediate public transport

Intermediate public transport (IPT), covers a very heterogeneous set of services, the main dimensions of variation being the following:

- Vehicle type – varying from two wheelers (the moto taxis of Bangkok), three wheelers (rickshaws of Bangladesh, tuk-tuks of Bangkok), four wheelers (jeepneys in Manila, etc.)
- Vehicle size – ranging from the one passenger motor cycle taxi to the 15 seater “black taxi in South Africa.
- Ownership – usually non-corporate, but varying from single owner drivers to absentee owners renting their vehicles to drivers on a daily rental basis.
- Mode of operation – fixed or variable routing, scheduled or unscheduled.
- Organization – while initially fragmented they frequently form associations to self-regulate in order to avoid conflicts on the road by devices (such as “tour de role” dispatching) aimed at fair revenue sharing.
- Function - ranging from local distribution where larger vehicles cannot access (motor cycles in the Bangkok sois, four wheel drives in the hillside barrios of many Latin American countries), supplementing traditional service where it is inadequate ( minibuses in Uzbekistan), serving unserved market niches (the FX in Manila and the commuter vans in Bangkok), through to directly competing with existing services

There is no “one-size-fits-all” way to handle this sector. In practice government responses have tended to depend on two main considerations, namely:

- Whether the IPT services are seen to perform a useful function in the immediate circumstances faced by government; and
- Whether they are perceived to have specific, undesirable side effects.

Some *functions* for IPT appear to be widely accepted and appreciated. The feeder function into territory unsuitable for conventional buses is generally viewed as appropriate for small demand responsive vehicles operating with a minimum of regulation. Hence, where IPT performs this function it is generally left alone. “Service gap-filling” tends to be treated opportunistically. In the early post liberalization period in the former Soviet Union, the authorities initially turned a blind eye to the informal service providers, but as it became clear that the informal sector had effectively become “the” public transport service (as in the Kyrgyz republic in the late nineties) the authorities turned their attention to trying to regularize their operation. Where IPT simply duplicates the activities of the formal sector and is perceived to be undermining the basic service a common response is simply to ban them, even if in doing so reduces the basic service available to the poor (as in Recife, Brazil) .

*Adverse side effects* have also been addressed by regulatory intervention. The most common concern has been about the congesting effects of a proliferation of small vehicles in central areas (as in Lima, Peru, and Recife, Brazil) in the latter case resulting in a complete ban on the intermediate sector operations in critical areas of the city. Safety and public order has also been a common reason for intervention, as in Sri Lanka and South Africa. A commonly resisted characteristic has been the practice of “tour-de-role” dispatching, which has the effect of forcing passengers to walk to terminals as well as typically increasing total costs by reducing the proportion of time that vehicles are actually running in service.

The responses of the public authorities have been very varied, with their actions typically reflecting what was considered politically feasible in the particular circumstance. Several different categories of response can be identified however. These include:

- ***Turning a blind eye*** to what are illegal or quasi-legal activities is the easiest policy practiced in early post liberalization FSU.
- ***Encouragement of self-regulation*** was practiced largely in the treatment of the black taxi business in South Africa. Apart violence in defending turf rights this typically involves socially inefficient operating practices (the dispatching system mentioned above) and may also result in organized corruption as local police assist the associations to protect their territory, as in the case of the protection arrangements which developed for the motor-cycle taxi groups in Bangkok.
- ***Specific regulation*** is quite common. The best practice here seems to be to design an intervention which is seen to directly address the specific perceived problem. For example, where the specific problem is environmental there may be a requirement for vehicles to use clean fuels (as in the case of the conversion of the Bangkok “tuk-tuks” to LPG). Where the intended role for the intermediate public transport is to provide feeder services this may be achieved through limitations on area of operation combined with some quantitative control to ensure that it is possible to perform the role economically.
- ***Formalization of the sector*** is the most comprehensive approach, adopted when the authority wishes to retain the intermediate public transport as an integral part of the total urban transport system, as in both Uzbekistan and the Kyrgyz Republic.

#### *Issues and Lessons for India*

*The most pertinent points for Indian policy would include:*

- *The intermediate public transport sector has played an important role in many low income countries and should be capable of doing so in India*
- *In their transport strategies cities should explicitly identify the roles that they see for IPT, and plan accordingly*
- *Where specific adverse effects are present – such as pollution from old or inappropriately fuelled vehicle – they should be dealt with by specific regulations*
- *Turning a blind eye to irregularities or allowing self-regulation of intermediate public transport is unlikely to be effective*
- *With well-designed regulatory mechanisms the intermediate public transport sector can be organized to make important contributions to an integrated public transport system*

## 9. Road system investment, management and maintenance

Many developing country cities have a surprisingly low proportion of land space devoted to roads. For instance, both Hanoi and Bangkok have less than 10% devoted to roads, compared with a norm of nearer to 20% in developed country cities. Encroachment on to the road area by street vendors reduces this even further. This emphasizes the need to plan adequately for roads in new developments, and to protect the roads for their traffic function when the amount is in any case inadequate. At the very least, private sector developers should be required to provide roads as part of land developments

Accentuating the deficiencies in total capacity, road systems in developing countries are often poorly structured, with little attention to ensuring that the system works as a system. That emphasizes the importance of having a clear functional classification of roads, so that road design and management can be matched with traffic volumes and composition. A good functional classification is also helpful in assigning responsibilities for road maintenance and making sure that the allocation of maintenance funds is effective.

In order to maintain roads properly it is necessary to have adequate funds and to use those funds efficiently. The issue of funding is dealt with in a different section of this overview. For efficient use of funds the basis is the existence of an up-to-date inventory of street characteristics and condition data. For example, in Bogota Colombia, despite having a problem of adequacy of funds, the city keeps a relatively up-to-date asset register/road management system which includes about 114,000 segments to describe its road network. On average the condition of the primary road network is surveyed every four years. Traffic counts are also carried out every four years. With that data available it is possible to determine the optimum road network maintenance strategy and related budget, using computerized road maintenance management systems (RMMS) which take into account vehicle operating costs, unit cost of road works, and pavement strength and condition. For example the HDM4 suite allows cities to determine (i) the optimum road network maintenance strategy and the related budget; (ii) the impact of different funding levels on the future quality of the city's primary and secondary road networks; (iii) economic consequences of budget constraints for society as a whole; and (iv) preparation of a five-year work program for the most likely budget scenario(s). The same program suite can be used for the assessment and prioritizing of rehabilitations and new investments.

Work implementation also needs to be efficient. While many cities still undertake maintenance by force account, there is an increasing trend to contract implementation out to private sector contractors. In that case the contracting arrangements are critical. Competitive tendering usually requires that there are a number of separate packages to let and monitor. For efficiency of this process, the number of packages should not be too large. For example, the city of Bogota recently reduced the number of packages from 330 to six (organized on an area basis) in order to improve the efficiency of monitoring and contract enforcement. Good monitoring requires good analysis; studies to define the scope of road rehabilitation and maintenance, including (i) a survey of road condition, (ii) traffic studies, (iii) definition of the intervention level (e.g., pavement maintenance or rehabilitation), and (iv) the required budget for each road segment, should be undertaken by the authority prior to tendering road maintenance contracts rather than including these tasks under the awarded maintenance contract.

Other arrangements are possible. In particular longer term performance based contracts are now being used in many countries. In performance-based contracting the client does not specify any method or material requirements (provided the country's standards are met). Instead he specifies performance indicators that the contractor is required to meet when delivering maintenance services.

The World Bank has produced guidelines for introduction of this type of contracting. In the developing world Latin America was the pioneer in developing and adopting its own performance-based contracting model. In 1995, Argentina introduced performance-based contracts, which at present cover 44% of its national network. In the mid-nineties Uruguay also piloted PBC, first on a small portion of its national network and then on the main urban roads of Montevideo. Shortly thereafter, other Latin American countries, such as Brazil, Chile, Colombia, Ecuador, Guatemala, Mexico and Peru, also started adopting a performance-based approach. Preparations for launching PBC programs are underway in Albania, Cape Verde, Chad, Madagascar, Tanzania, Burkina Faso, India, Cambodia, Thailand, Indonesia, Vietnam and Yemen.

Issues and Lessons for India

*The most pertinent points for Indian urban transport appear to include:*

- *Cities should develop a structured hierarchy in their road systems for planning and management purposes*
- *An up-to-date inventory should be kept of the road stock, its use and its condition, supported by a regular program of updating*
- *Modern road maintenance and assessment tools should be used to optimize maintenance expenditures*
- *The assessment tools can also be used to improve the efficiency of the maintenance contracting procedure*
- *Performance based maintenance contracting should be considered.*

## 10. Choice of transport fuels

The individual or company making a choice of fuel usually does so in the context of the decision to purchase or replace a vehicle. That choice will usually be made on the perceived long term total cost of alternative types of vehicle, including their capital costs as well as the efficiency with which they consume fuel and the expected cost of that fuel. The current attractiveness of diesel cars in Europe is a consequence of their perceived low operating cost and the relatively small difference in capital cost. The slow take-off of hybrids reflects the still high capital cost premium. However, most of the cost elements are subject to manipulation by government through tax policies. These tax policies can also affect the size of vehicles purchased and the annual mileage driven (see Paper 3).

From a government point of view, the preference for one fuel or another will depend on:

- (a) Their relative environmental impacts – both in local air pollution and global warming terms
- (b) Perceived costs of alternative fuels
- (c) Long term energy security issues

Whatever their judgment they can then affect market choices by firms and individuals by:

- (a) Setting emission or fuel economy standards for new vehicles
- (b) Setting fuel standards (particularly in respect of sulphur content)
- (c) Direct control over some “amenable” users (e.g. public sector vehicles, public transport operators)
- (d) Taxation policies.

Some further important considerations should be mentioned. First, the fuel standards and vehicle emission standards need to be technically consistent. For example, it is of little benefit in having state of the art diesel vehicles if you do not have ultra-low sulfur diesel. Second, the costing must be done on a full life cycle basis; it is of little global warming benefit to have electric vehicles if the electricity is generated from inefficient coal fired stations. Similarly, recent evidence on biofuels suggests that the global warming balance of transfer to biofuels is marginal for many feedstocks when the energy cost of producing the feedstock is considered. Third, it is important to pay regard to the realities of private incentives. Where a fuel can be routinely adulterated with subsidized kerosene, one must expect that outcome, with all the environmental penalties associated with it.

### Issues and Lessons for India

*Given those considerations, the most pertinent lessons for India on the choice of fuel would appear to be:*

- *Fuel taxation differentials do have significant effects, for example in encouraging the use of CNG in Chinese cities*
- *Full life cycle analysis is important in making the choice of fuel – especially in taking a view about electric vehicles or biofuels. Recent EU reassessment of biofuel policy deserves particular attention.*
- *Once ultra-low sulphur diesel is available, the clean diesel car is probably less polluting, as well as less costly, than the gasoline car. But without the right fuel the opposite is true.*
- *CNG has generally proved economical only when introduced on a scale sufficient to justify the costs of a local distribution system, and when a local supply is available (as in Buenos Aires, Argentina). Otherwise it is likely to be only appropriate for large, concentrated fleet applications.*

## 11. Public transport development

This subject is dealt with in detail in Paper 4. The essential message of the paper is that development of the public transport market is best achieved through a comprehensive policy including both “carrots” of public transport improvement and “sticks” of private transport restraint, discussed above. The public transport improvement strand of policy ideally requires a public transport management and regulatory authority capable of ensuring good physical and commercial co-ordination of all of the modes of transport, as well as efficient supply achieved through commercial competitive pressures. Good examples of well co-ordinated systems include that in Seoul, Korea, while the piecemeal development of privately financed mass transit in both Bangkok and Kuala Lumpur is judged to have missed some of the potential of multi-modal system operation. Segregated mass transit, either rail or bus based, should be the core of the system with feeder services planned so that public transport can match private transport in terms of journey times and cost.

Experience of large European cities suggests that a well regulated ordinary bus sector is required in order to ensure good co-ordination. This is best achieved through buses being operated on contract to the co-ordinating system manager. Private sector participation in supply has proved to be most effective if achieved through the comprehensive competitive tendering of service provision on a gross cost basis, which gives the greatest flexibility to the system manager while being sufficient secure to attract good private sector supply. This also facilitates implementation of a trunk and feeder structure which has been proved to be effective in cities like Santiago, Chile as well as in Curitiba, Brazil. Above all, however, experience suggests the importance of comprehensiveness (for example the failure to incorporate the informal sector buses in Bogota detracted from the success of the planned Transmilenio system) which in turn indicates the need for a single focal authority with an interest in system co-ordination. URBS in Curitiba is the prime example of how this can be most successfully done, while the recent experience in Lagos, Nigeria, is an interesting case of how that can be approached in very difficult circumstances.

### Issues and Lessons for India

*The most pertinent lessons of foreign experience for India would appear to include:*

- *A capable public transport regulatory and management authority is highly desirable as the basis for public transport development*
- *Effective physical co-ordination and through ticketing between modes are critical to the attractiveness of public transport in large cities*
- *Even in cities with mass transit systems the majority of trips will be taken by ordinary bus services which need to be efficient and well organized*

## 12. Transport demand management

The “stick” part of the comprehensive strategy concerns the management and restraint of private car traffic. This is dealt with in more detail in supporting Paper 3 Traditional traffic management instruments can be used to give priority to public transport – as in vehicle actuated traffic signals, common in European countries and now being introduced in developing cities like Warsaw, Poland. But the strategy needs to go further than that to restrain the total amount of private car movement in circumstances where the level of congestion that they are creating implies a marginal social cost of their use of scarce road space far in excess of the price that they are actually paying. The imposition of a congestion charge as implemented in Singapore and several European cities, is the most direct application of that philosophy, but does require a degree of sophistication of design and security of enforcement which may be difficult to achieve in many developing country cities. It also requires the political willingness to charge high prices as the administrative costs of operation of a congestion charging regime would outweigh its benefits at low charging levels.

If congestion charging is not acceptable, some alternative form of restraint is required. The control of parking availability and prices is the most commonly, and generally successfully, used alternative in European cities. Even that requires the legal power to prohibit or charge for parking on-street, which does not exist in some large countries like Russia, and the acquisition of which is an important initial step to be recommended in all countries. It also requires an ability to enforce, for which a special force is required. A simpler alternative which has worked successfully in the short term in cities like Mexico City, Bogota and Sao Paulo is the banning of cars on certain days by last number of the registration plate. In the long term, however, it is likely that car owners will adapt by keeping a second car, which is almost certain to be older and more polluting than average, to escape the restriction.

Another instrument which should not be forgotten is taxation. For example, fuel taxation has appropriate effects over a range of dimensions – including vehicle size and mileage driven, as well as on the number of trips made and the choice of mode. It is notable in this respect that there is a commonly observed asymmetry between the effects of private car fuel prices on public transport demand, which exhibits a cross elasticity of +0.34 and that of public transport fares on car use which has a cross elasticity less than +0.1. The implication is that public transport fare subsidy is a fiscally very costly way of trying to influence modal choice, while operating on fuel taxation is a fiscally very attractive one.

### Issues and Lessons for India

*The most pertinent pointers from international experience would include:*

- *Restraint of private car traffic is essential in large cities if congestion is to be controlled and people encourages to use public transport*
- *Low transport fares are not very effective in shifting people from cars to public transport, but high costs of motoring are.*
- *Direct congestion charges have the dual advantage of restraining traffic and generating revenues for public transport support, but are not worth introducing unless they can be set at a fairly high level*
- *Parking policy has been the most successful alternative to congestion charging in European cities, and should be a major responsibility of the traffic management unit. Simple administrative devices like number plate use restrictions can be effective in the short term.*

### 13. Choice of mass transport mode

The choice between MRT and BRT should be based on the relative economics of the two in meeting the necessary high standard of performance. Rail metro is by far the more expensive, though recent Chinese developments, based on high levels of standardization and localization of sourcing, reduce the gap somewhat. Effectively however, the choice will depend on the peak corridor demand, with anything above 25,000 passengers per hour in the peak direction calling for the extra capacity that a rail based system can provide. Some general warrants for the appropriateness of a rail metro, as used in China, may be helpful. However, it is likely that a comprehensive system may require the combination of both, as in Mexico City, while increases in demand over time may justify “graduation” from BRT to MRT at some critical stage, as envisaged in Curitiba and now being approached in Bogota. Timeliness of mass transit development is critical. If it is left too late, and a high level of car ownership has already been achieved it may be difficult to recoup the situation, as experience in Bangkok shows.

It is interesting to note in this context that while full life cycle analysis increases the real energy consumption and real costs of all modes, it does not significantly change the relative efficiency profile of different modes (Australian Greenhouse Office, 2002).

#### Issues and Lessons for India

*The most pertinent considerations for India based on this international experience include:*

- *Segregating mass transit appears to be the only way to match private transport performance and make public transport attract people from cars*
- *Costs vary enormously between BRT and MRT, so that BRT is likely to be the right starting point in smaller cities*
- *But there are limits (about 20,000 passengers per hour per direction), beyond which BRT struggles to maintain performance.*
- *A strategy for graduation from BRT to MRT is therefore necessary for larger cities.*

## 14. Surface suburban rail services

In many cities national rail undertakings have routes traversing the city, often on alignments which would appear to fit well within an urban public transport network strategy. The larger the city the greater the likelihood that there is an extensive network of suitable links. For example, suburban rail systems in London and Paris make a very substantial contribution to an integrated urban transport network. But in developing countries these possibilities are rarely well exploited. The policy question is whether this is inevitable, or whether there are some policy initiatives which can help.

There are, of course, some inherent historical differences which must be recognized. The spatial development of residential location in London and Paris was very closely associated with the development of suburban railways. On many of these the suburban passenger function was dominant from the outset. That is typically not the case for railways within urban areas in developing countries. For example, virtually all of the African rail systems were developed under colonial administrations for the export of minerals through ports which also happened to be capital city locations. But that is not a sufficient reason for not subsequently exploiting that potential. A number of additional contributory factors can be identified.

The first factor is the nature of national rail administrations, which take their function as being to facilitate long distance movements, and hence do not concern themselves with urban distribution issues. The second is profitability. Where by law, or by the force of competition from road transport, urban rail fares are constrained at unremunerative levels, national rail companies will have no interest in the urban passenger market. That has even been the case with railways concessioned to the private sector in many African companies (Gwilliam, 2011). Third, there is a general absence of a strategic urban transport institution with the responsibility and powers to address the issue. The practical policy question is thus how these three specific defects can be addressed in the developing country situation.

The first issue has been approached in various ways. In major Brazilian cities - such as Rio, Sao Paulo, Recife, Belo Horizonte – the responsibility for regional rail services has been transferred from the national rail undertaking to state level bodies. This has generally worked well, with substantial redevelopment of the suburban rail services in Rio and better integration of suburban rail with other aspects of transport policy in the other cities. In South Africa this has been addressed at the level of national organization with the establishment of the Sout African Rail Commuter Corporation, with specific responsibility for urban rail services and a clear division of functional responsibility from the rest of the system. In India, the creation of a joint company between IR and the regional authority, has similar potential, but does not appear to have yielded its full potential because of the continuing dominance of the national rail undertaking on most rail policy matters. The worst practice in this respect appears to be to leave the national rail undertaking in full control of the use of its urban assets, as in Manila, Philippines where PNR totally failed to develop an important line in the city, refurbished with Japanese grant funds. Similarly in Hanoi, Vietnam, the potential of urban rail routes within the city has remained undeveloped. The best practice appears to be either the creation of a regionally responsible rail management, as in the Brazilian cities, or of an independent commercially responsive rail management arrangement responding to regional strategic authority demands, as in the Western European countries.

The second requirement is the development of financial remuneration models within which the national or commercial rail undertakings are compensated for their services under a “public service obligation” arrangement. The obligations in this context might be both the maintenance of services which are unremunerative or politically determined fare levels. Moreover these payments should be put on a firm contractual basis. The best practices here are to be found in Europe, where the compensation arrangements have not been an impediment to the development of the role of suburban

rail even in the incredibly complicated private sector supply arrangements in the U.K. The worst practice appears in the case of several of the concessioned African railways where PS compensation is payable in principle, but not in practice paid in a full or timely manner.

Finally, underpinning the achievement of any effective development is the need for a strategic transport authority at the urban or metropolitan level capable of managing this type of arrangement. Again this is best exemplified by some of the European metropolitan organizations, but can be achieved in developing countries. In Brazil, metropolitan policy co-ordination arrangements have been established in many areas. Even in Africa, which is in many ways the most intractable situation, the newly established Lagos Area Metropolitan Transport Authority has begun to address modal co-ordination issues.

#### Issues and Lessons for India

*The most pertinent considerations for India based on this international experience include:*

- *Suburban rail transport is very important indeed in many great developed cities*
- *As part of an urban transport strategy it may need subsidy which must be paid in a secure and timely way*
- *National rail undertakings are notoriously weak instruments for provision of urban rail transport within an urban transport oriented framework, so regional administrations or independent private operation has proved more effective.*

## 15. Urban transport institutions

Urban transport institutions are dealt with in detail in supporting Paper 5. It argues that in order to achieve the chosen objectives of urban transport strategy both the institutions and processes must be designed to secure co-ordination of action, both between operational functions and on a spatial basis.

*Functional co-ordination* itself has several dimensions. Land use planning and control should be integrated with transport planning – the best example of this being the URBS organization in Curitiba, Brazil, from which have developed the concepts of “smart growth” and “transit oriented development”. In addition there must be an integration of the elements of transport strategy – road investment and traffic management, traffic management and transport demand management, traffic management and public transport development. It is argued that the achievement of this is most easily achieved where there is a strategic technical organization with the explicit responsibility for functional co-ordination – the organization “Transport for London” is presented as a good model for this. Within such an organization the existence of a technically strong and broadly defined traffic management unit is critical, as shown by experience in such cities as Helsinki, London and Paris. This is where responsibility traffic engineering and traffic restraint, public transport priority and traffic management, operational efficiency and safety of the road system are brought together. The performance of a co-ordinated institution is embodied in a comprehensive transport planning process. In many cities this derives from a published strategic plan which sets out the long term objectives of the city and the general strategies by which it is intended that they shall be achieved. This is supported by a time bound action program – often for a rolling period of five years – which estimates the resources available and allocates those resources to actions consistent with the strategy. This feeds into the annual budgetary process and, of course, gets amended to roll forward as the consequence of each successive budgetary allocation. A good example of this is the structure recently set up by the city of St Petersburg, Russia, with the assistance of the World Bank. A great advantage of this formal structure is that it explicitly links strategic policy initiatives with the expenditure allocation process and makes explicit what are the policy actions necessary to make investment expenditures most effective.

*Spatial co-ordination* is increasingly important as cities spread outwards across traditional jurisdictional boundaries. In some cases, such as Bangkok, there is a natural leader and no problems arise. But more commonly, as in the cases of Manila and Lima, difficulties arise both about the compatibility of policies between neighboring jurisdictions and about the financing of cross boundary services. In these cases the establishment of some kind of overarching institution is essential for the achievement of sensible co-ordination.

Metropolitan authorities may exist at three different levels. The most comprehensive occurs when the metropolitan area becomes a formal level of government with a full range of powers for those services which have interaction, or are most efficiently managed, at the metropolitan level. Transport is certainly one of these. In the U.K, for example, before 1986 the democratically elected metropolitan county councils had responsibility for strategic transport planning, as well as police, education, health, water and sewerage. Even then, however, there may be functions – such as local road maintenance or local parking administration (though not policy) which are still left at the lower jurisdictional level.

The possible second level is an authority which is specific to the transport sector. Where only a single municipal jurisdiction exists within the conurbation it may suffice for the TA to be a committee of the municipal political authority, served by a set of functional departments (planning, traffic management, public transport, etc.). Where there are multiple jurisdictions effective co-ordination may be achieved in two different ways;

- (i) By establishing some form of co-ordinating committee between the authorities for the purpose of transport activities
- (ii) By establishing an independent, or quasi-independent, special purpose authority to integrate transport development for the whole conurbation area.

It may be better for the STA to be a separate legal entity governed and strategically controlled by a governing body composed of councilors or representatives of the municipality or municipalities. For example, Most U.S. metropolitan areas have Metropolitan planning organizations (MPOs) as forums for co-operative transport decision making among city, county, state and federal authorities.

The third level is the public transport authority, dealing specifically with public transport matters. This is called a Passenger Transport Authority (PTA) in Britain and the US, a “Verkehrsverbund” in German speaking countries, an “autorite organizatrice” in France, and a “consorcio” in Spain and Brazil. This organization takes many forms, It may be a normal committee of the municipal government, or a quasi-independent agency reporting to a political owner (as in Helsinki), a single purpose organization directly responsible to the head of the local government (as in London) or a quasi-independent consortium, in company form, managed by a board representing the constituent authorities (as in Madrid, Recife, the German cities Vancouver and Washington DC). The considerations for the choice of form are discussed in detail in Paper 5. Where services are procured through competitive tendering there is often a specialized agency under the PTA to administer the system.

Acquisition of the necessary skills at the city level has been a great difficulty in many developing countries. One interim solution to this problem, used in Thailand, is the establishment of a pool of skills within a central agency (the Office of the Commission for the Management of Land Transport – OCMLT). A similar issue is currently being faced in the Russian Federation, with the Federation MoT considering the establishment of a central technical function even though formal responsibility for urban transport is a matter for the subjects of the federation.

#### Issues and Lessons for India

*The most pertinent considerations for India based on this international experience include:*

- *A strategic transport planning authority (STA) is crucial for the achievement of effective functional co-ordination. There are many models to follow.*
- *Public transport co-ordination requires a single purpose PT planning and procurement organization (PTA) , preferably responsible to a STA, but freestanding if no STA exists.*
- *Both STA and PTA need a technically skilled staff, or good external advice.*
- *Given the limited supply of technical skills in urban transport planning the development of a national pool within a ministry institution might be appropriate*

## 16. Financing of urban transport strategy

The very complex issues of financing of urban transport are discussed in Paper 1. The most critical problem, faced in many countries of the world – and particularly in those of the former Soviet Union – arises from the delegation of responsibility for urban transport from central to regional or municipal government without those lower levels of government having the necessary taxation sources and powers to fulfill the responsibilities delegated to them. While in principle this can be handled by inter-governmental transfers, in many countries adequate transfers are not made.

Paper 1 emphasizes the great differences in financing arrangements between infrastructure and operations and between roads and public transport modes. Urban roads are almost universally provided free to the user at the point of use, with most capital and recurrent expenditures being on the budget either of the municipal authorities, or in the case of some trunk roads in urban areas, the central government. With the exception of a few urban toll roads in cities like Buenos Aires and Bangkok, charges to users are imposed indirectly through taxes on vehicle ownership or fuel. While the former is often a local charge, fuel tax normally accrues to the national budget. Even where there is a Road Fund into which some part of the tax revenues are paid as a “quasi price” there is usually little relationship between the amount that urban road users pay and the amount that is returned to urban authorities for the maintenance of urban roads. A consequence of this is that road maintenance is typically underfunded even in countries which have an otherwise reasonably efficient Road Fund Administration. In order to avoid this outcome it is certainly desirable that there should either be a separate urban road fund or that there should be a predetermined commitment of a proportion of Road fund revenues to urban roads, preferably related to traffic volumes or to assessed efficiency benefits of the allocation.

Public transport operations, even if subsidized, are treated more commercially. Vehicle investments are privately financed in competitively tendered franchising systems in many countries – including countries of the FSU like Uzbekistan. Much evidence suggests that this is probably the most effective way to obtain private sector financial involvement in public transport. For small cities, as in Uzbekistan, net cost contracts may work well, but in large cities attempting to manage a co-ordinated multi-modal transport system Gross cost franchising is generally regarded as superior. But that does require careful attention to the security of the revenue streams either by separating the fare collection totally from the operations or by very secure on-vehicle fare collection technology.

Infrastructure investments in roads and public transport facilities are also usually on national or municipal budget, according to the category of road. Private finance has been raised for toll roads and urban railways in Bangkok. But the experience has not been entirely satisfactory. In the case of the BTS rail system, it was subsequently decided that infrastructure should be publicly funded, with private participation limited to operation and maintenance. Similarly the Second Stage Expressway concession encountered very great contractual difficulties. ADB have concluded that there are still major gaps to fill in the legal, regulatory and institutional frameworks, as well as in the facilitating arrangements before private finance can play a more extensive role in urban transport infrastructure funding (Nakaraj, 2007). Probably the best opportunities for private finance lie in airports where revenue streams are more secure (for example the new passenger terminal in Warsaw, Poland is based on pure non-recourse private finance

There are also some possibilities of land based finance. In the case of large new developments, developers exactions and impact fees can be used to ensure that part of the costs of extra infrastructure are paid in advance, though both in Britain and Chile it has been estimated that these only raise about one third of the real costs. But they should be used wherever possible. Betterment levies have generally proved difficult to administer, though voluntary contributions from large

developers have been used in connection with some rail developments such as the London Jubilee line extension. Similarly, the “land readjustment program” used successfully to finance rail infrastructure in Japan, relies on a well ordered land market and is less likely to be appropriate for Greenfield developments in developing countries.

The most prolific source of finance historically has been from grants of land in return for infrastructure investments or sales of publicly owned or acquired land (as in the financing of the first stage of the Kunming metro in China) or of development rights (in Sao Paulo). This seems to be particularly appropriate for urban or suburban rail developments. However, the Chinese procedure of selling former farming land for urban development purposes has resulted in development sprawl which has adverse environmental effects. (Liu and Salzberg, 2011).

#### Issues and Lessons for India

*The most pertinent considerations for India based on international experience with urban transport financing include:*

- *The importance of ensuring that the allocation of responsibilities for urban transport are accompanied by adequate financing powers of resources.*
- *Land based financing can be an important contributor to the costs of infrastructure development, but need careful monitoring to ensure that they are not creating perverse incentives for extensive, rather than intensive land use development*
- *Private sector participation in trunk transport infrastructure finance can be effective, but should be mobilized in the context of a clear urban level infrastructure development plan. Opportunism can be very costly.*

THE WORLD BANK GROUP

# Summary Paper on Railways

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Railways Overview and Issues Paper

**Paul Amos**  
**February 2012**

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# Nomenclature

**Rail service provider** refers to any entity that provides railway transport 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 or passenger train operating company (TOC)** refers specifically to a company that runs trains via an access arrangement with another (related or unrelated) company that separately manages the railway infrastructure network.

Railway passenger services discussed in the paper include **long-distance, regional and suburban services**, but exclude metro and tram services. The three conventional railway categories are not defined in exactly the same way in each country reviewed. Regional and suburban typically refer to systems which serve commuter and other local travel demands between a major city (or conurbation) and its suburbs and regional hinterland settlements. Most so-called suburban systems therefore extend some way into regional hinterlands and most so-called regional services typically include (and sometimes predominantly consist of) suburban lines. The paper combines suburban and regional categories.

**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, but there are others such as swap-bodies and TOFC (road trailer on flat car).

**Multimodal transport** is the use of at least two different modes of transport usually on the basis of a single multi-modal transport contract or ticket to move goods or people from origin to destination.

**Integrated transport policies** refer to public policies made in the transport sector that try to attain policy consistency, rational resource allocation, and/or better interchange facilities between modes.

## Disclaimer

The Paper has been prepared by the Bank's consultant. 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<sup>6</sup>. 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.

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<sup>6</sup> The Railway Reform Toolkit can be accessed at:

[http://www.ppiaf.org/ppiaf/sites/ppiaf.org/files/documents/toolkits/railways\\_toolkit/index.html](http://www.ppiaf.org/ppiaf/sites/ppiaf.org/files/documents/toolkits/railways_toolkit/index.html).

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>

# 1. Introduction

In response to terms of reference for World Bank assistance to the **National Transport Sector Development Policy Committee** (NTDPC), and subsequent discussions with NTDPC, two resource papers on international experience in railways outside India have been submitted:

- ***Freight railways governance, organization and management: an international round-up.*** This Paper summarized the salient features of the rail freight sector in eight comparator countries with large railway systems: **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.
- ***Passenger railway institutions and financing: China, Germany, Japan and the Russian Federation.*** This Paper focused on three specific issues in **Rail Passenger Transport:** institutional structure; financing; and fare regulation. It summarized approaches in four of the eight comparator countries which, like India, have a very large railway passenger sector: **China, Germany, Japan and Russia.** Nearly 120 passenger rail providers operate in these four countries.

This overview paper brings together the topics covered in the two papers which, for convenience of referencing, are referred to as FP (Freight Paper) and PP (Passenger Paper) respectively. It also combines the main conclusions.

The individual papers (FP and PP) were concerned with analyzing international experience and did not address India's railway industry, which is naturally very familiar to the Committee. At the request of the Committee, this combined paper goes further and highlights issues raised by international experience that India might wish to consider. Despite much dissimilarity in their railway industry structures, there are some remarkably common principles of policy and practice adopted among the comparator countries. The Paper does not endorse any of the specific comparator country models as being applicable to India but instead recommends that India consider which ingredients of the shared experience might usefully form part of a policy specifically designed for India.

## 2. Separation of policy roles from service provider roles

All the eight countries reviewed have adopted and, with the exception of China (and then only the rail sector) have implemented the principle that public policy roles in the transport sector (not just railways) should be separate from roles of transport services provider (FP2). One reason is the belief that government's responsibility for promoting the public interest in transport should not be compromised by a responsibility to protect the interests of any specific transport service provider. A second practical matter has been the recognition of big differences between the skill-sets needed for public policy formulation and administration and those required to manage a competitive service industry.

### Issues and Lessons for India

*India's approach is quite different to those of most comparator countries (though many of the comparator countries once had governance structures similar to India's current model). India's governance is monolithic, combining public policy responsibility, sector administration, economic regulation and service delivery all in one ministry. This structure presumes that the interests of Indian Railways and the public interest are one and the same - or that any conflicts that arise between IR interests and public interests are best resolved by a single body with both policy and commercial responsibilities. Issues that the Committee might consider are:*

- *Has the existing framework been sufficiently successful in practice to outweigh any apparent theoretical deficiencies?*
- *Has the IRB, as executive arm of the railway ministry, generally avoided putting IR interests as an institution over India's public interests in the development of the railway industry? Are there any inherent features of the Indian transport market environment which refute the relevance of the international experience on separation of roles?*
- *Does the IRB attract officers with the requisite skills and experience to provide high-level advice on public policy and governance matters, and dispassionately to administer the implementation of government policy decisions?*
- *Is the Indian Railways Act of 1986 (which is grounded very much in the 19<sup>th</sup> century Act) still 'fit for purpose' of governing the railway sector in India's 21<sup>st</sup> economy and society?*
- *Does the Act set out clearly the roles, aims, rights and obligations of sector institutions in commercial and social terms and provide an effective accountability framework?*
- *Or would a new Indian Railways Act help the sector to face the challenges ahead?*

### 3. Integrated transport administration

The seven countries that have separated government roles from service provision, Australia, Brazil, Canada, Germany, Japan, Russia and the United States, have all adopted a unitary Ministry of Transport<sup>7</sup> which encompasses policy responsibility for the railway sector alongside other modes. (FP2). This is partly to establish integrated national transport policies that transcend or augment individual modal interests, and partly to provide ‘checks and balances’ against any one modal administration attaining overweening influence. The eighth country, China, has recently brought all modes other than railways into a single Ministry, and is currently studying the possible inclusion of railways (though no decisions have been taken).

Most of the ministries have chosen to develop a medium or long-term integrated transport strategy as a public policy tool. Some support their strategies with mandated programs and funding channels for pursuing integrated freight transport. 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 who are its beneficiaries.

#### *Issues and Lessons for India*

*India has chosen not to have a unitary transport ministry, but has established separate ministries for different modes. Issues that the Committee might consider are:*

- *Does India need an integrated national transport policy or have existing institutions delivered sufficient transport policy integration or consistency?*
- *Does the segregation of modal ministries, particularly those responsible for land transport, inhibit coordination of policies and plans in promoting integrated transport policies in India?*
- *Has segregation given the MOR/IRB excessive power within the overall public governance of the transport sector: are there already sufficient checks and balances on its powers?*
- *What benefits would be lost or compromised by a unitary ministry, at least for land transport?*

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<sup>7</sup> In some cases the Ministry or Department responsible incorporates wider communications and infrastructure sectors.

## 4. Ownership of railways

In five of the eight countries reviewed - Australia, Brazil, China, Germany and Russia - the major part of the public railway network is state-owned and is expected to remain so<sup>8</sup>. (FP3). In Canada, Japan and the USA, the railway network is mainly privately-owned, though there are some publicly-owned (mainly passenger) parts of the network in all three; the high-speed Shinkansen lines in Japan is also state-owned, although leased to and used by private passenger service providers. The only countries in the last 50 years that have privatized a national railway network 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<sup>9</sup>.

### Issues and Lessons for India

*India is following international practice in retaining in public ownership a national railway network given its heavy and socially important use by passenger trains. Issues that the Committee might consider are:*

- *Why is the level of private sector participation in India's railway industry lower than in many other countries where the state also retains public ownership of railways?*
- *Could India's private sector beneficially contribute skills and investment to India's railway industry, for example, through greater participation in railway supply industries, business support services, or running some kinds of train services on the state's national network?*
- *If so, how can private sector participation best be encouraged while retaining the principle of public ownership of the railway network and public interest regulation of its use?*

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<sup>8</sup> In Brazil and parts of Australia the public rail infrastructure is concessioned to private companies.

<sup>9</sup> 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.

## 5. Corporate form of railways service providers

Irrespective of ownership and industry structure, all but a handful of over 900 railway service providers in the eight countries are corporations or subsidiaries of corporations. This is true when they are big<sup>10</sup> or small companies, when they are state-owned or privately-owned, when they are constituted under companies law or by special state-owned enterprise legislation, when they receive no budgetary support or a lot of budgetary support, and irrespective of whether they are freight, passenger or mixed railway companies (FP3/PP2). It is not surprising that this should be so: company structures have proven to be the most successful formula so far devised by modern economies for organizing large commercial service industries operating in competitive markets.

### Issues and Lessons for India

*India's railway service production units are zonal railways, sub-divisions of the IRB which is the executive arm of the MOR. Issues that the Committee might consider are:*

- *Does the current institutional framework, in which service providers are sub-divisions of a ministry, help or hinder those providers in being market-oriented and commercially responsive?*
- *If India were to adopt a corporation-type structure for its state-owned railway service providers should this be under company law, state-owned enterprise law, or special legislation?*
- *If the corporation model were adopted, what features of corporate governance structure would best contribute to its success e.g. independent and professionally-qualified boards of directors; merit-based selection of CEO's and managers; management accountability based on business planning targets; more pricing freedoms; use of commercial accounting and auditing standards; and others<sup>11</sup>.*

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<sup>10</sup> The biggest rail transport provider in the world, China Rail, is not a corporation (though several Chinese railway entities are).

<sup>11</sup> A checklist of good practice is captured in the OECD Guidelines on Corporate Governance of State-owned Enterprises, 20056.

## 6. Pluralism and network access

As noted, there are over 900 railway service providers in the eight countries, and all the countries, (including China in the form of local and joint-venture lines) have multiple railway providers. The number and configuration of companies in each country has been heavily influenced by history, by geography, and most particularly by the nature and dispersal of their transport markets. Bigger, busier and more diverse national transport markets can obviously support and justify a more pluralistic structure. (FP4/PP2).

Policy choices have also been important. In Australia, Canada, Germany, Russia and the USA, active policy decisions favouring competition in the rail freight market underpin the existence of multiple rail freight service providers. Some countries have also adopted horizontal (geographical) separation of regional passenger operations (Germany, Japan and Russia) as a policy aim, while in other countries this is inherited from a federal government structure (such as in Australia, Canada and the USA) wherein individual states or cities are responsible for operating (and funding) local passenger railway services.

Seven of the countries have policies that encourage plurality through some form of access to the national rail network by third-party trains, though the generality and application of 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<sup>12</sup>. In Australia there is legal right of access to accredited train operators under Competition Law but it is effectively confined to the freight sector. In the USA, about 37,000 km of route operated by private freight railway companies is on track owned by another 'vertically integrated' freight railway - equivalent to around a quarter of the total route-length of the US network<sup>13</sup>. Most of the access in the USA occurs under privately agreed track access contracts though some are mandated by (or agreed so as to head off) regulatory intervention. In Canada and Brazil, defined rights of access exist for freight trains on specific routes to allow multi-operator access into key terminal destinations. The detailed papers (FP Annex C) summarize the track access tariff principles and/or formulae used in four of the countries reviewed: Australia (interstate), Canada, Germany, and USA. The multiplicity of rail freight providers occurs in most of these countries without vertical separation of the national railway entity and without privatization of the state-owned freight railway. Only in the case of Australian (interstate lines) is the national railway network managed by an independent infrastructure company and even in this case the infrastructure remains state-owned.

### *Issues and Lessons for India*

*India has the most concentrated industry structure of all eight comparator countries. IRB and its associated PSE's provide virtually all railway infrastructure, freight and passenger operations and carry over 99 percent of India's railway traffic<sup>14</sup>. Issues that the Committee might consider are:*

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<sup>12</sup> See updating paper by Thompson et al for OECD at: <http://internationaltransportforum.org/pub/pdf/07RussRail.pdf>

<sup>13</sup> A detailed description of US railway industry structure and traffic can be found at the Association of American Railways' website at [www.aar.org](http://www.aar.org).

<sup>14</sup> A few separate special-purpose railways exist such as joint ventures between MOR and other entities such as the Kutch Railway Company Ltd., and the Koncan Railway Corporation Ltd.

- *Why is India's railway industry structure so heavily concentrated in one agglomerated service provider, despite the fact that it is operating in one of the world's largest countries containing some of the world's largest passenger and freight markets?*
- *Does this structural agglomeration deliver economies of scale that outweigh the converse advantages of market specialization and industry pluralism?*
- *Or conversely, does agglomeration create diseconomies of bureaucracy, diminish market-responsiveness, and reduce commercial agility?*
- *Are the benefits of market focus and specialization that have been evident in the Concor experience in India relevant to any other kinds of freight?*
- *Should the government encourage other freight train operators to use its India's railway network on the same terms as its zonal railways if it can be shown to improve services to freight shippers or increase railway mode share?*
- *If so should that access be wide or more narrowly defined and how might international experience help shape the access and regulatory regime in India?*
- *Should the four suburban passenger operations be responsible to and funded, or part-funded, by the appropriate State jurisdictions?*

## 7. Focus on core business

In all the countries in the group the larger railway entities, both public and private<sup>15</sup>, once administered a range of non-core activities from which they have now withdrawn. (FP5). They have devolved to specialist agencies the great majority of historically accrued social welfare activities and divested manufacturing businesses to independent companies. Many also contract out various business support services to specialist service providers. The imperatives of transport competition in the motor age have compelled railway service providers to procure railway equipment and business support services in the way that will best support their core transport business, that is, by competitive tendering among suppliers.

### Issues and Lessons for India

*Indian Railways retains a large number of social and educational institutions, owns huge manufacturing businesses and contains many in-house business support services that the other countries' railways have largely left behind. Issues that the Committee might consider are:*

- *Do IRB's policies help or hinder Indian Railways to compete successfully in the provision of transport services;*
- *Is IRB the most competent organization to provide those social and educational services that are not directly related to occupational health and safety; what other channels exist to ensure continuity of socially necessary services?*
- *Does the ownership of equipment manufacturers guarantee or improve the quality or value for money of equipment compared to competitive bidding among competing suppliers;*
- *Has ownership of manufacturing enterprises improved their management and performance compared to other models of ownership by Indian, international or joint Indian/International companies?*
- *Would the contracting out of many routine business support services make Indian Railways more competitive?*
- *Would the encouragement of a larger private railway supply industry in India be more or less beneficial to public interests than protecting IRB in-house suppliers?*

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<sup>15</sup> For example, in 1896, American private railways employed over 6,000 railway doctors and operated 25 hospitals that treated over 165,000 patients annually.

## 8. Freight and passenger transport as separate businesses

In seven of the eight countries, railway freight and passenger service providers are normally constituted and virtually always managed as separate businesses or business subsidiaries (FP6/PP2). In Australia, Brazil, Canada, Japan and the USA, freight and passenger companies are wholly separate entities. In Germany and Russia they are subsidiary companies of the same holding corporation. It was not always so; in most countries, the major railway companies once had common business management of passenger and freight business but found this model ineffective in an age of competition which creates a management imperative to focus on market needs. Passenger and freight transport markets are quite different: different customers, different service needs; different economic drivers; and different social role. Agglomerated structures also make it harder for governments to target any subsidies, such as to loss-making passenger services.

Finally, agglomerated structures dissipate the responsibility for market success and commercial performance over many cost-centres and not to any identifiable profit centres. This is an intrinsically flawed approach and not only because it weakens accountability; the two most compelling incentives for cost-centre managers are to maximize their budget allocation and then spend it all, so creating misalignment between departmental and corporate aims.

### Issues and Lessons for India

*By comparison with most international comparator railways, IRB's freight and passenger services are neither separately constituted, separately managed, nor separately accounted. Issues that the Committee might consider are:*

- *Does the bundling-up of passenger and freight services at all levels - institutional, managerial and financial – inhibit or encourage market-focus or service performance in either passenger or freight sectors;*
- *Does it improve public accountability for financial performance or for use of public funds?*
- *Is it a material factor in facilitating political intervention in passenger service and pricing policies by making it easier to fund the interventions from Indian freight service users rather than from the budget?*
- *In whose interest is the bundling together of freight and passenger services maintained – the public interest, the passenger interest, management interests, or the political interests?*
- *If passenger and freight services were to be separated, how should passenger service losses be either reduced or funded?*

## 9. Line of Business Structures

Even within the freight or passenger sectors or many larger railways, there are typically further subdivisions matched to markets. The managements of most 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. Equally importantly it has been to devolve management of specific segments to line managers, thereby making a complex business more manageable. LOB structures are applied in several different forms (FP7).

### *Issues and Lessons for India*

*India has arguably incorporated the LOB principle in two main segments, Concor (container freight transport) and the DFCCIL (specialist rail freight infrastructure) but IRB itself appears otherwise to have made little use of it within its own core business. In any event, without unbundling of the 'main businesses' of freight and passenger services, further sub-division by LOB is rendered somewhat academic.*

## 10. Funding passenger services and infrastructure

In all four of the countries that have substantial passenger operations, passenger transport is socially important and politically sensitive. However, each country has pursued this interest in a different way: Japan through a regulated private sector, Germany and Russia mainly through corporatized state-owned providers coupled with degrees of contestability and private sector participation, and China through a government ministry-run railway (PP2). A common policy aim in the four countries appears to be that long-distance passenger services should cover their train operating costs and make some positive contribution to recovery of network infrastructure costs. In the case of Japan this is a full economic contribution (other than for new Shinkansen lines where access charges are subsidized). In Germany, passenger revenue from long-distance services must fund their infrastructure operations and maintenance cost but the taxpayer pays most of the infrastructure capital cost burden. In the case of China and Russia long-distanced passenger services also make a positive contribution to infrastructure costs though the lion's share of infrastructure is clearly borne by freight. (PP3).

Regional/suburban services are treated differently. A major portion of the revenue earned from German regional passenger services (whether run by DB Regional or private contractors) is from government subsidized passenger public service contracts between a regional rail company and the administrations on whose behalf specific services are run. The contracts are tendered, and many have been won by private companies. The German model of concessioning of suburban/regional networks through competitive tender has provided better value for money than previous uncontested operation by the national operator. According to DB itself, the Federal Länder (states) now have to spend less public funds to obtain a far higher level of traffic performance in regional rail service than at the start of the rail reform. *'Although the regionalization funds decreased by six per cent in real terms between 1996 and 2009, traffic performance in the regional rail passenger sector rose by 29 per cent during that same time. After adjustment for inflation, the Federal Länder received 37 per cent more performance for each euro in 2009 than they did in 1996.'* (DB Annual Competition Report 2011).

Russia's railway structure is in a stage of transition. This year, 2011, will be the first year in which all previous RZD passenger services will be managed by subsidiary and joint venture companies of RZD. Henceforth the previous RZD long-distance and international services will be operated by a wholly owned subsidiary, the Federal Passenger Company, and regional/suburban services by one of 21 geographically-based suburban<sup>16</sup> passenger companies, jointly owned by RZD and regional administrations. They are intended, as in Germany, to be substantially funded by the corresponding regional administrations, but that has not yet been attained. The reform program seems to have reached the stage of revealing the extent of their accounting losses rather than eliminating them or establishing the local funding.

All four countries have adopted the principle the taxpayer should support at least some major new or upgraded railway infrastructure of a nationally significant nature. In the case of China this support is currently limited to lines to remote areas<sup>17</sup> and in Japan, to Shinkansen lines. In Germany the support is more systematic and subsidies are paid mainly to DB Netz (the infrastructure subsidiary) partly funded from the general budget and partly from petroleum taxes. The subsidies include replacement

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<sup>16</sup> Although RZD refers to these as suburban services, they represent networks that extend long-distances into rural hinterlands and include what would be known elsewhere as regional networks.

<sup>17</sup> There are some observers who consider that government will in due course need to assume at least some of the debt involved in provision of high-speed lines but this is not current policy.

investments set out in a Performance and Financing Agreement signed with DB and new-build and upgrading projects stipulated in Federal Transport Infrastructure Plan. In Russia the state is responsible for funding rail projects defined in a Federal Target Program<sup>18</sup> (though the actual level of funding currently provided for rail infrastructure is thought to fall far short of what is required to deliver the Program) and is also paying for passenger railway links in preparation for the 2014 Sochi Winter Olympics and for a new airport link in Vladvostock.

*Issues and Lessons for India*

*India's railway system has largely self-funded its own operating costs, with injections of capital support from government from time to time such as through the Railway Safety Fund to improve rail infrastructure. Issues that the Committee might consider are:*

- *Should India's long-distance passenger services as a whole be required at least to recover their long-term train operating costs; should they also make some positive contribution to the maintenance and operation of infrastructure?*
- *Conversely, should the freight sector continue to be internally taxed to pay not only the full costs of infrastructure but also part of the train operating costs of passenger services;*
- *If the freight sector is to continue to be internally taxed, would it be better to make this explicit through separated accounts for freight, passenger and infrastructure business performance;*
- *If it is considered undesirable to retain an internal tax, what would be the best framework for Passenger Public Service Contracts to allow budget funding of social service obligations?*
- *Should State or Urban authorities contribute to the specification and funding of Public Service Obligations in networks of suburban and regional passenger services of which they are the main beneficiaries?*

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<sup>18</sup> Decree no.377 'On Federal Target Program-Modernization of Russian Transport System (2010-2015)

## 11. Low-density branch-lines

In most of the countries in the group, the major railway companies have divested low density branch or regional lines (passenger and/or freight) to smaller companies or to local authority responsibility (FP10). In Australia small regional branch networks mainly handling grain, wool, fertilizers or timber were privatized mainly in period 1995-2005. In Canada and the United States the larger railways have spun off large numbers of secondary and branch lines to short line operators who have made a viable business from a lower cost base. In China, following the 1991 Railway Law, the Ministry of Railways devolved many low density freight branch-lines to independent management groups and regional government authorities. The German and Russian situation, in which the responsibility for funding regional passenger services has been (or in Russia's case is to be) devolved to regional governments, has already been described. In Japan more than 20 non-JR companies carry nearly a third of total railway passenger-km on networks typically in the range 50-200 route-km, but some up to 500 route-km in length.

### *Issues and Lessons for India*

*IRB runs a low-density non-broad gauge network of over 11,000 route-km, which constitutes about 18 percent of the total Indian Railways route length but carries only around 1 percent of traffic. It is a cost burden which the rest of the network cannot really afford to pay for while remaining competitive with road transport. Issues that the Committee might consider are:*

- *Should the costs of this secondary network be funded directly by national and/or State governments rather than by freight traffic on other routes?*
- *Should appropriate parts of the secondary network and associated train operations be divested or devolved to State governments or to private operators, if any can be found;*
- *If they cannot be divested or devolved, do the social benefits of keeping them open outweigh their costs (at their very low traffic densities there are unlikely to be significant environmental benefits)?*
- *Assuming that something new and different should be done, is this best implemented by the IRB or by special-purpose residuary company established to seek optimum solutions by negotiation with States and/or other potential operators?*

## 12. Issues affecting financial performance

The commercial drivers of railway financial performance are relatively straightforward. To earn sufficient net revenue to meet the threshold of **train operating costs** requires both efficient operating costs (implying close management control over operating resource utilization, particularly rolling stock and staff) together with strong earnings per train-km (implying management actions to attain high wagon or coach capacity utilization at adequate prices). To then generate a significant net revenue contribution to meeting **network infrastructure costs** depends on attaining high aggregate traffic density on the route and operating and maintaining the infrastructure efficiently. In both train operations and infrastructure management these statements presuppose that managers actively manage in the short-medium term both the quantum of resources they use (though asset management and staffing policies) and the unit costs of those resources (through procurement and wages policies); and in the long-term, invest in improving both the resource utilization and unit cost parameters. Two economic issues of particular interest to the committee were the commercial benefits of heavy load freight trains and the financial performance of passenger trains.

Heavy load freight trains provide clear cost advantage in markets where there is sufficient traffic to establish them (FP8) and where managers actively manage resources to save 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; nevertheless, they have also sought within their constraints to run larger freight trains.

Throughout the world, the financial viability of passenger rail services has been found challenging, but the international trend is towards improving service to try to maintain market share and revenue yields. The economics of passenger rail operations mean that low service quality does not necessarily mean low costs (PP1). Train crew, energy, station staff, train control costs, maintenance of infrastructure and many other items cost the same (and sometimes more) when product quality and amenity is low. A business strategy overly focused on providing a low quality product at a low fares therefore runs counter to the economics of rail technology which depend on delivering the superior travel benefits the technology can offer to those who can afford it, and pricing accordingly. Positioning the main role of passenger railways as cheap transport for low income groups is a certain recipe for financial stress; in rapidly developing countries especially, the long-term sustainability of rail passenger services depends on attracting a healthy proportion of increasing income earners within the country into their customer mix.

### Issues and Lessons for India

*Some railway managers in India take the view that the major proportion of train operating costs, and almost all of infrastructure management costs, particularly human resource levels and unit costs, are invariant to management actions, citing political and industrial constraints. Issues that the Committee might consider are:*

- *To what extent are labour agreements or political vetoes on changing staffing levels in IR stifling efficiency incentives in management of both train operations and infrastructure?*
- *Will the long-term role of rail in India, and the jobs it can sustain, be hindered by the efficiency consequences of inability to treat human resource costs as controllable?*

- *Can the cost base really be managed effectively while pay scales are not within IRB's responsibility?*
- *Is the Dedicated Freight Corridors program really going to deliver the most cost-efficient heavy-haul freight operations which the Indian market could support, or will it just be used to create extra capacity?*
- *Given the cost consequences, can India's railways continue to provide a high proportion of passenger capacity in the form of a very cheap low standard product without constraining its ability to provide the high quality passenger railway consistent with the imperatives of railway economics and India's future mobility needs?*

## 13. Information and Control Technology

Investments in modern centralized train control methods internationally have been found to be critical not only to railway capacity utilization but to building competitive advantage through better more reliable service. 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 partly 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).

Each step in the sophistication of signaling and train control systems involves substantial investment. Automation replaces the many signal-boxes and signalmen of a labour-intensive system so that other things being equal, the investments offer higher cost savings in higher wage economies. But the long-term benefits of the new technology are not only, or even 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, rolling stock and train crew, and improved safety.

### *Issues and Lessons for India*

*India has impressive Information Technology capabilities. It is not known if train control and signaling approaches are given less attention than in comparator countries, but are some evident gaps in train dispatching, for example the absence of any freight path timetabling. Issues that the Committee might consider are:*

- *Has the balance of investment in India's railway infrastructure given sufficient weight to investments in improving train movement management and optimizing line capacity as opposed to gauge-changing or other physical investments?*
- *If so, is this connected to the assumption that savings in staff costs from less labor-intensive signaling cannot be realized in practice?*
- *Has Indian Railways a coherent strategy for the upgrading of its management of train movements and optimizing line-capacity?*
- *More generally, are capital allocation processes in place to ensure efficient trade-offs between different areas of capital investment?*

## 14. International comparisons of productivity and tariffs

As requested by the Committee, a comparison of broad productivity indicators was made (with appropriate qualifications) for the five of the largest countries - Brazil, Canada, China, Russia and the USA (FP Annex A). They show India to have the lowest productivity of locomotives (two thirds that of Brazil, Russia or USA and less than half that of China); and the lowest productivity of labor (about half that of Russia and China). By comparison, track utilization is and wagon utilization are in the middle of the range.

Turning to tariffs, the average passenger revenue yield (that is farebox revenue per passenger-km) was estimated for China, Germany, Japan and Russia and compared to India (PP Annex A). In the case of passenger fares a comparison adjusted for relative parity of purchasing power (PPP) seems appropriate. India's average PPP-adjusted passenger yield per passenger-km is about 11 percent of that of Japan, 15 percent of that of Germany and Russia, and 37 percent of that of China.

For freight, estimates of average revenue yield/tonne-km were made for three of the countries for which data is available (USA, Russia and China) and for India. India's average yield is 42 percent higher than that of China, 4 percent lower than Russia and 8 percent lower than the USA. The use of a purchasing power parity (PPP) approach should be treated with more caution in the freight sector, where many of the freight shippers are not private citizens but large internationally-trading companies. However, subject to that caution, India's PPP-adjusted freight revenue yield per tonne/km is about 95 percent higher than in the USA, 80 percent higher than in China, and 33 percent higher than in Russia.

### Issues and Lessons for India

*Some of the comparisons point to issues of possible concern for India:*

- *Can India afford to have such low comparative productivity performance in human resources and locomotives which in most railways are considered two of the more 'controllable' resources?*
- *Can India's railway industry be sustainable in the long-term with average passenger tariffs which, even after allowing for relative purchasing power, are lower by orders of magnitude than any other in the comparator group (e.g. only a third of those of China)?*
- *Can India's freight shippers and economy afford freight tariffs that are bloated by the combined impacts of both lower than attainable staff productivity and the need to support part of the costs of passenger service?*

## 15. External benefits of rail against road freight transport

The last decade has seen the emergence of an increasing body of knowledge (summarized in FP Annex B) about the many environmental impacts and external costs of different modes of transport, including their contribution to greenhouse gas emissions. The European Union sponsored estimates show road haulage in Europe having higher external costs per tonne-km than rail freight by up to five times. United States estimates made by the University of Texas Transport Institute also show a substantial advantage to railways over road transport though less than in the EU particularly as regards vehicle emissions (possibly because freight railways in the USA are almost exclusively operated with diesel locomotives and because Europe is more urbanized than the USA).

### Issues and Lessons for India

*It is likely that any estimates made in India would demonstrate a greater advantage of railways over road transport in external impact than in EU or the USA, due to the prevalence in India of (on average) smaller and more polluting road trucks, and because of India's much higher road accident rates. Issues that the Committee might consider are:*

- *Whether the differences in external costs materially support the case for an integrated land transport policy or a unitary transport administration that could develop and administer such a policy?*
- *Whether adoption of some of the international experiences contained in this report would support both a wider role for railways and assurances that users would benefit from that wider role?*

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THE WORLD BANK GROUP

# Summary Paper on PPPs in Transport

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**Jose Luis Guasch**  
**The World Bank and University of California**  
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# 1. Introduction

India has witnessed more than a decade of robust high economic growth. Yet on the back of this economic growth is a rising demand for better physical infrastructure including power and energy, telecommunication, water but particularly transport, which today is perceived as a critical bottleneck to support its high growth levels. Given the Government's fiscal constraints, it is not feasible to expect Governments to meet all the funding requirements of meeting the rising demand for better infrastructure, particularly transport. Consequently, the PPP option has and continues to be on the agenda.

This report provides an analysis of the major cross-cutting themes and of the record, within the context of the Transport PPP program. It focuses on the enabling environment for Transport Public Private Partnerships (PPP) with specific reference to past experiences, and the record and evaluations of realized transactions. Due consideration is also given to assessing the existing legal, institutional, regulatory and policy environment. It evaluates the benefits of the program and identifies the most recurrent problems. It also provides policy prescriptions to implement a best practice enabling environment. The PPP framework and solutions to the problems are presented to guide the Government on its efforts to improve the country transport infrastructure and the structuring of transport PPPs, and secure the desired level of services to support growth and alleviate poverty.

## 2. Transport PPP Transactions

Through the last twenty years most Governments have embarked on and adopted PPP programs to complement traditional public works to improve their deficient infrastructure. Table 1 shows the extent of PPP projects and private investment secured through such types of programs. Nearly 5,000 PPP projects have been implemented with investment levels of about US\$ 1,500 billion. In the transportation sector itself, nearly 1,200 PPP projects with investment levels of around US\$250 billion have been implemented. About 64 percent of the transport projects were roads related, about 18 percent were on ports, 10 percent were on airports and 8 percent were on railroads. In the transport sector the leading region has been Latin America and leading countries in terms of number of PPP projects and investment levels have been Chile, Korea and Mexico (and India). Those countries were the pioneers in implementing PPP programs in the early 1900s. This report is based on the evaluation of over 400 transport projects in Latin America, over 50 projects in Central Europe, nearly 50 projects in Africa, and over 80 projects in Asia

Table 1: Total of PPP Infrastructure Projects and Investments in Emerging Developing Economies, 1990-2010

<b>Item</b>	<b>Energy</b>	<b>Telecom</b>	<b>Transport</b>	<b>Water and sewerage</b>	<b>Total</b>
Total number of projects	1,852	807	<b>1,196</b>	715	4,570
Total investments (\$, millions)	481,695	719,645	<b>253,197</b>	60,280	1,554,817

*Source: PPIAF Database, 2011*

### **3. Public-Private Partnerships**

The term Public-Private Partnerships has been used since the 1990s to describe a form of private sector participation (PSP) in infrastructure financing and service delivery. Although definitions vary, these are all based on the common principle that PPP is a procurement process to provide financing, services or deliver assets through joint public and private cooperation. PPPs are contractual arrangements of varied nature where the private and public parties share rights and responsibilities during the duration of the contract. Different forms of PPPs exist involving various combinations of public and private sector finance and exposure to project risk. Forms of PPP include inter alia, concessions, build-operate-transfer (BOT), leases and even management contracts. Best practice PPP aims for an optimum balance of sharing risk and rewards between the private operator and the Government. It is recognized that private sector financing could cost more (although not always, particularly in countries with limits or constraints to indebtedness) and the private sector needs a higher return on investment, but this is offset by the private sector's ability to reduce overall costs of infrastructure services delivery through higher efficiency, the bundling of responsibilities for construction and rehabilitation and maintenance and better risk management, for example during construction. PPP can also vary in terms of the source of cost recovery of investments. PPPs range from full cost recovery from users fees, to recovery through government payments (the so called PFI model) to hybrids. In the PFI model, where it is not possible to recover costs through user charges, the public sector makes payments to the private party when, and as to the extent that, a service is made available (the Availability Payments). Therefore, in PFI, the demand or usage (commercial) risk remains with the public sector.

# 4. Choosing the Modality and Financial Support to Implement Transport Projects

The ultimate goal is to secure a proper level of infrastructure service provisions through projects that have a high economic/social rate of return. PPPs can be and have proven to be a very valid option to implement some of those projects, but are obviously not the only one.

The lessons are clear, infrastructure projects should be identified, selected and prioritized based on economic and social impacts (subcomponents often considered to select projects in the transport sector have been, job creation, country physical integration and connectivity, trade impact, logistic costs, etc.). Conventional wisdom is that PPP prevents “white elephant” projects because the private sector will not bid on a PPP project that is not financially viable (although the argument is only valid for those projects where there is not supposed to be government support/contributions). However, the reality is that potential bidders focus on financial viability, not the overall economic impact on society. Governments should avoid PPP projects that are financially attractive but lack sufficient overall public benefits. Once a project is identified based on that criteria, then the government has to select a suitable financing option, which could be PPP, as shown in the graph below.

## Decision Matrix for PPP projects

Economic Rate of Return		
LOW	HIGH	
No need for Public Sector Involvement	PPP with no or limited Government financial support	HIGH
	Public-Sector Financing  Or PPP with Government financial support	LOW
		Financial rate of return

Even within PPP there are a variety of modalities that can be used depending on the context, project and circumstances. Countries that have been successful in their transport PPP projects have implemented a process by which the modality (and financial support) of the transport projects is selected. The proper identification and selection of the modality to execute a project should be based on viability/affordability, economic and social impacts, and value for money.

The choice of modality and financial support has been driven by the domestic and global context. Thus Governments have considered the different options to advance the transport infrastructure agenda, and chosen carefully the appropriate modality and typology of financial support. The most common type of options, used by Governments in the last twenty years are listed in terms of decreasing government involvement-financing and risk exposure of public sector.

- Build and operate transport project by public sector

- Full decoupling: Finance and build transport project as a public work with the intention of, once built, bring the private sector through: i) a management contract; or ii) a lease contract; or iii) as PPP Brownfield (Mexico, Uruguay are examples of that)
- Use of pay as you build scheme to reduce PPP financing requirements, through types of financial certificates (CRPAOS) to be issued by government, and given to the private operator, as construction (and investment) moves forward (i.e., triggers tend to be in increments of 10% of project costs and so on) (Peru, Brazil, Dominican republic are examples of this)
- A PPP but with a reduction of commercial risk for private operator-through availability payments (direct-independent of traffic/demand or via shadow tolls) (Peru, Colombia, Brazil are examples of that)
- Viability Gap Support-to make the project financially viable
- Direct lending often through state own development banks, or/and stapled finance (Brazil, Mexico are examples of this)
- Facilitating funding and credit enhancement through infrastructure investment (government supported or hybrid public-private, or pension funds facilitated) or/and guarantee funds (government provided) (Peru, Brazil, Indonesia, Colombia are examples)
- Facilitating the financing and financial viability through the structuring/bundling of PPP projects, along the lines of scaling down the size of projects and bundling projects mixing into a single package of Brownfield and Greenfield projects (Mexico, Peru and Brazil on road projects are examples)
- To address risk of government complying with financial payments over the life of the PPP (15 to 20 years) the Government might consider offering guarantees (through multilaterals) or creation of a dedicated viability gap fund to cover those payments, or/and infrastructure funds (Peru, Brazil, Colombia, Indonesia, Uruguay are examples of that)
- Traditional PPP project, widely relying in private sector financing

The project characteristics, local and global context and country experience are the elements that have guided countries in the selection of the most appropriate option among those listed above. Often countries starting a PPP program have had to be more generous either in terms of risk allocation or on its financial support, so as to establish themselves as credible partners and develop a reputation. As the program matures the governments can and have been more cautious and mainstream in the granting of financial support and risk allocation (examples, are Chile, Korea, Peru, Brazil, etc.)

## 5. Benefits of Projects Implemented Through the PPP Modality

The answer is that in general transport PPP projects have brought significant benefits, but that the benefits could have been even larger, had the projects been done as best practices. PPP projects also have had a number of systemic problems that have reduced the potential benefits of the program. An evaluation of the outcomes and impact of the PPP transport projects in the last twenty years, show that on average those projects have brought significant benefits, in themselves and when compared with the public works alternative. The main benefits of PPP are and have been to accelerate the infrastructure agenda, provide possible short term release of fiscal pressures and more relevantly, offer better value-for-money to public authorities, which means cheaper/better services over the long term, significant improvements in the quality of service, quality of assets and productivity and coverage. A critical benefit of PPP comes as a result of the usual bundling of construction, maintenance and rehabilitation for the life of the project/concession, usually from 15 to 30 years. The problem with unfit maintenance of public works projects and of the current stock has been key in leading to the deteriorating infrastructure stocks. More specifically, the benefits of transport PPPs have been and can be quite significant (plenty of evidence through 20 years of experience): efficiency/productivity gains ranging from 10-20% to over 70%, improvements in quality of service sometimes over 60%, and accelerating coverage of service. Experience has shown that reductions in prices/tariffs are difficult to achieve (although there are notable examples such as road PPP in Brazil and Mexico) given the often poor initial state of assets requiring investment and that the original prices tended to be highly subsidized.

Transport PPP projects can and have also contributed to significant reduction in costs and delays in construction. For example a review of construction projects by the UK National Audit Office has shown that on average PPP arrangements were responsible for only 22 percent of cost overruns for the public sector, as opposed to 73 percent under traditional procurement arrangements. However, that has been possible only with an optimal risk allocation between the public and private sector. Some risks, such as construction, can be better managed by the private sector. Traditional procurement does not always transfer such risk to the private sector, which can lead to cost overruns or construction delays. The same applies to operations and maintenance; a well-designed PPP project can ensure that maintenance is done in an optimum way, which extends asset life, reduces overall management costs, and yields more value-for-money for government than traditional projects. Another potential benefit of PPP has been to increase the capacity of local industry and bring more innovation to a specific sector. In principle, by bringing in international construction companies, investors and advisors, countries have benefited from their experience in PPP and adoption of international best practices. For example, when applied to road construction and management, this could mean improving the technical quality not only of the road assets but also of the expertise of local staff, institutions and companies involved. However, PPP is not a guarantee for knowledge transfer. Knowledge transfer will come if international companies are willing to bid and have the incentive to build capacity in the local contracting industry. In fact, the argument can be made that given the limited capacity of the sector and experience in PPP, an international company would find it less risky to use basic construction design methods with standards that are appropriate to the local conditions, and ensure that the work can be done without delays and overruns. In conclusion, PPP has the potential to improve the capacity of the local industry but Government should address the specific issues already facing traditionally procured projects.

The private sector and investors usually recover their investment in PPP projects from user charges or through a variety of Government contributions. However, investors borrow to invest so they must repay debt and generate a reasonable profit for their equity participation. In practice, revenue sources are often limited to user charges and public sector contribution (financed by taxpayers), which can be made available whether or not the project is a PPP (tolls can be applied for example on publicly

funded highways). When public authorities consider PPP to bridge the infrastructure financing gap, an important consideration is to compare the cost of the PPP option with traditional procurement and public sector financing in the long-term, the value for money criteria.

In summary the main benefits that PPP have brought have been: reform/modernization of public services; acceleration of infrastructure program; improved value-for-money procurement of public services; improved quality of service; increased access; improved productivity; additionality of finance; bundling of services which have brought much improvements in rehabilitation and maintenance; contestability in delivery of public services; as an antidote to short-termism in both public and private sectors; improved transparency of costs of public services delivery. The overall evaluation confirms that the benefits of PPP programs have been substantive, that they could have been higher, had the program been better designed. It is also the case that a number of mistakes have been made, but many of them can be avoided, if countries avail themselves of current knowledge of best practices. Overall PPP can bring much value if countries can avoid a number of mistakes commonly made and use best practices to implement all elements of a PPP framework.

## **6 .Typical Structure of Transport PPP projects**

The concessionaire in transport PPP projects typically does and has done a number of the following activities: designs, builds, finances, manages/operates, maintains asset and provides services. The public sector grants a concession to a project company, which functions as the Special Purpose Vehicle Company (SPV) to do the agreed activities such as design, build, finance and operate the project. The concession period has ranged between 15 – 30 years.

The PPP Contract (and associated documents) regulates all relationships. Land is provided by the public sector and leased to the Concessionaire for the duration of the contract. The project company often subcontracts the design and construction to a construction company through a turnkey contract, normally at a fixed price. Similarly, the operation and maintenance can be given to a specialized operator, which is often closely connected to the Sponsor Group or consortium of companies. The consortium inserts equity, the norm has been around 10% to 20% of the total costs, and signs a limited recourse loan for the remainder on behalf of the project company with banks. There also can be government contributions to make the project financially viable.

## **7. PPP Project Cycle**

The typical PPP project cycle is shown in the figure overleaf and it has five phases: setting PPP policy and strategy; project identification prioritization and jurisdiction of origin; design and analysis of individual projects; designing and managing the transaction; contract management, oversight and regulation and impact evaluation. To be able to successfully move PPP projects from identification to award and oversight and to secure the expected benefits, successful countries have set up a PPP framework, that entails: laws and regulations, institutions, process and procedures, contract design, transaction design, oversight and regulations all accompanied by effective operational instruments.

## **8. Critical Elements of Successful Transport PPP Programs**

### **A. Legal and Regulatory Framework**

A country's solid legal, public policy and regulatory frameworks provides clarity to the private sector, increasing the attractiveness of a PPP project. It also allows the public sector to clearly define responsibilities, and manage the risks associated with PPP. Standardization of guidelines, process-related tools, model contract clauses, template contracts, approvals and monitoring rules can reduce both the complexity of PPP arrangements and project costs. Oversight procedures have more of an advisory role, leaving room for flexibility and innovation in designing the PPP arrangement. Most successful PPP programs have developed comprehensive and transparent concession laws, with normatives for proper institutions and procedures and public sector goals and objectives in private participation. Equally clear is the process and terms by which the private sector is to be involved in the partnership.

Likewise clarity on sector policies is critical for an effective PPP program. Policies should specify PPP responsibilities at national and regional levels, sector reforms, and the role of the private sector. Some projects are unlikely to attract significant private financing unless accompanied by sectoral reform, and a sectoral approach clarifies the policy environment for the private sector, which lowers their perceptions of risk. In 1997, the UK passed the Local Government Contracts Act to clarify local government procedures for undertaking PPP contracts and related arrangements. In 2002, Ireland passed the State Authorities Act, which defined the possible range of PPPs that State Authorities could undertake. Likewise, for example Brazil, Colombia, Korea, South Africa, Australia, Peru, Colombia, Uruguay, Mexico have passed concession/PPP laws to guide the process and provided a legal grounding.

### **B. Institutional, Jurisdiction and Capacity**

PPP Programs. Experience shows that the traditional public sector institutions typically lack skills to prepare, procure, and monitor PPP projects and they need to be restructured and strengthened for a PPP program to be successful. For example, Chile, Korea, Brazil, Peru and South Africa had positive PPP experiences and all had allocated significant resources and invested in institutional building and strengthening. Even skilled external advisors cannot compensate for a strong public sector institutions to lead and manage the process.

Also the fragmentation of the transport agenda needs to be avoided and addressed. A common problem has been the separation of a transport vision into its sub-modalities, roads, railways, port and airports, with each having and launching its own strategy and projects. What has been effective has been an integrated vision and strategy and the linkage of projects across the sub-modes, often accompanied by the enactment of a Multimodality Law.

Fragmentation and lack of clarity on jurisdictions and institutional weaknesses are just one of the reasons for the lack of PPP projects taking off in recent years. While institutions generally do exist and could be mobilized to function in a coordinated manner that facilitates PPP projects, the reality on the ground indicates that no strong enabling environment accompanied by political championing of PPP is in place to support integrated transport PPP projects or to induce the proper coordination across the relevant institutions. Coordination has been critically weak between the various agencies, and modalities that are at the frontline of PPP facilitation and implementation. The communication between these key institutions tends to be ad-hoc and not conforming to any specific routine schedule.

Capacity building is and has been another critical factor for successful transport PPP programs. There

is also a clear lack of capacity and human capital/knowledge at all relevant institutions and amongst the public sector officials in the areas of facilitating PPPs and this is also a contributor to the failures.

### **C. Processes and Procedures**

Processes. The PPP frameworks have been highly deficient in the structure of processes and procedures to move the project from identification to award to post award oversight. Often, there is no clear path, and things are done in an ad-hoc fashion. As a result, delays and confusions have been substantial. Project proposal approvals have taken far too much time from a private sector perspective and only serve to dissuade investors. Contract approvals have often required cabinet concurrence in most cases and contract re-drafts also require cabinet clearance. The time taken on the second round for re-drafts may be prohibitive to investors looking for swift progress on their proposed ventures. Typically environmental issues in transport PPP projects have taken up the longest time to get approval and clearances. Therefore, one option may be for the government to get the environmental approvals which will speed up the process as well as transfer some of the environmental risk on to the public sector.

### **D. Instruments**

Instruments. PPP frameworks have been in general weak in operational instruments that promote efficiency, adoption of best practices and provide specific knowledge to address, both contract design issues, transaction and post award oversight. Examples are, the lack of standardization of documentation (contracts, model clauses, regulatory accounting, bidding documents, dispute resolution procedures etc.) has been a bottleneck that has still has not been addressed in many countries. Contracts that are issued to the private sector from the various institutions often have not conformed to the same format.

Most of the successful PPP programs have moved to develop and implement critical PPP instruments, such as contract and model clauses, per sector, to secure standardization of documents, implementation of regulatory accounting, information data set for benchmarking exercises (and setting tariffs), risk assessment tablets, cost of capital methodology and resetting tariffs guidelines.

### **E. Contract Structure and Design**

#### *Risk Allocation*

The risk allocation or the sharing of the diverse project related risks has been a key feature of transport PPP contracts (in contrast to public works contracts). Appropriate risk sharing is a critical characteristic of PPP projects. Appropriate allocation of risk between the public and private sectors can increase the value for money of a PPP project and ultimately reduce the financial contribution from the government, the tariff required from users, or both. Contracts should establish a risk matrix indicating the risk sharing structure in the project in the most clear way.

#### *Measurement and Evaluation of Performance: Indicators*

It has been critical for success of PPP transport projects to carefully identify a reduced matrix of measurable performance indicators, with compliance linked to financial impact. Performance is and has been measured in terms of availability and quality of service on the basis of “Key performance targets” and “Key performance indicators” (together KPIs). It has been critical that the Grantor of the PPP is able to monitor whether the private operator is meeting its obligations with respect to:

- Service coverage targets (if any) in terms of quantity and quality
- Provision of service and assets to required standards
- Upkeep, upgrade and rehabilitation of the assets
- Adequate reporting by the Developer of its activities

A matrix of KPIs in the contract specifying detailed performance standards has been critical for successful PPPs, with compliance with these KPIs tied to remuneration and sanctions. For example for transport projects the most used key performance targets and indicators have been: road condition (e.g. smoothness); driveability (e.g. signage); safety (e.g. illumination); time to fix defects/problems; congestion; and overall level of service such as maximum time for services (e.g. time to reach point B from A-for both rush and normal hours; time to load and unload containers, berth time of ships, airplanes turnaround time, etc.).

#### *Needs and Typology of Government Support for Transport Projects*

Most transport projects require significant investments, and a number of them while having a high rate of social/economic rate of return are not fully financially viable—full recovery from user fees. Also in a number of contexts, securing financing by the private sectors—when the PPP modality is selected—has proven and can be difficult due to bankability issues. Thus a number of PPP projects have required support from Government (financial or guarantees). Often the nature of the project, associated risk, difficulties in cost recovery of investments from users and failures of financial markets do require some forms of government support to make the project viable. When projects are economically viable but not financially viable, the government may want to provide subsidies to ensure that the PPP is attractive to private investors.

In the context of PPPs, a subsidy refers to a direct fiscal contribution or grant to pay for a portion of costs that is not repaid by project revenues. Subsidies to PPPs can be structured in a number of ways. Governments can provide subsidies by making upfront cash contributions to pay for capital costs. Alternatively, once a project is constructed, governments can make regular payments to the private company based on the availability and quality of the service it is contracted to provide. A third option is for governments to pay a fee per user, such as number of vehicles on a toll road. These forms of direct fiscal support are the focus of this study. However, in addition to these direct fiscal contributions, there are more indirect ways to make a fiscal contribution to a project, such as providing concessional loans, guarantees, or paying for project preparation—these are often called ‘implicit subsidies’ because they are less transparent.

The typology of government support for transport PPP projects, has been along the following lines: i) Financial; ii) Non-Financial; iii) Other. Understanding the linkages across financial and non-financial support, and external effects (to be captured) is critical since it reduces the extent and need for government support; it improves project bankability, and the chances of financial closure; and increase chances of success.

PPP, in principle, cannot be considered as an additional source of revenue as the private sector is ultimately paid from the same sources. But it is often considered as such for fiscally constrained countries, or where the budget process is not multiannual, and where the alternative is no project at all. Moreover, PPPs do allow for the acceleration of the infrastructure program and, at least in the short term, release of fiscal constraints. The main reason is that the sources of funding remain the same: users and tax payers. As shown in the figure below, the private sector will still need to recover its investment and make a profit (but through the life of the project), and expects to be funded through the same sources: tolls, fuel taxes or government contribution (general taxes).

Governments have developed a strategy and procedures to support projects with high economic rates of return but which are not financially viable. The typology of interventions and options used by a number of countries is shown below. The extent and choices has been and is an evolving process—Korea, Colombia and Chile are examples where guarantees (minimum revenue) have been extensively used, particularly at the early stages of the PPP program. But in the second phase (the mature phase with already a reputation and credibility has been established) guarantees have been seldom given.

Not surprisingly, the most effective interventions have been those with direct support to the projects, subsidies or direct lending from state owned institutions (Mexico and Brazil and Korea are the best examples). Investment funds have proven difficult to implement and to become effective. In their design they tend to offer long-term equity on commercial basis to Greenfield and/or brownfield project across infrastructure sectors. Some of them offer mezzanine products as well. Often operating policies restrict equity investments to minority stakes or to a maximum amount of total project costs to limit project exposure. They have target returns may range between 15% -20% depending on the investment policy, the portfolio focus and risk appetite of investors. For example the MENA infrastructure fund has a target return of around 15% as its risk appetite is at the lower end of the IRR and it avoids country and currency risk in frontier markets. Often these funds have a co-investing strategy with banks, multilaterals and other financing bodies.

The ISDB and its partners have established the “lending club” concept and CDC has set up the long-term investors club with the EIB, CDP, and KfW to coordinate long term institutional investments in emerging markets. Also a number of countries have reformed the investment regime of the pension funds, to allow them to invest a share of their holdings in private equity funds for infrastructure or for direct investment, often requesting investment grade rating, subject to some ceilings and limitations and requirements, so as to facilitate the tapping of the extensive liquidity of pension funds for infrastructure projects. The impact of this latter measure could be extraordinary given the large holdings of the pension funds. Finally guarantee funds also have had mixed results.

Some lessons relevant to the design of infrastructure financing facilities are:

- Ability of standalone financing facility to raise capital. The experience in financing facilities as a stand-alone model illustrates an associated need for government to provide credit enhancements to support capital-raising from the private sector. For example, when established, IDFC (India) was mainly funded by equity provided by the government and the central bank, any borrowing raised on the market has been generally backed by government guarantee. Similar experience with IIFCL whose significant borrowings are backed by sovereign guarantees
- Fund raising experience of infrastructure private equity funds. The experience of several private equity funds fund raising in capital market has been challenging and the majority of the funds have not achieved their target size. The financial climate impacted the ability of infrastructure funds to raise capital. The capacity of some financial sponsors to invest in long-term activities such as infrastructure assets has been reduced by liquidity constraints due to the financial crisis
- Infrastructure funds with tiered capital structure. The experience in infrastructure funds has seen the establishment of funds with a tiered capital structure as an alternative to a pari passu structure. In these experiences the tiered capital structure may have contributed to the success in raising commercial senior debt or private equity since establishment the funds. Tiering allows for a greater variety of risk/return investor appetite to be catered for. Greater use of appropriately tiered facilities may help deliver investment from new sources such as sovereign wealth funds
- Use of side-contractual arrangements. Contractual arrangements are being used to involve the private sector in alternative ways compared to a direct participation in the capital structure. Examples are the establishment of ‘lending clubs’ at project level in the case of the ISDB “Cobra fund” and the establishment of the Complementary Finance Facility which provides co-financing to projects in which the ISDB Infrastructure Fund has an equity stake.
- Asset/liabilities matching. Equity funds provide equity and quasi-equity investments, whereas IFFs provide a larger range of products with a focus on debt products such as long

tenor senior loan and/or financing in local currency, depending on the gap in the target financing market

## **F. Transaction Design: The Procurement Process of PPP Transport Projects**

### **Procedures to adjudicate the project and run the auction:**

The most effective procurement process for PPPs has proven to be competitive bidding. Negotiated agreements done bilaterally have proven questionable and led to much poorer results.

The request for bids that has proven most effective has been decoupling the technical bid/proposal from the economic bid/proposal. While there is the belief and practice to open first the technical bid to disqualify those whose offer does not meet the minimal technical specifications, and then to open the economic bid to select the winner, that has proven faulty. There is a better option which is to reverse the process. That is to open the economic bid first, and then only the technical bid of the winner of the economic bid. And if the technical bid does satisfy the stated technical requirements, the process ends there without the need to open the technical bids of the rest of the bidders. The beauty of reversing the process is that it eliminates a common source of conflicts and appeals that arise from the disqualification of technical bids, when opened in the first round under the traditional process. Under this reversed process, since the technical bids of the losers are not opened, it avoids the problem. Brazil has been leading this innovation in their transport PPP projects.

### **Award Criteria to Adjudicate Transport PPP Projects**

The most common and used economic criteria to award Transport PPP projects have been:

- Lowest Toll/Tariff
- Highest payment to government.
- Lowest subsidy requested from government
- Lowest present value of revenues
- Best level of service
- Lowest concession duration
- Highest number of kilometers to be built (for roads PPP).
- Highest investment
- Best investment plan

Not all those criteria have proven equally effective. Based on experience and results, the best ones have been: first the lowest present value of revenues; second the highest payment to government, or lowest subsidy (depending on the project being financially viable or not); third the lowest tariffs; and fourth the best level of service. The others have proven quite problematic and should be avoided. Even the lowest tariff criteria has proven questionable since it has led to aggressive bids, hampering the financial sustainability of the projects, leading to renegotiation and with a very low lock-in effect (Brazil and Colombia highway projects are examples of that).

*Highest Payment to Government.* This scheme has three attractive features. First, it uses a non-soft criterion to award the concession, which is more difficult to renegotiate and is consistent with the transfer for the use of the existing assets and the right to operate the concession. Second, by forcing the operator to pay a single amount up front, it generates a lock-in effect, increases the commitment of the operator, and grants increased leverage to the government in the event of the operator's performance noncompliance. Third, it provides for increased ownership (of the concession decision) for future governments, because they will also benefit from annual payments.

This component has a drawback, compared with a scheme where an operator makes annual payments, in the sense that it is financially more expensive, because the amounts of funds needed at the start are clearly greater than in a scheme with a simple canon, paid annually by the operator. However, arguably, the benefits of increased commitment are bound to be greater than these

increased financial costs.

*Minimum Subsidy to Private Operator.* This scheme is conceptually the same as the previous one, but applicable when the project is not fully financially viable-but has a sufficiently high economic rate of return, so is worth undertaking it. The criteria is to fix just about all of the economic variables, except the annual (or lump sum) request, which is then the bidding variable submitted by the interested private parties. The project is adjudicated to the party that requests the minimum subsidy. This has been a quite frequently used criteria for transport projects which are not fully financially viable.

*Minimum Present Value of Revenues.* An interesting alternative developed by Engel, Fischer, and Galetovic (1998, 2000) for PPP transport projects is the use of the minimum present value of total revenue (LPVR) as the criteria to award concessions. Interested operators bid on the present value of total revenue to be received and the one submitting the lowest value gains the concession. Once that present value of total revenues is received the concession ends. The government sets up maximum tariffs and a rate of discount that can be fixed or variable.

*When to Select the Transfer Fee/Minimum Subsidy or the LPVR Criteria to Award Concessions*  
Which one of these options should be selected depends on the characteristics of the PPP project. The key characteristic is whether the quality of service provided by the concessionaire has a strong effect on demand or not. Because the LPVR in fact insures the operator against changes in demand, it is only appropriate in settings where the concessionaire can do little to influence demand, and where objective quality standards can be set, measured, and enforced. Typical settings then are roads and highways, landing strips in airports, water reservoirs, and so on. Alternatively, in settings where the operator through the provision and quality of service can significantly influence demand, LPVR criteria are not appropriate, and the annuity canon should be used. Typical settings for the latter are water and sanitation concessions, port concessions, network concessions, and so on.

#### **G. Regulation and Oversight: On ex-post award contract/project management**

Many PPP projects involve 30-year+ contracts for concessions or BOT projects, so the public sector attention is often focused on the transaction rather than contract monitoring and supervision to guarantee that services are delivered according to agreements with users. Without solid contract monitoring, additional costs can mount, public revenues can disappear, and users can receive poor services.

Regulation, its structure, institutionality and effectiveness is an issue, with some variance across sectors, tight in some sectors and weak in others. Therefore, as many of these existing PPPs are nearing the end of the concession agreement period, there is a need to work on the feasibility of renewal of contracts. Where applicable there might be a need to enter into renegotiations and bargain on the prices. The salient vacuum in the institutionality of transport PPP has been and still is the lack of regulatory institution on the transport sector, and on the degree of autonomy of the existing regulatory/oversight institutions.

Instruments for Regulation and Oversight. Effective regulation needs to be supported with a set of high power instruments, in particular, regulatory accounting, cost of capital methodology, financial model, and benchmarking tablet.

## **9. Conflict Resolution**

Disputes have been very common and are to be expected. Yet countries that route the disputes through the domestic court system, have seen diminished appetite from the private sector to participate in PPP projects. That process has been lengthy, unpredictable and non-credible. Ever more that process is a key determinant of private sector interest. The best practice has been adapting as the salient mechanism the use of binding arbitration for conflict resolution, based on a panel of experts, selected randomly among a pool of qualified professionals and based on the law/contract rather than in equity.

## **10. Innovative Responses/Interventions to Facilitate Bankability/Financing of Transport PPP Projects**

There have been a number of interesting and innovative responses and interventions by governments to facilitate the bankability and financing of transport PPP projects, a number of them in the context of the global financial crisis. Among them are: i) scaling down the size of transport projects or/and structuring the project in two or more phases to be done sequentially (done for roads and airports in Colombia, Peru and Mexico); ii) packaging deal/projects with a mixture of Brownfield and Greenfield projects, so that the cash flow of the Brownfield projects can help finance the Greenfield projects (done for roads and airports in Mexico and Peru); iii) issuing certificates (bond type) on progress of construction at 10% increments that can be cashed/discounted and used to finance the subsequent 10% (roads in Peru, and Brazil); iv) structuring contracts by level of service instead of output or technical specifications, and with staggered and increasing level of service (Chile and Mexico roads and others); v) providing staple finance, to all participants in the bidding, announced prior to the bid submission so as to facilitate financial closure (Mexico); vi) government taking an equity position with the idea to sell its stake though an IPO at a later point; vii) government financing the project with the public works modality and once constructed the projects being concessioned as a PPP to a private operator; viii) increasing the ceilings for pension funds to invest in/lend to infrastructure projects.

Other initiatives that are becoming more common are establishing project preparation facilities to facilitate financing the design of best practice projects; sharing of the benefits/gains from refinancing debt by sponsor; in the procurement process opening the economic bid first and then second opening only the technical bid of the winner of the economic bid.

The benefit is to avoid unnecessary appeals by those whose technical proposals are found not meeting the required standards; imposing freezing periods such as five years from contract award, for considering changes in contracts or renegotiations (Peru); setting fees for renegotiation demands, reimbursable only if the demand is granted; when granting minimum revenue guarantees, also setting ceilings on revenues, so when exceeded the government receives or shares on the extraordinary benefits.

# 11. Most Common Problems, Lessons and Solutions for Transport PPPs

Unsuccessful PPP transport projects have exhibited several common weaknesses. A review of 20 years of PPP projects in transport revealed that unsuccessful PPPs had weak feasibility studies, unresolved land allocation issues, overly aggressive bids, unpredictable and lengthy conflict resolution mechanisms, ambiguous tariff adjustment guidelines, ambiguous risk allocation and a lack of comprehensive planning and use of best practices. Since most PPP projects are complex and differ substantially from normal project procurement, an overly ambitious agenda and often reduced capacity and unclear jurisdictions and coordination problems across different agencies have hindered project preparation. Common feasibility study mistakes have included unrealistic demand forecast, poor or ambiguous risk allocation, and undefined public sector contribution. All of those factors have led to high incidence of renegotiation of contracts, and a reduction of the benefits of the transport PPP project.

## **a. Integrated Approach to Transport Policy**

A most common problem in most countries that has affected the effectiveness and benefits of PPP transport projects has been the fragmentation of policy and investments by transport mode. There is the road strategy, the ports strategy, the railways strategy and the airports strategy, often leading to wasted investments, poor projects providing little additionality.

*Solution: there should be an integrated transport strategy from which the selection of projects should arise. The issue is a focus on transport corridors and the use and composition of the optimal mix of modalities to move merchandise and people at the lowest costs with minimal standards of quality. A Multimodality Law, third party operator, integrated insurance across modes should be key components to facilitate efficiency in transport.*

## **b. Land Issue and Expropriations Framework**

The expropriation, valuation and allocation of land to the project in a timely manner has been a common problem of transport PPP projects (roads, airports, railways and ports). It has led to lengthy delays conflicts and sometimes cancellation of the project

*Solutions: It has been critical to clarify and improve the methodology for land valuation (mostly through Public Works Law, Acquisition Law); in order to provide for more efficient project development, there should be legislation providing for templates of more streamlined procedure for acquiring the land and rights of way that often constitute a vital part of the transport infrastructure projects.*

*On the determining compensation for expropriation, the successful norm has been eliminating the traditional use of government appraisals in favor of commercial bank appraisals, which may take account of (i) the increase in the value of the land once the project is completed, and (ii) the rights and interests of third parties, such as occupiers and lessees. Moreover, it should provide for the acquisition of a complete property holding where only a part is needed, but where the remaining area would be of little or no use to the owner. The normative should also provide for simplified procedures for expropriation and require that negotiations with landowners be covered by specific regulations.*

*On facilitating of right of way acquisition (mostly through an Expropriation Law), it should make the expropriation process transparent and much more simplified and faster.*

*On Process, cutting project preparation time: there should be simplified procedures for the*

*procurement of engineering project and studies (through a Public Works Law), allowing under certain circumstances for a much simpler procurement process to assign the production of engineering project reports, cutting project cycle or preparation time significantly. In special cases- properly justified, provisions for transparent-criteria driven-direct award of studies would accelerate, between four and six months, the execution of identified projects, often a bottleneck and delay inducing of transport PPP projects.*

### **c. Access Issues to Essential Facilities and Vertical Integration**

Another recurrent problem mainly on railway and ports PPP, has been third party access issues and problematic or lack of connectivity with complementary modes.

*Solution: Thirds party rights should be granted in the contract and the accesses fees and terms regulated.*

### **d. Project Preparation Facility**

With very few exceptions (such as Mexico, Korea) countries have lack of appropriate support to prepare and award projects. This lack of resources, both financial and human capital, has led to poorly designed projects that have resulted in reducing the potential benefits of PPP projects, capture by operators and increased conflicts.

*Solution: Setting a Project Preparation Facility that would provide the resources necessary to prepare adequate projects (Mexico is good example). The funding allocation would be criteria and competitively driven based on project benefits.*

### **e. Transparency**

Transparency in the procedures to adjudicate a PPP contract and in the contract details is and has been key in securing larger benefits of PPP projects. Main barriers to improved public reporting in a number of countries have been: secrecy of PPP agreements in some cases, which are not in the public domain and prevent information on performance reporting and performance target achievements from being made public; and lack of specification of the requirements for information and processes related to public reporting in the PPP agreement itself.

A number of transport PPP transactions/projects have been subject to a lack of transparency on the way they have been selected, designed, awarded. Procedures, adjudication and contract disclosure influences the behavior of the public partner, of the private partner and of the users, taxpayers and public. With public information and contracts disclosed to the public private firms tend to focus on performance, and not so much on strategic moves, and the public will be more vocal in the process of defining the public interest, and active in the oversight of projects.

*Solutions: The first best is when all procedures and contracts are fully disclosed and available in a web page. If that is not possible, at least, it is critical that selected information is disclosed for example that the public be fully informed about performance levels agreed upon, performance levels achieved, use of government grants and guarantees, and other key contract and financial information, while still protecting the competitive position of the provider. In particular, the following information ought to be disclosed:*

### **f. Feasibility Studies**

A recurrent problem in transport PPPs has been rushed or deficient viability studies, particularly with over optimistic demand forecasts, which have led to sustainability problems and renegotiations, and with questionable risk allocations that have reduced potential benefits.

Solutions: Templates for context and methodology for viability studies ought to be the norm. Demand forecast studies done by reputable third parties ought to be considered as well as the use of effective risk matrix for allocation of risks. Particularly important are providing accurate estimates of traffic and (where there are user charges) users' willingness to pay and determining the public sector's contribution. Sensitivity analysis is critical for determining the resilience of the financial model to changes in assumptions.

**g. On the interface between Construction Companies and Operators**

A common problem has been the role that construction firms have played on PPP transport projects as the leading sponsor. Often the incentives are in the construction phase, which is followed with the transfer of operations and balance sheet to a separate operations company, leading into serious misaligned incentives.

*Solution: It should not be allowed to disengage the construction company from PPP operations and to transfer the balance sheet, at least for a period of 5 to 10 years.*

**h. Complementary Contracts**

Another recurrent problem has been the high incidence of complementary contracts added to the original one, directly or through renegotiations. Typical cases have been Chile where additional complementary contracts accounted for more than 30% of the original investment, or Colombia where the figure was above 150%. Other countries such as Peru, Korea, South Africa, and Brazil to a lesser extent also show the incidence. The problem with complementary contracts is that they usually bypass the budget allocation-scrutiny process, have been done with little transparency, in a bilateral mode-private operator and government not disclosed, and with questionable methodology for assigning compensation.

*Solutions: Setting a ceiling for the adjudication of additional work/investments to the project around the 10-15% range of the original investment for direct adjudication. If the additional investment is above that ceiling a new open auction for that work is to be launched. Also that the outcome of the agreement when done through direct adjudication, be disclosed to the public. And that the methodology for the compensation to the private operator for the original work be described in the contract, with the principle of zero net present value of original benefits.,*

**i. Misused and Abused Financial Equilibrium Contract Clause**

Many transport PPP projects had open clauses in the contract, granting financial equilibrium through the life of the PPP project. That led to distorting risk allocations, reducing benefits for government and users, and high incidence of conflicts.

Quite often concession contracts or regulatory frameworks, when ordinary or extraordinary tariff reviews are called for, state or make reference to the principle of adjusting variables so as to secure the financial equilibrium of the concession, usually in a forward looking manner. While in principle, this is appropriate, and consistent with the spirit of regulation, care should be exercised in how it is stated. Broad and sweeping statements without reference points are undesirable and often have been the source of conflicts and inefficiencies. Such clauses should not guarantee the financial equilibrium without making reference to efficient operation and preserving, the sanctity of the bid. The risk of an opportunistic bid should be fully borne by the operator.

Similarly, financial equilibrium clauses should specify the capital base that the firm is allowed to earn a fair return on. The capital base ought not to necessarily include the transfer fee when the concession was awarded by that criterion. This is often a key argument for renegotiation and also for the tariff review process. For if the whole transfer fee is allowed to enter into the capital base, it distorts

competitive bidding and reduces value to the country. It then becomes more like a loan to the country—to be repaid through higher tariffs—than a purchase price indicative of superior efficiency. It means that on any amount paid, the firm would be allowed to earn a fair rate of return, and that is not the essence of competitive bidding. The capital base should be linked to the book value of the assets, rather than the transfer fee. Similarly, accumulated profits should not be allowed to be part of the capital base, a common problem in LAC countries, where it has been allowed. When they are invested, under the appropriate guidelines then they ought to enter into the capital base.

Another element that needs to be very clearly stated in the financial equilibrium clause of the contract is the period of application. This refers to the period of time over which the financial equilibrium is evaluated, and in principle it could range from one year to the life of the concession. Both of those extreme points are inappropriate, a three to five year period seems more appropriate. If that period is not clearly stated operators will choose the shortest period when the financial results have been deficient, and the longest period when the financial results are very good. The choice of the relevant period has been a source of conflict where it was not properly specified. Finally, the principle of financial equilibrium should be an ex-ante consideration and not ex-post market outcomes, in the sense that it should not bail the operator out for adverse realizations of normal commercial risk.

*Solution is not to have such an open clause of financial equilibrium, but to specifically state the events, that when occurring, the private operator is entitled to compensation. And that is part or done within the risk allocation framework of the contracts. Likewise clauses that state that the private operator would be entitled to compensation when “unforeseen” events occur affecting its balance sheet, should be avoided. Finally symmetric treatment of actions by Government financially affecting the operator should be the norm. The problem has been that most contracts state that when the Government undertakes actions (not specified in the contract) adversely affecting the profitability of operations, the private operator should be entitled to compensation. While this is right, it should also state that in the event that an action taken by the Government (not specified in the contract) that benefits the private operator, the Government is entitled to compensation, directly or indirectly via reduction of tariffs, or financial transfers.*

#### **j. Unforeseen Events Contract Clause**

That contractual clause, standard in most PPP contracts has been the source of innumerable conflicts, where the fight and argument is about if the event is indeed unforeseen or could and should have been expected and thus accounted for and properly assigned in the risk allocation matrix. Practically every country has faced that issue in their transport PPP contracts.

*Solution: The best practice response is to narrow down the scope of such a clause, by listing explicitly the potential “unforeseen” events and properly assigned the risks to the relevant parties. This is not complicated to do today, given that there is the experience of thousands of transport PPP projects, and there is a list of the so called “unforeseen” that have taken place in those PPP contracts. Then the clause would be applicable only to the residual, likely to be negligible. Given that the risks would be allocated properly for those events to the relevant parties, that would void the disputes about the nature of the event and who should bear the risks.*

#### **k. Performance Bonds**

A number of PPP transport projects have a relatively low value of performance bonds, resulting in an increase in leverage for private operators in renegotiating contracts and higher incidence on miscompliance with contractual clauses.

*Solution: The performance bond should be sufficiently high to induce incentives to compliance. The proper levels should be in the range of 5 to 10% of the value of total investment of project, or above 20% of annual gross revenues, of operations.*

### **l. Arbitration-Panel Composition**

While most successful PPP programs have moved to the use of compulsory arbitration as the best practice mechanism for conflict resolution, the panel composition has been an issue. The standard has been the three persons panel mode, one selected by the Government, another by the private operator and the third by common agreement. That has proven controversial and questionable and not very effective, since de facto the decision is left to the person selected in agreement by the parties, and has led to significant unpredictability and some arbitrariness.

*Solution: To address this issue the best practice is to identify a pool of recognized professionals with strong reputations, and for the arbitration panel, and select three persons from that pool randomly (controlling for possible conflict of interests). In addition it needs to be normed that the decision should be based on the law and contract and not on equity grounds (as has been the case in Chile).*

### **m. Unsolicited Proposals**

It is also noted that most countries allow for the relevant ministries to have entertained unsolicited proposals from the private sector for transport PPP projects and engaged in direct negotiations. Unsolicited proposals have been proven controversial for the fear of being improperly used. While sometimes there are some guidelines stated in the procurement process documents on how to deal with unsolicited proposals, in reality it is not clear if these are always followed. Consequently, the authority and integrity of agencies mandated to oversee such transactions are undermined and often those proposals have been associated with arbitrariness, lack of transparency and scrutiny and even corruption, all impacting adversely country welfare and even fiscal sustainability.

*Solutions: In some contexts and countries unsolicited proposals could be an effective component of the PPP program. Yet particular care ought to be exercised. First, they have to go through the same filters that standard proposals go through. Second they have to be launched through competitive bidding process. Third, there should be enough time to be given for interested third party to prepare bidding proposals- a minimum of three months. And fourth, the compensation or premium for the party submitting the unsolicited proposal ought to be transparent and not too generous. Appropriate compensation would be reimbursement for the costs of preparation of the proposal, and second best, a premium not exceeding 5% over alternative bids.*

### **n. Renegotiation**

A recurrent problem and a serious concern in PPP transport has been the incidence of renegotiated contracts, and the speed of renegotiation since the projects is awarded and the outcomes of the renegotiation process.

The concerns about renegotiation are that: it eliminates the competitive effect of the auction allocating the project; questions credibility of model; renegotiation takes place away from competitive pressures in a bilateral-government/operator-environment; and competitive bidding is distorted, with the most likely winner being not the most efficient operator but that most skilled in renegotiation. While some renegotiations are efficient, many are opportunistic and should be deterred. The following table illustrates the high incidence of renegotiation, the speed to renegotiate, who initiates the renegotiation process and the unfavorable outcomes (to the users) of the renegotiation process.

*Solution: The intrinsic nature of the subject of concessions contracts in infrastructure is bound to make any contract incomplete. And renegotiation can be an efficient—albeit second best—instrument to address that issue, so it should not be ruled out on principle. But it indeed can be framed so as to dissuade frivolous claims and support the valid ones. The concession contract should address as clearly as possible: i) events that would trigger tariff adjustments and the extent of the adjustments*

and ii) events that would trigger a renegotiation of the contract with guidelines about the process and outcomes of the renegotiation.

*The principle is that small changes that impact the financial equilibrium of the firm, and not controlled by the firm, should not require adjustments, while large ones may. It is also advisable to require that renegotiations be undertaken in the most transparent manner possible, preferably by appointing a neutral and professional commission to review the claim and advise on the outcome, and that the process be as open as possible.*

*Sanctity of the bid contract: When facing petitions for renegotiation, the sanctity of the bid contract must be upheld. The operator should be held accountable for its submitted bid. The financial equation set by the winning bid should always be the reference point, and the financial equilibrium behind that bid should be restored in the event of renegotiation or adjustment, with an impact of zero net present value on benefits and without changing the risk allocation matrix. Renegotiation should not be used to correct for mistakes in bidding or for overly risky or aggressive bids. This is another reason for the superiority and desirability of transfer fees over minimum tariffs as award criteria for concession awards.*

#### **o. Contingent Liabilities: Management of Fiscal Risks associated with PPP programs**

One of the main risks associated with PPP is fiscal risk, including direct fiscal impact. Public authorities must implement only projects that are absolutely needed, taking into consideration the long-term financial commitment associated with PPP. Although the public sector is usually asked to contribute to capital expenditure, some of its contribution is phased during the life of the concession. Because longer-term future payments (often 30 years) are typically unaccounted for in budget planning, public authorities may be tempted by the relatively small initial contribution to implement an unaffordable project. However, the risk is that longer-term payments could restrict the corresponding Line Ministry, State Government or municipal ability to finance other much-needed projects. And that has been the case as illustrated by the experience of Chile, Korea and Colombia. If not properly managed the PPP program could also constrain future spending through accumulated contingent liabilities.

The cash flows may appear attractive for a single project but if a PPP program is developed, it would result in an accumulation of payments. Given that a concession is often for 30 years, an active PPP program over, for example, 5-10 years may restrict future public investment, because Government would have to service these contracts before considering other projects. The other issue is that government must often provide guarantees for PPP projects, and the more projects government undertakes, the more likely it becomes that at least some guarantees will be triggered, resulting in future payments to support the private partner. This may be problematic, especially in countries with limited fiscal space. In Korea where in the early phase of the 1990s, minimum revenue guarantees were the norm and where more than 90% of those guarantees were triggered, the fiscal impact was considerable.

Countries with more successful experience in PPP have established eligibility criteria. Concerns about long-term fiscal impacts of PPP projects prompted governments to establish rules to ensure that projects demonstrate (i) value-for-money; (ii) optimum risk transfer to the private sector; and (iii) affordability for government. (Box 6) The remaining key risk is that countries could not afford basic services or undertake future investments if payment levels become unsustainable. Brazil, for example, has established limits on future payments for PPP projects to protect future investments. This trend is emerging in the ECA region; Hungary is proposing an amendment to the Act on Public Finance that would limit the total capital value of PPP investment for budgetary investment at the time of its accounting capitalization.

*Solution: Contingent liabilities associated with transport PPPs should be managed or monitored. Typically it is impossible to avoid providing guarantees to the private sector for risks not under their control; however, these risks carry premium prices that reduce value-for-money aspects of PPP. Guarantees can be triggered, but establishing rules to ensure that people in charge of PPP projects have the right incentives, information, and abilities to account for the costs and risks of contingent liabilities.*

**p. Communications**

In a number of countries there is still mistrust about the private sector engaging in the provision of public services. That has led to delays and even cancellation of PPP projects and compromised the success and sustainability of PPP programs. The PPP concept is complex and the public and public servants often have misconceptions on the asset ownership, tariff policy or even the potential for private investment.. Government officials may also have a pre-conceived idea of what is PPP, its benefits and risk and there is value in organizing several seminars to ensure that a broad audience fully understands the concept and Government objectives in pursuing it.

*Solution: Successful PPP programs have implemented a well thought out communications strategy/program to raise the public awareness on PPP programs. Public acceptance can be improved with a solid communication campaign using the media informing the public about the reasons and benefits of PPP programs, and with the commitment to transparency in the key decision process, selection of preferred bidder and disclosure of the PPP agreement.*

**q. Ex-post Contract management: Regulation and Oversight**

This has been one of weakest points of the implemented transport PPP projects. Very few countries have set in place effective regulatory and oversight (RO) frameworks and as a result, conflicts have been common and the expected benefits of the PPP projects reduced.

The most common problems have been:

On institutionality: Lack of a structured regulation or oversight framework; lack of minimum level of autonomy and independence-RO done by directly by the conceding Ministry (Transport)-facilitating capture and questionable or misaligned incentives; high turnover and removal of regulators; lack of required level of knowledge, skills and capacity of unit in charge; overlapping or unclear jurisdictions over the task.

On Tariff/Toll setting: Conflicts on proper tariff adjustments, due to lack of clarity in the guidelines or methodology in the regulatory framework for adjusting clarity. Typical cases are the selection of the productivity factor,  $x$ , on those projects guided by price caps regulation, and the composition and individual adjustments to basket of tariffs-very common in airport, port and railway PPP projects.

On the treatment and mixing of regulated and competitive operations undertaken by private operators: This has been addressed through regulatory accounting request full accounting separation of those two activities.

On the composition of the asset base: This has been critical to properly evaluate rate of return and should be handled though regulatory accounting norms as shown below.

On the valuation of assets: The most common and appropriate methodology is that based upon a full cost of service approach that takes account of the replacement value of all of the assets of the concession and allows for the estimated depreciation of these assets over standard periods rather than according to historical accounting conventions. The regulatory asset base would thus be equal to the

replacement value of the concession assets and would be quite separate from the book value of such assets. One merit of this approach is that it would avoid the inconsistent accounting treatment of concession assets. Despite the fact that the concessionaire does not own the assets and cannot mortgage or sell them, they are included in the balance sheet as if they were conventional fixed assets. A clear separation should be made between (a) the assets owned by the concessionaire, and (b) the assets that are used to provide services and should be included in the determination of tariffs. Similar issues apply on asset valuation at the end of the concession when there is a clause allowing for compensation for not fully depreciated assets.

On the appropriate compensation in the event of termination, early with cause and without cause and final: That should be clearly stated in the contract (see Guasch (2004) for the principles).

On the accounting and measurement of realized investments: While obligations for investment commitments have been a fixture in practically all concession contracts, it should be avoided as much as possible, and replaced by specific outcomes, i.e. the building of a new water treatment plant, access road etc. when applicable, with clear technical and quality specifications or even better when possible the specification of outcome indicators, such as coverage rates, quality standards, or technical achievements. A timing schedule should accompany those specifications, stating over the life of the concessions, the gradual increase of those targets. Those targets should be easy to measure and a description of how they will be measured included. Governments have found it politically attractive to request investment amounts in contracts, as an indication of success as investments are associated with significant improvements in sector performance, new jobs created, and increased economic activities.

On competitive and access issues to essential facilities: This and has been critical for successful ports, airports and particular railways PPP. The solution is to impose open access to third parties with regulated access fees.

#### *Solutions*

##### *-Informational Requirements Set in the Concession Contract*

*Effective regulation requires good information about the operations of the regulated firm. Information about costs, revenues, prices, investments, financial data, and realized demand needs to be periodically collected from the operator. For that the concession contract should as clearly as possible state the information and in which form, and the frequency, the operating firm has to provide to the regulator. The contract should provide the regulator with subpoena powers to coerce the information from the operator in the event of non-cooperation plus the rights to impose significant and increasing fines in the event of non-cooperation. As obvious as these requirements might seem, there have been plenty of concession contracts that have failed to provide those details and rights and have led to a protracted conflict between operator and regulator, seeking to obtain relevant information adversely impacting regulatory oversight. Without that explicit mandate legally grounded in the concession contract, the operator, as the experience has shown, is going to be unwilling to provide the relevant and in the proper format, information. The most common argument used by operators is that information is proprietary and confidential and their submission might damage their competitive edge.*

##### *-Regulatory Accounting Norms should be Spelled Out in the Contract*

*Complementing the information requirement issue above, effective regulation requires good data, properly standardized and even better analysis. Both are problem issues in emerging countries. Quite often the concession contract does not specify the format on which the data is to be provided by the regulated firm to the regulatory agency, there is a lack of proper definition of the different variables and of depreciation and amortization rules, treatment of assets, the accounting methodology*

*(whether to use current cost accounting (CCA) or historical cost accounting (HCA), renewal accounting etc.) what constitutes a valid investment and what prices are to be used to value investments, and what can be considered as costs and profits. Then when the regulator requests data and financial information from the firm, it often gets not very useful and unfriendly processed data and information, rendering the task of regulation even more difficult and increases the possibility of conflicts and disagreements.*

*But even when the data and financial information is provided in a friendly format particular care should be taken when analyzing it, since the firm is likely to interpret and manipulate the data to its best advantage, not surprisingly, resulting in imputed rates of return of capital much lower than the reality, to make the case for increase tariff rates. Thus the need for proper regulatory accounting and analysis and the norms should be spelled out in the concession contract.*

## 12. Summary lessons

Most of the countries with successful transport PPP programs have reformed their framework along the following lines:

- Requiring a clear, broad, and stable legal and regulatory environment, via the enactment of concession/PPP law
- Requiring the restructuring of institutions to lead and oversee the PPP program
- Requiring that PP projects must demonstrate value-for-money, appropriate risk transfer, and affordability
- Requiring state entities to conduct a rigorous viability analysis (including an environmental Most of the countries with successful transport PPP programs have reformed their framework along the following lines assessment) before launching the process;
- Establishing that competitive procurement remains the best public sector procurement option for transparency and lower cost. International experience shows that directly negotiating with a single firm usually prolongs negotiations, results in higher costs for government and users, and increases perceptions of corruption that can trigger strong public opposition to the project.
- Setting clear principles, transparent processes and reasonable incentives for dealing with unrequested proposals;
- Defining mechanisms and conditions under which contracts can be modified or extended without changing risk allocation among the parties;
- Allowing for financing collateral and step-in rights. The bill would allow service providers to offer the assets and rights in such projects as collateral to lenders. Developers would be able to grant full step-in rights to project lenders in order to allow them to cure or avoid defaults and prevent negative impacts on the project's revenue flow
- Clarifying circumstances that can result in contract termination and the process for dealing with the project's assets;
- Stating that the design for a contract monitoring system should begin during project preparation. Appropriate mechanisms and resources should be allocated to PPP contract monitoring and regulation after project contract award and financial close
- Identifying arbitration mechanisms in case of disputes resolving their disputes in respect of a PPP project by commercial arbitration. In the case of technical disputes, independent experts may be appointed
- Eliminating of restrictions to concession terms extension (Highways Laws), this amendment acknowledges that during the long life of a PPP contract, a variety of circumstances may require changes to the original contract or the project, particularly on extending the length of the concession term, as compensation for damages or additionality of work
- Designing risk matrix with proper risk allocation with private sector
- Designing contracts output based and even for level of service
- Commitment to effective contract oversight and regulation
- Special emphasis on capacity, capacity and capacity

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# Summary Paper on Ports

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## Ports Overview and Issues Paper

**Ecorys Nederland BV**

**June 2012**

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## Disclaimer

The Paper has been prepared by the Bank's consultant. It is based on a report submitted by the consultant, which covers the work on two policy papers (those on port governance and stakeholder participation) and recommendations therein, and draws heavily from the Bank's Port Reform Toolkit (2007)<sup>19</sup>. 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.

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<sup>19</sup> The Port Reform Toolkit can be accessed at:  
<http://www.ppiaf.org/ppiaf/sites/ppiaf.org/files/documents/toolkits/Portoolkit/Toolkit/index.html>

# 1. Introduction

In response to terms of reference for World Bank assistance to the **National Transport Sector Development Policy Committee** (NTDPC), and subsequent discussions with NTDPC, two resource papers on international experience in the ports sector have been submitted.

These papers are on **port governance and port stakeholder participation**, and have been submitted along with recommendations on how to advance port reform in India. The objective of the policy papers is to yield international best practice on issues and trends in contemporary Port Policies, Governance and Stakeholder Coordination relevant to the Indian situation.

In addition, **four case studies** were prepared as follows, and the summary of these case studies is presented as Annexure I to this summary paper:

- Development of national port networks – supported by the case of Turkey;
- Development of road and rail freight corridors – described in the case of the Maputo corridor in Mozambique and South Africa;
- Insuring competition in the provision of port services – as illustrated by the regulation of port services in the European Union;
- Redevelopment of older port facilities – presenting the case of Boston as an example.

Point of departure was the World Bank's Port Reform Toolkit (2007)<sup>20</sup>, which still stands as the basic source of information on Ports, Shipping and Logistics. Recently, some more emphasis has been put on:

- Further implementation of the Landlord Port Management Model
- Evolving private sector participation
- Changing roles and functions of port authorities
- Legislative and regulatory frameworks

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<sup>20</sup> The Port Reform Toolkit can be accessed at:

<http://www.ppiaf.org/ppiaf/sites/ppiaf.org/files/documents/toolkits/Portoolkit/Toolkit/index.html>

## 2. Policy Paper on Port Governance

### Trends and challenges

The international port sector is facing significant changes in economic and social conditions, and transport/logistics markets which are to be addressed by Governments, Port Authorities, Private Sector and Port Communities. A summary of trends and challenges is given below.

#### *Key trends:*

- Low transport cost along with information technology developments, have made it possible for companies to globalize their manufacturing.
- Ports are focal points in international logistic chains, and globalization makes that inter-port competition is more and more becoming chain competition.
- Main players in global networks (shippers, carriers, ports/terminals) engage in vertical integration in an attempt to gain scope of control of the entire supply chain.
- Global container carriers employ steadily growing ship-sizes between major (transshipment) ports/terminals, using hub-and-spoke systems.
- Technological changes in the handling of containers and bulk tend to call for more space in existing ports than can be provided by surrounding cities, inspiring operators to move beyond the urban boundaries.
- Hinterland transport costs, usually the major share in door-to-door logistic costs, are increasingly determining shippers' route choice. Port competition is growing as hinterlands are enlarging and overlapping. Port captivity is getting rare in most countries.
- Inter-modalism (rail, barge corridors linking hinterland terminals with ports) is advocated by e.g. the European Commission, to pursue traffic safety and environmental objectives.
- In many countries, clusters of regional ports and linked industrial and logistic activities are emerging, usually led by one major port in cooperation with smaller ones. Port competition becomes cluster competition.
- A "community approach" has been adopted by ports, reflecting the need felt by authorities and society to involve all port related business and social groupings in matters of common concern. Increasingly, ports employ Port Community Systems: shared information systems according to the "Single window trading environment" concept.
- Urban conflicts are growing between the city and its port, in terms of spatial demands and negative environmental and safety/security impacts associated with increasing port throughputs (in particular "dirty bulks"). Once port activities have moved, many cities engage in urban (waterfront) redevelopment projects

#### *Challenges:*

To avail of:

- A stated Port Policy embedded in a National Transport Policy, at National, regional and local level.
- Specification of Port Governance (who is responsible and accountable for what), in particular:
- The functions and roles of public and private sectors in Ports, Transport and Logistics, in particular:
  - The institutional position and objectives of a Port Authority
  - A regulatory framework, addressing level-playing-field competition between ports and environmental and safety/security conditions in ports
- Stakeholder coordination (at national, regional and local level), involving:
  - Public and private parties in port management and operations

- Members of the port community
- Urban players (port, authority, society)

### Issues and Lessons for India

*Most of the mentioned trends apply to India too. The challenges are somewhat different; India has in fact two port governance systems, one at national level for the major ports and one at state level for the minor ports. Port policy is therefore developed at two different authority levels.*

### **Governance structures**

Port Governance is structured by ownership and administration/management models and regulatory frameworks. These matters have been duly assessed in the World Bank/PPIAF Port Reform Toolkit (hereafter referred to as “Toolkit”). The paper therefore presents a short summary of the Toolkit findings, with special attention to their dynamics and recent developments. It focuses on the following port management or administration models:

- Service port model
- Tool port model
- Landlord port model
- Private sector port

It concludes by saying that by now, the Landlord Model is the mainstream port governance structure worldwide and becoming the dominant port model in larger and medium sized ports. Though widely acknowledged, the Landlord Model is not fully implemented everywhere since port reform requires institutional and managerial competence which is not always available in port organizations. Moreover, transition to the Landlord Model assumes a regulatory framework in place geared to encourage fair competition on a level playing field.

### *Port reform modalities:*

The paper further discusses that Governments and port managers can select from among a variety of strategies for improving organizational and operational performance, including:

- Modernization of Port Administration and management
- Liberalization or deregulation port services
- Commercialization
- Corporatization
- Privatization

Each of these options may be equally valid and successful forms of port reform, depending on the setting of the port in question.

### Issues and Lessons for India

*In the early 1990s the decision was made to corporatize the major ports and to introduce the landlord model. However Ennore Ltd is currently the only port operating as a corporatized landlord port. In the first decade of this century, plans were made to start a serious privatization process in the major ports, but these plans have not been implemented. In the Minor port, PPP projects have been developed under BOOT or BOO schedules, where in fact the ownership of the land is (at least temporarily) transferred to a private party. In a landlord model, land always remains under ownership of the landlord (thus only BOT project schedules are possible).*

### **Economic Regulation**

The paper defines economic regulation as typically involving intervention in the functioning of markets in terms of setting and controlling tariffs, revenues, and profits; controlling market entry of

exit; and overseeing that fair and competitive behavior and practices are maintained within the sector.

It defines the main objective of the regulator as to ensure fair competition among competing operators in the port; control monopolies (including public ones) and mergers; and prevent anticompetitive practices. Generally, a port sector regulator has legal powers to interfere in anticompetitive practices such as:

- Use of a dominant position to prevent or lessen competition.
- Cross-subsidization from monopoly services to contestable services, where it threatens fair competition.
- Price fixing among competitors.
- When a firm or a person providing port services pursues a course that of itself has or is intended to have the effect of restricting, distorting, or preventing competition.
- Monopoly situations, which are most likely to occur in medium size or smaller ports. In many ports, only one container or oil terminal exists. Generally, when a monopoly or merger situation is not in conflict with the public interest, it may be permitted.

The paper goes on to prescribe that a port competition regulator should only be established in the event of serious threats to competitive behavior within the port. It should preferably have the character of an arbitrator rather than a court of law, and be accepted by the port community as being independent. In the case that boundaries between port authorities and terminal operators are vague or non-existent (when a port authority not only runs its own container terminal but also owns shares in a competing facility, as is the case in Sri Lanka), a regulator might be a solution for guaranteeing a level playing field for all port operators. A regulator, however, should not jeopardize the legal powers of port authorities to operate freely in the market or the ability of a terminal operator to negotiate tariffs with its clients.

In principle, tariff setting or other price control should not be exercised under the Landlord model but left to the market. Rather, economic regulation pertains to establishing conditions for fair competition on a level playing field. Only under serious market imperfections, as mentioned above, some pricing control may be indicated. Otherwise, as van Krimpen<sup>21</sup> emphasizes, "...there is no need for tariff regulation under a Landlord Port Model. There might be a need for competition regulation!"

### **Regulatory Governance**

The paper notes that apart from generally applicable legislation by any competent authority, specific port related regulation can also be exercised by:

- Competition Regulator giving regulations and specific orders to prevent anti-competitive behaviour in ports or abuse of dominant position by a Port Authority or private operators. Usually a competition regulator has the power to issue a tariff order. It might also deal with mergers of port service providers which endanger fair competition in ports.
- Maritime Authority in the event that the Port Authorities are deemed to be too commercially oriented.

The Competition Regulator would function on the basis of the following principles:

- The Competition Regulator shall not interfere at its own initiative in the tariff setting of Port Authorities or terminal operators and/or other service providers, whether of a private or public character, carrying out such activities in a port.
- The functions of the Competition Regulator as provided for under the Competition Act shall not apply to transshipment services.

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<sup>21</sup> Krimpen, Christiaan van (2011) *Regulation of the Indian Port Sector*

- Other than in the manner or to the extent set out in the Competition Act, the grant of a concession or a lease or any other rights to land or property of the Ports Authority shall not fall within the scope of the functions of the Competition Regulator.

The objectives of the Competition Regulator would then be: The Competition Regulator shall exercise, perform and discharge its powers, functions and duties under the Competition Act reasonably with fairness, impartiality and independence and in a manner that is timely, transparent, objective and consistent with the Act and in a manner, which it considers is best calculated:

- To protect the economic interests of India in general;
- To encourage and promote competition between service providers, whether of a public or private character;
- To encourage and promote equity in the access to port services and marine services, and the provision thereof;
- To promote an atmosphere of confidence in the ports sector in India towards potential and existing investors in port services and marine services;
- To use best endeavours to create an environment for enhancing the market potential and the profitability of service providers and the application of best practice in the ports and shipping industry.

### **International practice**

The paper states that there is surprisingly few evidence in International (Best) Practice on well structured, dedicated port specific economic regulatory frameworks. Results from two major countries (South Africa and Australia), both with a federal structure, are discussed in the paper.

#### Issues and Lessons for India

*The shift in functions of the public sector from port services provided to landlord and private operator infers that the role of governments are changing from having direct control over state-owned and operated ports to exercising indirect guidance through appropriate regulation. Key function of economic regulation in or between ports is competition regulation.*

*As to India, it is noted that a number of queries regarding economic port regulation, in particular the controversial issue on tariff regulation have been addressed in:*

- *Draft Regulatory Authority Bill 2011<sup>22</sup>*
- *Intra-port competition in India has been regulated in: Ministry of Shipping (2010) Policy for preventing private sector monopoly in Major Ports<sup>23</sup>*

*Tariff regulation is performed by the TAMP for the major ports (Tariff Authority for Major Ports). Attempts to extend tariff regulation to minor ports have so far not succeeded.*

### **Port Governance in selected countries**

The paper also presents the institutional setting, port ownership structure and stated government policies for selected countries (USA, Canada, UK, Netherlands, Germany, European Union, Australia, South Africa, Japan, Hong Kong and China).

#### Issues and Lessons for India

*Worldwide, the Landlord model has been adopted as the indicated Port Management model today.*

- *The contemporary Port Authority is usually a corporatized entity with sufficient autonomy to pursue port regulations at the local/regional level*

<sup>22</sup> See: <http://www.prsindia.org/uploads/media//draft/Draft Port Regulatory Authority Bill, 2011.pdf>

<sup>23</sup> See: <http://www.shipping.nic.in/writereaddata/1892s/69754893-Policyforpreventing.pdf>

- *Economic port regulations pertain to*
  - *Inter-port competition, requiring competition regulation rather than price regulation*
  - *Intra-port competition: preventing abuse of monopolistic power while ensuring common access*
- *A port policy shall be imbedded in a national integrated (inter-modal) transport policy, to be defined at the central government level*
- *Worldwide, Port Authorities at the local/regional level prove best placed to deal with traditional roles, i.e. landlord, regulator, operator, and enhanced functions:*
  - *Shaping supply chains, involving hinterland intermodal corridors and terminals*
  - *Planning and financing of port development, port related industrial development and port related urban (re)development*

*In terms of lessons for India, the paper concludes that while countries differ substantially, the Australian model is outstanding in Ports Policy and Management, relevant to the Indian situation, and recommended for further consideration by Indian authorities. The system of major and minor ports leads to the existence of two different port governance systems in India and to distorted competition between major and minor ports. Transgression to a single port governance system should therefore be considered.*

### **3. Policy Paper on Port Stakeholder Co-ordination**

#### **Roles and Functions of a Port Authority**

The paper discusses that during the past three decades, extensive discussions on port reforms centred particularly on the relevance of a number of port management or administration models, summarized as follows:

- (Public) Service Port, a management model where a Port Authority functions both as landlord and terminal operator. This model has become rare as it does not properly function in a market oriented economy;

- Tool Port, an (unsuccessful) combination of a Service Port and a Landlord Port where the Port Authority manages the port land and operates the terminals while labour is supplied by the private sector;
- Landlord Port, is characterized by a strict division of tasks and responsibilities between the public sector in the form of a public Port Authority and the private sector performing terminal operations;
- Privatized Port, sometimes in the form of a Private Service Port. Basic characteristic is that a private port authority owns the port land. This model can be found in the UK and New Zealand.

The Landlord model is increasingly becoming the dominant port model in larger and medium sized ports all around the world. Under this model, the port authority acts as a regulatory body and as landlord, while port operations (especially cargo-handling) are carried out by private companies. Port reform modalities refer to the continuum of port administration reform, in terms of the key notions modernization, liberalization, commercialization, corporatization, and privatization. By now, the mainstream all around the world is a development towards corporatized Port Authorities, with sufficient autonomy to assume roles and functions of contemporary landlords.

#### Issues and Lessons for India

*The paper concludes that despite plans to introduce the landlord port model, to date the port of Ennore is the only major port operating as a (corporatized) landlord port. The minor ports are increasingly governed by State Maritime Boards, taking the success of Gujarat Maritime Board as an example.*

#### **Private sector involvement**

Facing fiscal constraints, many governments all around the world have pursued private finance for transport infrastructure more to move investment off-budget rather than to improve efficiency and services. Results have thus far been mixed, and suggest a need to focus more on Public-Private Partnerships (PPP) that indeed can achieve value for money.

Private sector involvement in ports occurs in various ways:

- Following devolvement in port management towards the Landlord model, the taking over of formerly publicly managed operations by the private sector through concessions granted by the Landlord, whereby the Government remains owner of the basic infrastructure and the private sector invests in terminal superstructure and runs the operations.
- Port development, either rehabilitation of existing infrastructure or a new (Greenfield) facility (terminal or dedicated berth) under a BOT type of contract.

The paper goes on to indicate some particularities of PPP arrangements in Seaports. Next, an overview is given of world-wide PPP performance in Seaports (relative to other sectors) based on the World Bank PPI-data base, and finally some recent developments at the international PPP front.

#### *PPP Models in the Ports Sector*

Unlike the roads sector, there is little literature on PPPs in ports. The World Banks Port Reform Toolkit presents basic principles and results. Some recent evidence has been found in an EU initiative “COST” (European Cooperation in Science and Technology), Action 1001: Public Private Partnerships in Transport, Trends and Theory (initiated in 2010), in particular the contribution by Sheila Farrell (2011) Observations on PPP Models in the Ports Sector”.

#### Issues and Lessons for India

*Based on the World Bank-PPIAF Private Participation in Infrastructure (PPI) database which captures investments by sector and segment, region and type, private activity was concentrated in*

*India and road projects globally. India alone accounted for 56% of investment and 61% of new projects, driving most of the growth in activity in 2010. Road projects accounted for 69 new projects and US\$20 billion of investment, the highest level thus far thanks to activity in India. In addition, there were sixteen port projects with investment of US\$3.7 billion, two railway projects with investments of US\$3 billion, and six airport projects with investments of US\$2.3 billion. India accounted for all but one project in South Asia. Roads comprised most of the activity in India, accounting for 49 projects and investments of US\$12.7 billion. These road projects, most of which were for the expansion of highways from two to four lanes, represented over 4,870 kilometers. In addition, five Greenfield seaport terminals reached financial closing at Kandla, Paradip, Salaya and Marmugao Ports. The ports were dry bulk coal terminals, except for one in Kandla Port, which was a multi-purpose terminal.*

*Proper dedicated policy and legislation is a critical success factor in PPP implementation. Here too, India is one of the frontrunners, see the recent Draft Policy on PPP. Further, the art of PPP is well developed in India, as may be seen from various sites of Ministry of Finance and Planning Commission:*

- *Ministry of Finance, Government of India (2011) Public Private Partnerships in India: <http://www.pppinindia.com/sector-ports.php>*
- *Ministry of Finance, Government of India (2011) Draft National Public Private Partnership Policy: <http://www.pppinindia.com/pdf/draftnationalppppolicy.pdf>*
- *Ministry of Finance, India PPP Toolkit Ports: [http://toolkit.pppinindia.com/start-toolkits.php?sector\\_id=3](http://toolkit.pppinindia.com/start-toolkits.php?sector_id=3)*
- *Planning Commission, Secretariat for Infrastructure: <http://infrastructure.gov.in>*

*The paper concludes by stating that on a critical note, public stakes are not always sufficiently safeguarded in PPP projects and India is no exception. Careful formulation of the PPP frameworks is therefore important.*

### **Urban context**

The paper summarizes recent trends in port territorial developments as:

- Globalization in transport and logistics, concentration towards major international gateways and/or transshipment hubs
- Growing spatial demands for handling, storage and distribution, hinterland access
- Negative (perceived) environmental and safety/security conditions, especially associated with some bulk cargoes

The combined effect of such outer forces (globalization transport and logistics industry) and inner forces (urban development, social impacts) constituted the impetus to:

- Ports moving to new locations beyond the city's boundaries
- Redevelopment of the city-center ancient port areas

### *History of waterfront redevelopments*

The paper discusses the history of waterfront revitalization which began in North America in the 1960s and 1970s. USA and Canada are considered “the cradles of the waterfront-redevelopment movement”. Well-known is Boston’s waterfront redevelopment project Faneuil Hall and Quincy Market, a prototype of a recreation-oriented “people place”, which has been reflected in other waterfront redevelopment schemes since. US waterfront projects have been developed in, amongst others, Boston, New York, St. Louis, San Diego and San Francisco. Canadian ports witnessed similar waterfront redevelopments including Halifax, Montreal.

The North American waterfront redevelopment “model” was diffused to other ports around the

world. Initially, waterfront development emerged in European Ports, such as in London, subsequently in Australia and Japan, and more recently in all continents, including developing countries. For example, Singapore has rejuvenated its historic harbour, historic waterfront buildings in Mumbai, Calcutta and Madras are being protected and revitalized, Havana is renovating its old port city and Cape Town redeveloped its waterfront. In most of these events, improvements of the waterfront proved a catalyst for revitalizing adjacent city centres.

In many port cities, the growing separation between the central city and its commercial port was reinforced by the port's downstream migration. Examples are London, from the Docklands to Tilbury and Rotterdam from the city-centre port to the Maasvlakte.

In Europe today, waterfront redevelopment is underway in many port cities. The vast majority of European ports (some seventy urban areas were surveyed) have wastelands close to the CBD due to shifting port activities, and are involved in redevelopment projects. It is noted that European port redevelopment typically combines recreational, business and residential functions.

Next to spatial and social considerations, there are also economic drivers behind the movement of port activities out of the city (centre):

- The opportunity to develop high value added economic activities in the former port territory
- The land value of the ports area, usually adjacent to the city centre, is potentially high<sup>15</sup>.
- The old port area could be used for development of “cruise tourism”, a rapidly growing, profitable segment of international maritime shipping (new destinations, also and particularly in developing and transition countries being very much in demand; an opportunity for Indian port cities!)

The paper goes on to review the experience with respect to waterfront development in selected port cities in Canada, USA, London Docklands, Rotterdam, Hamburg, Capetown, Sydney, Melbourne, Adelaide, Singapore, and Osaka. The key conclusions it draws are mentioned below.

#### *Key conclusions from review of waterfront development*

All over the world, ports are in spatial transition. Following environmental and social pressures, a “separation” occurs, port activities leaving their traditional home in/near the city centre for new – Greenfield - locations outside the urban area in industrial and logistic clusters. Later, and that may take decennia, urban redevelopment is initiated, through waterfront “regeneration” of abandoned inner-city port sites.

Critical success factors in this process:

- A port regeneration master plan is required, embedded in an overall integrated urban development policy/strategy
- The plan shall strive for economic and social balance of urban functions, including residential
- The plan shall build on strong cooperation between the Port Authority, the Municipal Government and the Private Sector, preferably through a special purpose vehicle development corporation, using Public Private Partnerships as delivery mechanism
- The Port Authority seems to be the indicated party to guide the transition process and initiate urban redevelopment planning, acting as the stakeholder coordinator in their role as port landlord with responsibilities for the entire port community
- Governance of the transition process shall be at the municipal level. Of course, there is some central oversight (policy, legislation) but planning and action is a local matter
- The economic significance of new maritime activities in the redeveloped port sites, i.e. recreational boating/marinas and cruise shipping is rapidly growing

- Proper access of the regenerated waterfront area and connectivity with the city centre shall be secured

### **Bulk Handling**

The paper describes that there is a world-wide trend of development of dedicated bulk-handling facilities outside of the boundaries of the existing public ports. Stand-alone bulk cargo terminals have become more common:

- As the scale of shipments and size of the bulk vessels has increased
- As direct rail access for unit trains operation has become a prerequisite
- As the shippers have assumed greater control over their supply chains, and
- As stricter environmental regulations require greater physical separation from the handling of general cargo.

Traditionally, bulk-handling occurred side-by-side with general cargo in multi-purpose ports. During the past decades, bulk-handling facilities increasingly move away from their original home within city-ports to new locations, beyond the boundaries of existing ports, frequently Greenfield sites outside the urban area, for the following reasons:

- Changes in cargo-handling technologies, specialized bulk terminals requiring more storage space and deeper water for larger ships than can be provided in the multi-purpose city-ports
- Hinterland access: the need for direct connectivity to rail and/or inland waterway networks
- Environmental and safety/security pressures from the urban society
- Port development will be more and more integrated with industrial territories outside urban areas for value added production and logistics
- Shippers increasingly strive for vertical integration, securing control over the entire supply chain, including dedicated port and terminal facilities

The movement of port facilities from the traditional central location was described above in the urban context in terms of separation, transition and territorial integration. The latter is manifested in two ways:

- Urban redevelopment, waterfront generation in/adjacent to the city centre, and
- Integrated industrial port development outside the urban area, i.e. container terminals and dedicated bulk handling facilities

In bulk trading, there is a tendency for vertical integration, whereby main players are striving to avail of dedicated facilities preferably in ownership, along the entire supply chain. In principle, this could in some situations, induce risks of monopolistic powers, i.e. when a private terminal is the only one of its kind in a port and does not allow entry and use by others (competitors or not). Port Authorities shall be aware of such risks and if necessary set regulations to ensure level playing field competition.

### *Bulk trades and ports*

The vast majority of bulk trades (in tons) is Coal (basically coking or steam) and Iron ore. In order of importance:

- Iron ore Main exporters: Brazil, Australia, India, South Africa, Canada
- Iron ore Main importers: China, Europe, Japan, Korea, Taiwan Coal Main exporters: Australia, Indonesia, United States, Canada, Russian Federation
- Coal Main importers: Europe, Japan, Korea, India, Brazil

The paper then presents examples of selected countries and ports with bulk trade facilities. These include ports in Canada, Brazil, South Africa, and Australia.

### Issues and Lessons for India

*The paper on stakeholder co-ordination concludes that the mainstream in contemporary port*

*governance is the landlord port management model and a corporatized Port Authority with sufficient autonomy to assume enhanced roles and functions in field of:*

- *Evolution from “Conservator” to “Facilitator” and “Entrepreneur”*
- *Strategic Manager for (cluster of) regional ports*
- *Responsible for port development and its financing*
- *Including port related industrial development (bulk trades)*
- *Committed to Global Logistics/Trade Facilitation/Supply Chain Management*
- *Increasingly involving hinterland transport (corridors) and inland terminals*
- *Caring for port community/social matters and maintaining the city-port dialogue*

*Private sector involvement in ports occurs in terminal operations and port development.*

*In financing port development (and associated industrial facilities and urban regeneration), Public Private Partnerships are increasingly employed. A worldwide survey reveals that India and China are leading, while the rest of the world is stagnating in PPP applications.*

*Many port cities all around the world undergo a transition in terms of separation of space demanding and/or dirty trades from the inner-city port to a location outside the urban area, followed by waterfront regeneration in the city centre. International best practice shows many successful projects. Frequently, cruise shipping promises an untapped potential.*

*In bulk-handling, particularly coal and iron ore, there is a trend towards vertical integration by major suppliers, aiming at increasing the scope of control over the entire supply chain through dedicated facilities under private ownership. Port regulation shall be geared to preventing abuse of monopolistic power while securing common access.*

*In India, the landlord model has not yet been introduced to a great extent in the major ports, despite good intentions. The minor ports are mostly governed by State Maritime Boards, which act as Port Authorities. A few exceptions are the privatized ports, developed under BOO or BOOT schemes, where the land ownership is (permanently or temporarily) transferred to private concessionaires. PPP schemes have become quite popular in infrastructure development in India, but there are concerns about proper safeguarding of public interests.*

## **4. Conclusions**

*The key conclusions and lessons for India from the papers on port governance and stakeholder participation include:*

1. *India needs to develop additional port capacity to facilitate imports and exports and to support the growth of its economy. The balance between capacity and demand will be fragile at best the coming decade and capacity expansion realization is threatened by delays in PPP projects. The additional capacity needed concerns bulk and containerized cargoes and needs to provide sufficient draft for the largest ships;*
2. *The Indian economy needs efficiently organized and efficiently operated ports, to make sure that the maritime infrastructure is used as optimal as possible. The management of ports in India should be changed to allow for more efficient planning and operation of ports and the participation of the private sector, particularly in port operations, should be further increased. A new port hierarchy should be considered based on emerging traffic flows and demand/supply patterns of both production and consumption centres;*
3. *Competition in the port sector should be promoted, and where necessary regulated, as competition will lead to efficiently organized and operated ports;*

4. *The logistics flow of trade through ports (and in fact along the entire transport chain) should be supported by efficiently organized information exchange;*
5. *The increasing pressure on India's rail and road network could partly be relieved by developing short sea shipping as an additional sustainable alternative mode of transport. Nonetheless, also hinterland infrastructure should be seamlessly adapted to growing port related traffic volumes;*
6. *Ports should be developed as international connection nodes in structural economic development, aimed at strategically positioning ports as nodes in transport and economic corridors. A good example already exists in the form of the Dedicated Freight Corridors Project.*

## 5. Annexure I: Summary of Case Studies

The four case studies summarized in this annexure cover the following themes:

### **Case 1: Development of national port networks**

This case study gives insights into the role of government during a period in which the demand for port capacity is expanding due to growth of intra-regional trade. The case considers the role of the government in guiding the port planning. Considerations are the planning process applied and how the plans of various ports were integrated, the pace of capacity expansion and the way this expansion was implemented (for instance private versus public investments). The proposed example case involved is the port network in Turkey added with observations readily available from other Ecorys assignments.

### **Case 2: Development of road and rail freight corridors**

Railway infrastructure is an important prerequisite for shipping goods from and to seaports. Due to its economies of scale, rail transport is particularly important for the transport of bulk goods, such as coal or iron ore. Without rail access, transportation of these goods would become too expensive. Besides for bulk goods, rail transport can also be used for the shipment of containers. In these cases, rail transport is often seen by governments as a way to alleviate road congestion. In this case study, the role of governments in both a bulk rail corridor (South-African case) and a container transport corridor (the Rhine Delta – Ruhr region case) are presented.

### **Case 3: Insuring competition in the provision of port services**

In ports, services such as stevedoring or pilotage are often performed by one or a few firms per port. As a result, possible lack of competition could provide companies with a degree of market power and the ability to exploit customers, for example through higher prices. Besides competition issues by private service providers, also port charges set by the port authorities do not always reflect fair pricing. Governments try to compensate the market power of these service providers and port authorities through various types of measures, such as setting upper limits for prices or regulating the service period of an operator. Depending on the effectiveness, further development of such regulatory models is often seen. In this case study, examples are presented for the EU as a whole.

### **Case 4: Redevelopment of older port facilities**

Due to changes in competition, economic decline of a region or changes in the location of main port activities, older port facilities sometimes become decayed. Often these facilities are located fairly central in urban areas. In order to revitalize such areas, urban governments invest in the redevelopment of these old ports by introducing new functions, such as a residential or office function. Numerous examples of such redevelopment exist throughout the world. This case study presents one example from the US, added with readily available material from other cases.

# Case 1: Development of a national port network in Turkey

## Context

Turkey enjoys a strategic location, geographically as well as geo-politically, as a bridge between Europe and the Middle East. The economic crisis set apart, the Turkish economy has grown rapidly in the last years. Important energy, trade and transport networks run through the country, connecting which connect west to east and north to south. Turkey's ambition is to become a logistical hub between Europe and the Balkans, Middle East, Russia, Caucasia, Black Sea and Mediterranean countries. One of the policy priorities of Turkey is increasing its port capacities and transforming ports into logistical centres where combined transport can be realized whilst ensuring efficient management of ports. Especially investments in the maritime (and rail) sector are needed, as the current capacity is too low and too inefficient to accommodate the increasing freight flows.

## Geography

Turkey has a long coastline. It is bordered by the Black Sea to the north, the Aegean Sea to the West and the Mediterranean Sea to the South. Only the Eastern border of the country, about half of the southern border and a small stretch in the northwest are land borders. The majority of Turkey's surface is located in Asia; a small part of the country is located on the European continent. The European and Asian part of Turkey are separated by the Dardanelles Strait, the Sea of Marmara and the Bosphorus, which connect the Aegean Sea with the Black Sea. Particularly the Dardanelles Strait and the Bosphorus, which runs right through the city of Istanbul, are bottlenecks to maritime traffic. Both straits are so narrow that traffic streams up and down have to be alternated, causing the need for ships to wait for a convoy to pass through. In the Bosphorus, safety is an important issue, as fully loaded tankers have to navigate the narrow and bendy Bosphorus right through the middle of Istanbul, which has a population of 14 million people.

## Economic developments

Turkey experienced a severe financial crisis in 2001, followed by financial and fiscal reforms as part of an IMF program. In May 2006, the first oil emerged from the Baku-Tbilisi-Ceyhan pipeline and several gas pipelines connecting Central Asia to Europe through Turkey are under planning. This will bring new economic opportunities to Turkey and might help addressing the country's dependence on energy imports in the long term. The basis of this economic performance lies in structural reforms that strengthened the macroeconomic fundamentals of the country, partly driven by the post 2001 crisis IMF programme and partly by the country's EU accession process. The main objectives of these efforts were to increase the role of the private sector in the Turkish economy, to enhance the efficiency and resiliency of the financial sector, and to place the social security system on a more solid foundation. The improvements in the Turkish economy have also boosted foreign trade; the traditionally largest Turkish export sector of textiles has meanwhile been surpassed by the automotive, construction and electronics industries. Exports have grown from 36 billion USD in 2002 to 114 billion USD in 2010. In 2023, the value of exports is expected to hit the 500 billion USD mark.

## Cargo volume development

As an expected 90% of Turkish trade will move by ship, this will place the Turkish port sector under a heavy burden. Container volumes have increased from 1.25 million TEU in 2001 to 5.87 million TEU in 2010, whereas in the same period the total cargo volume more than doubled from 170 million tons to 350 million tons. Expectations are that container volumes will grow to 15 million TEU in 2020 and 30 million TEU in 2030, and that the total cargo volume for these years will grow to 419 million tons and 758 million tons respectively. This enormous growth in cargo volumes will have to be catered for by an efficient ports system, linked to the main consumption and production centres of the country by an efficient hinterland network of roads and railways.

### **Transformation in the physical infrastructure**

The Turkish maritime policy vision is based on the following elements:

- Provision of infrastructure with sufficient capacity, based on the cargo volume forecast figures as indicated in the previous section
- Efficient operation and efficient administration
- Improved safety and security
- Integration with European and neighbouring economies

The major challenge in the coming decades is to provide additional infrastructure and to make existing infrastructure more efficient.

### **Port infrastructure**

The Turkish maritime policy vision aims to develop ports at the right place, at the right time and with economies of scale. They need to be developed into logistics centres with good hinterland connections and will be planned according to strategic planning documents and with proper feasibility studies. Apart from several smaller initiatives, both public and private, Turkey is aiming to develop three major port projects. These ports were selected as a result of the TINA (Transport Infrastructure Needs Assessment) study for Turkey carried out in 2004, as priority port projects to develop a multimodal transport network in Turkey. In fact the TINA study prepared an extension of the TEN-T (Trans European Network - Transport) into Turkey. All three ports will be considered for European funding through the IPA (Instrument for Pre-Accession) programme. These ports are:

- A container terminal in Çandarlı (near Izmir), with an ultimate capacity of 4 million TEU;
- Additional container terminals at Mersin, with an ultimate capacity of 11 million TEU;
- A bulk and general cargo port in Filyos, with a capacity of 10 million tons of dry bulk, 3.6 million tons of break-bulk and 0.9 million TEU containers.

The ports of Mersin (on the Mediterranean coast) and Filyos (on the Black Sea coast) will be connected by a railway so that they can form a land bridge as an alternative to maritime transport through the Bosphorus.

### **Other transport infrastructure**

Though not part of the ports network, a road and rail network that connects ports to the major production and consumption centres is paramount to complete the network of ports. The Turkish government is aware of this too and is investing in its road and rail network. In the feasibility studies of the three major port projects above, the road and rail connections of the port, including expansion plans, have been studied in great detail.

### **Objectives that guided this transformation**

The major objectives behind the development are clear: Turkey wishes to develop a port infrastructure to support its economic growth objectives, and wishes to do so in a coordinated manner. Along with the objective of providing infrastructure with sufficient capacity, there are objectives such as:

- Correct timing of the developments in order not to waste capital
- Improvement of efficiency in the ports to make better use of existing capacity
- Improvement of the efficiency of administrative processes in order to facilitate trade and transport flows
- Improving safety and security in ports to match international requirements
- Involvement of the private sector to attract capital for investment and knowledge in specific areas
- Stimulation of containerization

### **Evolution in institutional relationships**

The concept of PPP is not new to Turkey. In particular the BOT concession has been widely applied with mixed success in Turkey, particularly in the energy, airports and ports sectors. In the ports sector the BOT (Build Operate Transfer) law has been used to build nine marinas and four ports, but there have also been some unsuccessful examples and a number of projects have been cancelled or abandoned. Some attempts have been made in Turkey to tender projects without explicit government guarantees but no compliant bids were received. The private sector has been reluctant to invest without these guarantees especially in light of the financial crisis. On the other hand, the same BOT law has worked well in the airport sector.

Today, the Turkish state still has a very large stake in the port sector. Many ports are still state owned, managed and operated. This situation is changing however, as Turkey is privatizing parts of its port sector seeking private capital to invest in port infrastructure. Parts of the three major port development projects that will be tendered soon will be tendered as BOTs, where the government will only invest in those elements of the development that cannot be attractively funded by the private sector, such as breakwaters and some of the other basic infrastructure. All other investments, including part of the basic infrastructure will be funded by the private sector.

### **Underlying governance structure**

There is, as yet, no single ports authority in Turkey; ports are owned and operated by TCCD (Turkish Railways), which remains responsible for the performance of the ports operator, and has the power to step-in in the event of default by the operator of its contractual obligations. These include a requirement to carry out specified improvements to the port infrastructure. It is possible for private companies to propose other port developments, but these must obtain a number of permits and consents. The privatization programme for the TCDD owned ports is now almost completed, and the methodology for encouraging private investment under the BOT model has evolved to work effectively in the ports sector. BOT is considered to be the most appropriate model for creating new facilities, although the TOR model (in which the operator operates the port according to certain specifications) can also include capital improvements in the concession requirements. Between 10 and 15 ports are now in private operation under the TOR model.

### **Legislative changes**

The BOT law (3996) has been used as the basis for private investment in nine marinas and four port facilities. A report by the Ministry of Transport has looked at alternative financing models for the ports sector and made recommendations on improving the application of the existing BOT laws, based on experience to date, as a short term measure, and the drafting of a new PPP law for the longer term. A general PPP law is under construction but is yet to be enacted.

### **Cross country comparison**

The situation in India has obvious parallels with the Turkish situation. Both countries are developing economies that experience strong economic growth, both countries have a long coastline and rely on maritime transport for most of their imports and exports, both countries are confronted with fast growing volumes of maritime cargo and face the challenge of supplying the infrastructure to handle these volumes.

## **Case 2: The Maputo development corridor**

### **Context**

The city of Maputo in Mozambique has a port that is well located for South African transit cargoes. For cargo with origin or destination in the South African provinces of Limpopo, Mpumalanga, and

Gauteng the port of Maputo is either the nearest port or just as far as Durban or Richards Bay. The distance between the port and the South African border at Lebombo (Mozambique)/Komatipoort (South Africa) is only 100 km. Along the corridor Johannesburg-Witbank-Nelspruit-Komatipoort, there are several centers of production, notably mining and agricultural products. The port of Maputo is connected to the South African consumption and production centers by railway through the Ressano Garcia line in Mozambique (part of the network of CFM - Portos e Caminhos de Ferros de Moçambique) and by the rail network of South Africa's railway company Transnet Rail. The road connection in both Mozambique and South Africa is the N4, a toll road. Rail and road use the same border crossing, at Lebombo/Komatipoort.

### **Cargo volume development throughout the years**

At its peak year during the colonial era, in 1971, the port of the city (then called Lourenço Marques) transported 17 mln tons of cargo per year, a fair share of which was SA transit cargo. The independence of Mozambique in 1975 was followed by a period of civil war lasting until 1992, during which the port but in particular the railways suffered damage from attacks and neglect. By 2002, the all-time annual low volume was recorded at 1.2 million tons. In the early years of this century, the port and the railway were gradually rehabilitated and a quality road was constructed. Today, the port caters to local imports and exports as well as to transit imports and exports. Most of these transit cargoes are from South Africa, but increasingly transit cargo from other countries finds its way to Maputo, in particular cargo from Zimbabwe and Swaziland. The total cargo volume handled in 2011 is likely to come to the range of 11.5 million ton and the port has plans to further upgrade and expand capacity to about 30 million tons by the end of the decade.

### **Political developments**

The development of the Maputo corridor, or rather, if compared to the pre-1975 situation, the revival of it, was triggered by major political, economic and social changes in both South Africa and Mozambique. The years of the civil war (1977-1992), combined with a major draught in 1983, practically paralyzed the Mozambican economy. After the peace treaty in 1992, the gradual rehabilitation of the country's economic, political and social structure could start. Today, the country is still among the poorest of the world, with a GDP per capita of 1000 USD in 2010 and an estimated 54% of the population below the poverty line. However, the economy has been growing at a rate of 6% to 7% in the past few years, despite the worldwide recession. The country is very rich in natural resources (coal, iron ore, chromium, gold, and a series of other ores and rare earth metals). Despite its economic issues, the country has recovered from the economic crisis and has joined the BRICS1 grouping of countries in April 2010.

### **Comparison to India**

As Southern Africa, India too has a geographical situation where the major production and consumption centers are situated away from the major ports. The Delhi-Mumbai corridor is a good example, in a way comparable with the Maputo corridor. The major difference is that the Gauteng area in South Africa has several corridors to ports for its imports and exports, and that there is a border crossing in the Maputo corridor which forms an obstacle. Politically speaking, political stability in India has existed for far longer than in both South Africa and Mozambique. India's economy is growing rapidly too and at higher levels than the two African countries. Pre-crisis annual growth levels frequently hit the 10% mark and during the crisis growth only slowed down to just under 6%. Yet, comparable to South Africa, the country has an economy that is rapidly expanding and modernizing.

### **The Rhine corridor in North-west Europe**

The Rhine corridor forms an important transport corridor between the port of Rotterdam in the Netherlands and the German Ruhr area. The Rhine river is navigable beyond the Ruhr area all the

way to Basle in Switzerland and even further (about 1000 km), but this section focuses on the Rhine corridor between Rotterdam and the Ruhr area (some 200 km). The Rhine corridor consists of several transport links, of which the main ones are inland waterways, rail links and road links.

The infrastructure could broadly be divided into three categories:

1. Naturally available, which relates to the waterways. These have been adapted and been made navigable, but in principle are based on the natural existence of the rivers.
2. Purpose built infrastructure, which applies to some of the canals (notably the Nieuwe Waterweg that gave the port of Rotterdam direct sea access in the 1870s) and the Betuwe rail freight line.
3. Infrastructure built with a mix of purposes, which concerns most of the railway lines and the highways. These were built with the purpose of connecting the major urban centres as well as with the purpose of connecting the industrial areas to the port(s).

Contrary to the Maputo corridor, there is no corridor development agency. The responsibility for the infrastructure falls under several public authorities, mostly at national level or at the level of federal state (in the case of Germany) or province (in the case of the Netherlands). This explains for instance that the development of the Betuweline was completed from the Dutch side, but is awaiting further works on the German side. The private sector is much less involved in the development of the corridor than in the case of the Maputo corridor, although on the rail corridor, the management and maintenance is tendered and a concession is given to a private operator for the infrastructure, who should then arrange access to multiple rail operating companies against regulated tariffs.

### **Transformation in the physical infrastructure**

The infrastructure of the Maputo corridor was gradually rehabilitated in recent years:

- Maputo port was concessioned to the Maputo Port Development Company (MPDC)
- The Ressaño Garcia railway line, from the port of Maputo to the border crossing at Lebombo/Komatipoort was rehabilitated in the early years of this century. Further upgrading of its capacity is still ongoing.
- The road connection consisting of the N4 toll road running from Johannesburg (with a branche from Pretoria) to Maputo was constructed in the years 1998-2001.

### **Port infrastructure**

The port of Maputo was concessioned to MPDC, a joint venture of Portos e Caminhos de Ferro de Moçambique (CFM), Grindrod and DP World. In 2003 MPDC obtained a concession for 15 years with an option of extending for another 15 years. In June 2010, the concession period was extended for another 15 years, with an option of an additional ten years of operations after 2033. MPDC holds the rights to finance, rehabilitate, construct, operate, manage, maintain, develop and optimize the entire concession area. The company also holds the powers of a Port Authority, being responsible for maritime operations, piloting towing (tugboats), as well as port's planning development. The fact that (part of) the port authority function that previously exclusively rested with CFM is part of the concession is quite unique; commonly concessions concern stevedoring and terminal management, but not the marine function and port planning functions which are typical for a port authority. MPDC has several subconcessions: DP World Maputo (container terminal), Grindrod (Matola bulk terminal), STAM (sugar terminal).

The port nowadays consists of the main port in the center of the city and the bulk terminals at Matola, about 6km upstream from the main port. The main port has 16 berths with depth alongside from 8 to 11 m (below chart zero). It handles containers, breakbulk cargo, cars and a series of smaller bulk flows, such as sugar, sized coal, chrome ore, ferrochrome, phosrock, manganese, etc. Larger bulk flows are handled at Matola, such as coal, magnetite, aluminium and petroleum products.

The main port consists of quays dating back to colonial times. Some of these have been rehabilitated, others are still in need of an upgrade. Expansion plans mainly focus on increasing efficiency of terminal areas by improvement in equipment, storage and logistics. Additional berths are foreseen for the container terminal in order to increase capacity from the current 140,000 TEU (based on 1 berth) to an eventual 1.4 million TEU (based on 4 berths).

### **Rail infrastructure**

The rail infrastructure of the Maputo corridor consists of the Ressano Garcia Line (RG-line), running from Maputo to the border crossing at Lebombo and operated by CFM. The RG-line connects to the South African Transnet Rail Network at the border, which offers a rail connection to Johannesburg and several branch connections, such as the branch to Phalaborwa (where most of the magnetite comes from). The Ressano Garcia railway line was rehabilitated in the early years of this century. Some capacity expansions have already taken place (such as increase of the number of passing loops, upgrading of the signaling system and investments in rolling stock). Further capacity expansions are planned, as the capacity of the RG-line needs to be kept aligned with the capacity of the Matola bulk terminals.

### **Road infrastructure**

A good quality toll road, the N4, from Johannesburg (with a branch from Pretoria too) to Maputo was built under private concession in the years 1998-2001. The concession rests with TRAC (Trans African Concessions), a company that was established in 1994 for the purpose of developing the N4 toll road. The road was constructed under a BOT (Build Operate Transfer) contract for 30 years that was closed in 1997. TRAC operates 6 toll plazas along the stretch of 600km of N4 road; 2 in Mozambique and 4 in South Africa.

### **Objectives that guided this transformation**

Several objectives of various stakeholders have guided this transformation. MPDC wished to promote the port of Maputo amongst South African cargo owners as an alternative to Durban or Richards Bay. CFM wished to upgrade its railway connection to South Africa and to attract cargo to it. South African cargo owners were looking for alternative and efficient routes to export or import their cargo. Government organizations were looking at the development of regional economic opportunities and the rehabilitation of infrastructure. In order to align the objectives of the various stakeholders and to unite them in a joint effort, the Maputo Corridor Logistics Initiative (MCLI) was founded in 2004.

MCLI is a non-profit organization consisting of infrastructure investors, service providers and stakeholders from Mozambique, South Africa and Swaziland, who are focused on the promotion and further development of the Maputo Development Corridor (MDC) as the region's primary logistics transportation route. It was founded by stakeholders from the public sector, such as CFM, the South African Department of Transport and Transnet Freight Rail, and the private sector, such as MPDC, DPWorld Maputo, Grindrod and TRAC. MCLI aims to co-ordinate the views of service providers and users of the corridor, engaging primarily the governments of South African and Mozambique as well as Swaziland, to remove barriers along the corridor, inform on market developments along the corridor and to market strategic benefits and opportunities of using the corridor.

### **Evolution in institutional relationships**

The institutional relationships along the Maputo corridor are not particularly different from elsewhere in the world. The exception is perhaps the fact that MPDC also holds part of the port authority function for the port of Maputo in its concession. The strength of the Maputo Development Corridor is in the way that the various stakeholders and institutions are working together within the framework of MCLI to develop the corridor. In this initiative not only the infrastructure owners and transport operators cooperate, but also the users of the transport system. This feature is different from Western

examples; in the Rhine corridor there are various alternatives, both in terms of transport mode (road, rail, inland waterway, pipeline) and in terms of routes and ports.

### **Underlying governance structure**

MCLI is incorporated in South Africa as a non-profit membership organization, which positions MCLI to facilitate inclusively between all stakeholders, public and private, across national borders. Its role is explicitly to promote and to bring stakeholders together. It cannot make decisions on infrastructure or regulations or enforce them; such power rests with the competent authorities. However, MCLI can set up contacts between other stakeholders and the authorities or inform authorities on other stakeholders' needs and wishes.

### **Legislative changes**

Whereas MCLI cannot propose or impose any legislative changes, it can lobby for them. MCLI has put great efforts in facilitating changes in border crossing procedures. The major disadvantage of the Maputo corridor compared to the Durban corridor is the fact that it includes a border crossing, which used to be a time consuming and costly affair. The time needed to cross the border has been India greatly reduced by the introduction of pre-clearance. Transit cargo from the port of Maputo can nowadays be pre-cleared to cross the border so that truck drivers only need a quick check of their papers before they can cross.

### **Conclusions**

In a transport corridor, the various infrastructure elements need to be aligned in terms of capacity, quality and time of realization. A port with 20 million tons of capacity needs a combined rail and road capacity of the same volume to connect it to its hinterland. Such alignment would also need to exist in terms of regulations, but more importantly in terms of objectives of the various stakeholders: the authorities, infrastructure owners, logistics service providers, rail, road and port operators, cargo owners, communities along the corridor, etc. A very good means of promoting a corridor and of bringing in contact the various stakeholders in a corridor to align their objectives and to facilitate changes and development is a corridor promotion organization, such as MCLI in the example of the Maputo Development corridor. There are more examples of such corridor development organizations, such as the Walvis Bay Corridor Group or the Dar es Salaam Corridor Group.

Contrary from the situation in India, this corridor includes a border crossing which used to form a barrier (and to a certain extent still does). Corridor development efforts by where therefore partly focused on removing the barriers caused by border crossing; which in the case of India would not be necessary. Apart from this minor difference, a corridor development organization would be a good instrument to develop freight corridors in India.

## **Case 3: Insuring competition in the provision of port services**

### **Scoping: port services**

The port services cover services of a commercial value which are provided against payment to port users in a seaport and whose payment is not normally included in the charges collected for being allowed to call at or operate in a port. This relates to the following services:

- Technical-nautical services of pilotage,
- Towage and mooring,
- Cargo handling operations (loading, unloading, stevedoring, stowage, transshipment and other intra-terminal transport),
- Passenger services, and
- Environmental services

These services are clustered in services “on the ship”, “on the cargo” and “other services”.

### **Services provided ‘on the ship’**

Both port authorities and (semi)-private companies provide the port services provided on the ship. The provision of maritime access, general facilities in the port basin, and the provision of berthing space are all examples of services provided by the port authorities and concern a natural monopoly. Other services, like pilotage, towage and mooring are generally provided by pilotage companies, by towage companies or by specialized companies depending on the port. The ancillary services are less important in qualitative terms and therefore not considered as these are not required for each ship calling.

### **Port services and charges on the cargo**

The cargo handling services are often provided by one type of company, the terminal-handling operator. It should be noted that terminal-handling operators often offer both the cargo handling (2/2) and transshipment services (2/3) and storage services (2/4), however this situation differs per type of port and per type of commodity. Another important remark relates to the existence of vertically integrated companies that offer different handling services. This relates to crude oil and petroleum products and dry bulk commodities such as grain, coal, iron ore, alumina and bauxite.

### **The problem: competition issues in the provision of port services**

In ports, services such as stevedoring or pilotage are often performed by one or a few firms per port. As a result, possible lack of competition could provide companies with a degree of market power and the ability to exploit customers, for example through higher prices. Besides competition issues by private service providers, also port charges set by the port authorities do not always reflect fair pricing. Governments try to compensate the market power of these service providers and port authorities through various types of measures, such as setting upper limits for prices or regulating the service period of an operator. Depending on the effectiveness, further development of such regulatory models is often seen. In the field of port services, an inventory of European ports shows that in many ports<sup>24</sup>:

- In the sector of pilotage services in many European ports there is only one supplier of these services, and in many cases these services have not been tendered out, but concessions have been awarded to – former – (semi)governmental bodies, active in an intricate mix of public and private interests.
- Also in the sector of towage and mooring this situation exists: suppliers of services are often combined in one supplying entity offering its services to the port, in many cases without public procurement procedures.
- Regarding cargo handling operations (loading, unloading, stevedoring, stowage, transshipment and other intra-terminal transport) the situation differs per type of cargo.
- Moreover it has been shown that in several instances labour in ports is relatively well paid when compared to relevant job alternatives in the same region outside the port area.

Port services however only account for a small share in total shipping costs. Price differences in individual port charges therefore will only have a small effect for shippers in their choice of port. Whether there are market failures in the provision of port services requires detailed study. However typical indicators for the existence of such failures are:

- Number of service providers in a port
- Level of tariffs compared to other competitors

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<sup>24</sup> Ecorys (2005), Complementary Economic Evaluation study on the Commission proposal for a Directive on market access to port services. Study on behalf of the European Commission, DG TREN, 1 November 2005.

- Level of wages compared to other sectors
- Procurement procedures

An inventory in 47 EU ports has shown that for many services only one operator is available<sup>25</sup>. For most ports however it appears difficult to have more than one operator, simply because of the scale of operations which in many ports is too small to have more than one company working effectively. Still this does not mean there is no competition per se. With regular and publicly procured concession contracts market functioning could be in place. This will depend on the set-up of the tender procedure, concession period, etc.

### **Possible approaches for governments**

Since ports are, like other infrastructure sectors, characterized by large capital stocks in the form of high fixed (sunk) costs to construct them, port operations as a whole may be seen as being a monopoly. According to OECD (2011)<sup>26</sup> there are three categories of solutions:

- Separating the monopoly portions from those activities that can be efficiently opened up to competition
- Create competition through vertically integrated providers
- Achieve efficient operations within government regulation through ‘incentive regulation’.

In the context of ports, examples of each of these solutions are found. However competition may come from other forms as well. In the area of ports, competition within a port may be faced differently when also competition between ports is in place. On a higher level, ports can be seen as only nodes in transport chains serving the delivery of goods between A and B. The definition of ‘the market’ for transporting goods defines the impact of (non)competition within a seaport. Finally, the role of end client should be considered.

All in all, for addressing port competition issues, a clear market definition of the economic services concerned is necessary. With regard to the specific port services under the scope of this case study, across the world an increasingly dominant role for private operations is seen. The market for container handling services is considered to be the largest of all port services assessed here. Furthermore in many ports more than one container handling operator is active (sometimes even more than 10), suggesting an amount of intra-port competition. In most ports however in fact one dominant operator and a few smaller operators are active. Still, large differences are seen between the container handling rates in Europe, North America or Asia.

### **Regulatory solutions developed in the EU**

Beforehand, it is noted that the regulatory process in the EU is still ongoing and no final implementation has been realized by now. This implies the below description is a state of play elaboration including assumption on the current and expected future impacts. In its white paper of 2001, and reinforced in its 2011 White Paper, the Commission addresses the need to raise transport efficiency as a measure to contribute to the expected rise in demand for port services following the forecasted dramatic growth of freight volumes in the coming decades. On 13 February 2001 the European Commission adopted a Communication to the European Parliament and to the Council “Reinforcing Quality Service in Sea Ports: A Key for European Transport” (the so called Ports’ Package). The cornerstone of this Communication was a proposal for a Directive of the European

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<sup>25</sup> ESPO (2005), Factual report on the European port sector 2004-2005

<sup>26</sup> OECD (2011), Competition concerns in ports and port services. Submitted by the US Department of Justice and the US Federal Trade Commission to the Working Party No. 2 on Competition and Regulation

Parliament and of the Council on “Market Access to Port Services”.

### **The focus of the 2004 Second Port Package**

The stated aims of the Directive are to remove restrictions that hamper access for existing or potential port service operators, ensure a more systematic application of Treaty rules, improve the quality of service to port users, and help reduce costs. In practical terms, the Directive will introduce a common framework for entry into competition for the provision of commercial port services. The services covered by the Directive are: cargo-handling, pilotage, towage, mooring, storage and passenger services. The Directive would create a level playing field by ensuring that the market is aware of the opportunities that exist for the provision of such services and would require ports to allow competing service providers to enter the market should they wish to do so. However, it also allows the number of service providers to be limited in certain circumstances (such as safety grounds).

### **Impacts of the EU port package approach**

At the time of the second Port Package development, an Impact Assessment was conducted by Ecorys (2005) which derived a number of impacts for various options of regulation that were assessed. Several case studies indicate that while the impact regulating port services may have on charges to be paid, the impact on port throughput and market shares will be much smaller since the charges regulation will only affect some 4-6% of total transport costs. The study concludes that organizational models matter. In general four types of port management can be distinguished; Public service port, Tool port, Landlord port, and Private sector port. Within mainland Europe, the landlord model is the dominant form. Since the role of private operators varies between these models, the impact of regulating port services competition also differs. The table below summarizes the expected impacts for each port management model.

### **Regulation of port services provision in the UK**

The EU level of regulation can be compared to the regulation at national, regional or even local level, as for instance seen in the UK. Although the latter is a member country of the EU, their situation differs considerably, mainly because of the domination of private financing and operation in the UK’s commercial seaports. In the UK, privatized ports are essentially self-regulating (World Bank, 2007). LBRO (2009) suggests that regulation at the local level may even be the most effective in addressing problems faced locally. The downside, as also addressed by them, is that the impacts of local regulation may however be felt at a wider geographical level, causing impacts elsewhere and impeding the need or desire for higher level coordination, if not regulation. Vice versa, effective local regulation can contribute to setting the standards for national level regulation.

In the 1980s former state-owned ports have been privatized and the seaport industry has been deregulated. One reason was the financial burden of port development to public budgets. Three forms of governance were formed: private ownership, trust authority, and municipal control. Most of the larger ports became privately owned and they also own the port’s land. No port regulator was installed leaving the private ports free in setting tariffs for port services. Trust ports and municipal ports essentially serve local interests on a quasi-commercial basis.

### **Impacts of the UK approach to port services regulations**

Compared to mainland European ports the UK ports are an main exception as port service charges are not set by a supervising national authority but decided on a commercial basis in each port by the (private) port authorities. These tariffs vary considerably between ports. The overall understanding is that prices of port services in the UK on average are higher than those of nearby mainland European ports. Detailed data however do not allow simple comparison. On a broader scale, the same is seen when comparing port access charges across Europe. Here, the assumption is that the impact of privately operated ports versus public ports is seen in all revenue components of a port. The UK

claims to have a higher level of market discipline already in place, thereby reducing the need for European intervention. An impact assessment of the European port package to UK ports concludes that the impacts would be largely negative. Their main complaint is that the Directive is based on the common port operational model in place in continental ports (e.g. the landlord model), where indeed a further liberalization is welcomed, but which in the UK is not an issue since ports and the port services therein are already liberalized.

### **Conclusions**

The analysis above has shown that competition for port services can contribute to efficient operations and lower prices. With regard to analyzing the level of competition in place, however, a distinction should be made between intra-port and inter-port competition. Intra-port competition may be defined by the number of operators for a service. Inter-port competition will depend on the connectivity between ports, the hinterland service options available, as well as the accessibility of ports for shipping companies and shippers. India has twelve major ports, and in most of them the handling of liquid and dry bulk commodities are the largest share of volumes handled. According to Pittman (2009), the combination of the proximity to bulk shippers and poor interior connectivity may be the cause of limited inter-port competition, thus calling for ensuring sufficient intra-port competition. On the other hand some of the major (and minor) ports seem located close enough to each other or having similar quality hinterland railway networks available to ensure at least the potential of inter-port competition.

With regard to regulating port services in India, the regulatory regime of the EU seems to fit better than that of the UK since most of the Indian ports are under government control. The profile of the ports, and their differences in handling volumes, commodity types and navigational access may require some level of differentiation. Furthermore a question to be answered would be whether to apply the same regime for major, minor and state ports. Finally, a development of private ports in India is noticed and this may shift the future balance if the trend is continued. In that case a mixed regulatory model addressing both categories could be envisaged.

## **Case 4: Redevelopment of old port facilities in Boston**

### **Introduction**

The Boston Harbor is located on Massachusetts Bay in the Atlantic Ocean and was established as a fishing and shipbuilding centre in the early 1600's. The port's dominance as the major American North Atlantic world port lasted until 1750. From that year on, the port of Boston experienced severe competition from other ports like New York, Baltimore and Philadelphia, and an overall trend downward was noted until the period after World War II. After World War II, the creation of Massport, the implementation of containerization and significant public and private investments have supported modern shipping activities and maintained the port's variability. During the second half of the 20th century, markets, industries and modes of transportations were all changing, which made it necessary for the Port of Boston to keep reinventing itself in order to remain competitive and to deal with the changing global economy.

The main transformation that took place from the late 19th century until the second half of the 20th century, was the relocation of the main shipping activities from central Boston (Downtown) to outer areas (like Charlestown, East Boston and South Boston). This was due to the growth of central Boston, which became more densely settled as an urban area. As a result, this part of Boston became too congested for the growing Port's needs and was no longer suitable for the direct cargo rail service to the waterfront. These services had to shift to other areas like Charlestown, East and South Boston. Downtown Boston became an area for recreation and residential use.

The port of Boston became the only full-service industrial port of New England and is nowadays an important economic engine with an annual economic impact of \$2.4 billion and 34,000 jobs. Before going into the details of the Boston redevelopment works, a cross-country comparison is given.

### **Cross-country comparison**

The theme of port city redevelopment is seen across the world. Many cities, where commercial trade activities were developed from decades or even centuries ago, have seen growth in the volumes of cargo handled, as well as the population to be accommodated. Furthermore increase of scale of shipping activities has led to physical limitations as well. The need for relocation of commercial port activities, and subsequently redevelopment of the 'old' port area became visible already from the 1960s but received increased attention in the 1980s. In general, the main drivers for redevelopment of old port areas found worldwide are:

- Growing spatial demands (especially for recreational and residential use) within the city;
- The scaling-up of port activities and the necessity to move to other areas with more space;
- Opportunities for development of high value added economic activities;
- Rising land prices of old port locations;
- Increasing demand for good connections between the city centre and the old waterfront;
- Prevention of the economical, physical and social degeneration of old port areas;
- Possibilities for cruise tourism in the old port areas.

The above described drivers for redevelopment of old port areas resulted in several projects with e.g. recreational, residential or business purposes. The approach followed to realize and interpret these developments however differs between port cities across the globe.

The urban renewal of the old port locations began in the USA and Canada, whereof Boston is a good example. But also other cities like New York, St. Louis, San Francisco, Halifax and Montreal

conducted several waterfront development projects. In Halifax, for example, the growing land requirements for railways led to development of terminals and rail yards at the east and west side of the city and the older port area within the city centre became abandoned.

The 'Kop van Zuid' in Rotterdam is a nice example of multifunctional and intensive use of space combined with appropriate urban design. The 'Kop van Zuid' was built on former docklands and is located relatively far from the city with the Maas river as a physical barrier. By modern urban design, multiple facilities along the river and the realization of good connections with the city centre, this location became a popular residential area, but also became an important bridge between the southern and northern part of Rotterdam.

These developments was also seen in Cape Town, where a mixed-use area was created and needed to be made accessible from land side residential and other business/retail sites in the city. This was done by redevelopment of the old, historic docklands around the Victoria and Alfred Basins with retail, tourism and residential developments. This resulted in physical link between the city and its waterfront, and the 'Victoria and Alfred Waterfront' became a popular and high quality trade and investment location.

### **Transformation in the physical infrastructure**

We will now further zoom into the redevelopment projects in Boston. First, in this section we will address the physical changes that were realized. In the subsequent sections the underlying driving forces, objectives, processes and the role of institutions is addressed. Four zones of port activities were defined in the port of Boston: 1. Downtown Boston, 2. Charlestown, 3. East Boston and 4. South Boston. All of these locations had their own (re)development processes. Subsequently, the main redevelopment processes of the four areas are shortly described.

#### **Location 1: Downtown Boston**

Downtown Boston is the old harbor location and its waterfront is regenerated during the last centuries from an important commercial shipping area to an recreational and residential attractive area.

Examples are the redevelopment of the Long Wharf, the India Wharf and the Rowes Wharf.

The Long Wharf (built 1710-1721) was once the main commercial wharf within the port, but since ca.1990 Long Wharf has been transformed from a commercial waterfront area into a recreational and cultural centre with a hotel, boat landings, restaurants, shops, offices and residences. The regeneration of India Wharf took place in the 1970s as part of the Boston Redevelopment Authorities plan. The plan introduced the desirability to live along the waterfront, which made investors develop luxury residences along the wharf (e.g. the Harbor Towers) and create good public access to the Harbor. Until the early 20th century, shipping commerce dominated the Rowes Wharf area and the wharf also served as a access point for public ferry services. Due to outdated shipping infrastructure and a stagnant economy, Rowes Wharf deteriorated.

#### **Location 2: Charlestown**

Charlestown is located north of downtown Boston. The waterfront consists of multiple wharves, which made this, together with the status of Charlestown as a deep water port, attractive for the US Navy to construct a Navy Yard in 1797. This yard has attracted prominent shipbuilders and maritime related industries, and during World War II this yard was of great importance for the US Navy. This resulted in major labor demands in the shipyards. After the war, the demand for naval construction declined and in 1972 the Navy Yard was closed and since that moment much of the waterfront of Charlestown was transformed to non-maritime uses. Examples are the former Navy Yard and Hoosac Pier; these are nowadays used for mix of commercial, residential and touristic purposes. Especially the old Navy Yard, an extensive mixed-use urban renewal project, became part of the Historical Park of Charlestown with a mix of historic preservation and new construction. In this park, visitors can

learn about the events that led to the American Revolution and the history of the Navy. The development of the Moran Terminal by Massport (Massachusetts Port Authority) began a new trend of waterfront industrial development, which made the Charlestown port area one of the pillars of the Port of Boston for intermodal container traffic, an array of bulk commodities and general cargoes.

### **Location 3: East Boston**

East Boston has been of great importance for the Port of Boston commerce since the early seventeenth century. The industries and piers developed nearly at the same time as the activities in Charlestown and South Boston. Together these three areas made it possible for the Port of Boston to adapt to the increasing demands for space and landside transportation. Such space could not be found at Downtown waterfront in central Boston, due to the congested wharves and increasing land prices. However, during the last decades the East Boston waterfront industries have shrunk or disappeared (due to changes in transportation methods and the decline of the shipbuilding & repair market) together with the waterfront employment. The upper reaches of Chelsea Creek remain important maritime properties, though along the rest of the waterfront for decades little private investments have been made and no large scale redevelopment projects have been conducted. This changed with the East Boston Master Plan in 2000, where the city and the community made a plan for new growth and development in the commercial districts and waterfront area.

### **Location 4: South Boston**

South Boston is an industrial zone that is located within the peninsula in the Southeast of Boston and is the largest and most active maritime industrial area of the harbor. It includes the Port's largest container facility, Boston's only cruise terminal and the Marine Industrial Park (MIP). In addition, South Boston is also home to the fishing fleet and the seafood industry of Boston.

The South Boston harbor area has experienced major changes in land use the last decades. In order to satisfy the growing demands in shipping activities, adopt to the global changes in the shipping industry and stay competitive, Massport (Massachusetts Port Authority) and the City of Boston (through the Boston Redevelopment Authority (BRA) and Economic Development and Industrial Corporation (EDIC)) have made major investments in port facilities, like the Conley Terminal and the Black Falcon Cruise Terminal as well as investments in the seafood industry and the Marine Industrial Park.

The realization of the Central Artery/Tunnel (CA/T) project, known as the Big Dig, has improved the accessibility of South Boston. The Commonwealth Pier became home to the Boston Convention and Exhibition Centre, the Seaport Hotel and Seaport World Trade Centre. In 1999 the BRA published the South Boston Waterfront Public Realm Plan, which provided a framework for future waterfront developments in the South Boston area. The main objective was to develop the district not only for business expansion to create jobs, but also to provide an accessible waterfront, an attractive open space network, a strong urban design character and new places to live. The neighbourhood should become a mix of industrial, residential, commercial, civic and retail uses.

*The above examples highlight a few of the physical changes that have been realized since BRA came into action in the 1970s. The implementation of the Economic Development Plan in 1995, was a major step towards the redevelopment of (old) port areas into high quality, mixed-use locations in Boston.*

### **Objectives that guided the transformation**

The main economic drivers that shifted the shipping industry from Downtown Boston to other locations and therefore redevelop the old port area were:

- The growing demand for space in the port industry and the lack of such space downtown;

- Containerization accompanied with much larger vessels;
- Competition from other US and Canadian ports
- The development in regulatory in trucking and ocean shipping;
- Labour costs, productivity and regulations;
- The growing spatial demand for residential and recreational purposes within the city, resulting in increasing land values in the old port area;
- The attempt to boost tourism.
- The increasing pollution from the sewage system which resulted also to endangerment of the local flora and fauna, from the environmental perspective.

### **Development plans and objectives**

The Boston City Council and the Massachusetts Legislature established in 1957 the BRA (Boston Redevelopment Agency). Its primary goal is to work with both public and private stakeholders in order to provide direction for development in the city of Boston. Initially, the BRA was assigned to address the problems faced in the inner city, but during the process however the scope was broadened and it was noted that redevelopment works were also needed in other parts of the city, like the harbor area. In the 1970s the first steps towards redevelopment of parts of the port area were taken.

Massport's (Massachusetts Port Authority) responsibilities are to plan, develop, market and operate the Port's public terminals, and to coordinate planning and development of the commercial port as a whole. In the context of these responsibilities, seven roles were defined for Massport whereof two were:

- Redeveloper of obsolete properties;
- Provider of public access to the waterfront.

In the 1990s the objectives were again redefined and broadened to the entire port in the Port of Boston Economic Development Plan (1996). The major change was the joint effort of the BRA and Massport (Massachusetts Port Authority). This Port of Boston Economic Development Plan made a major step into the redevelopment of (old) port areas for mixed-use purposes and the main objectives were:

- Promote and encourage seaport economy
- Maintain maritime industrial jobs and preserve essential port properties for active maritime uses
- Provide the waterside and landside public infrastructure to support the future growth of the industrial seaport
- Promote the Port as a component of the Boston tourist trade
- Redevelop appropriate portions of the Port for a mixed harbor-wide economy

In the context of the redevelopment of older port facilities, only the last point is relevant. While planning the redevelopment of portions of the Port, new and unique opportunities have been investigated. The main objective that was kept in mind, was to achieve a synergy among the industrial port, waterfront commercial and mixed uses, and public spaces. This all together should result in an economically vital port, and a publicly lively harbor and waterfront.

### **Evolution in the institutional relationships and underlying governance structure**

The main authorities for redevelopment of the Boston's waterfront are the BRA and Massport, though many other institutions (especially concerning the water quality of the harbor) were involved in the process. Some of BRA's responsibilities regarding spatial planning are:

- Co-working with developers, businesses and citizens to formulate master spatial plans that address the city's needs for infrastructure and community economic development.

- Approving development projects;
- Acquiring, selling and leasing real estate to achieve economic redevelopment and to promote public policy objectives;
- Owning real estate throughout the city and selling any such property when an attractive plan for the use of the property is submitted and approved;
- Issuing bonds and notes to finance the development projects;
- Granting tax concession to encourage commercial and residential development, if necessary.

With the commercialization of the port, the Massachusetts Port Authority (Massport) was created, which replaced the locally controlled Port of Boston Commission. Massport is an independent public authority of the Commonwealth of Massachusetts, created by the act of legislature in 1956 to own and operate Boston-Logan International Airport, Laurence G. Hanscom Field, the Port of Boston and certain facilities in and around the Port.

The Governor and the Legislature created in 1984 the Massachusetts Water Resources Authority (MWRA) with the overall objective to reinvent the region's wastewater conveyance, treatment and discharge systems. The MWRA took over the water supply and sewer activities of the Metropolitan District Commission (MDC). The Metropolitan District Commission (MDC) was created in 1919 by a merger between the Metropolitan Park Commission and the Metropolitan Water and Sewer Commission. After handing over the water responsibilities to the MWRA, the parks component of the MDC made great improvements. The public interests of harbor users, environmentalists, developers, waterfront business and decision makers are brought together by the non-profit, public interest organization TBHA (Boston Harbor Association). This association is founded in 1973 by the League of Women voters and the Boston Shipping Association in order to promote a clean, alive and accessible Boston Harbor.

### **Conclusions**

One of the key success factors in the redevelopment of the old, underutilized port areas in Boston was the establishment of the Boston Redevelopment Authority and its co-operation with the Port Authority, Massport. The joint forces of the BRA and Massport contributed significantly to the renewal of the deteriorated port areas.

Since private investments and economic activity form the basis of the development of Boston, the city kept on creating a favourable environment for private investors in decadent and underutilized urban areas. Several regulations and facilities were developed with the objective to attract and support these private investors (e.g. the exemption of property taxes for certain areas). The necessary investments in road and rail infrastructure were needed to connect the revitalized areas with other parts of the city. These infrastructural developments gave another economic boost to these areas and increased the attractiveness for private investors.

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# Summary Paper on Inter-Modal Co-ordination

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Seamless Transport Policy: Institutional and Regulatory  
Aspects of Inter-Modal Coordination

**Stephen Perkins**  
**International Transport Forum**  
**Paris, France**  
**May 2012**

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# 1. Introduction

This paper briefly discusses inter-modal<sup>27</sup> coordination of transport services from a perspective of what could be called “diversity-based mobility policy”<sup>28</sup>. It examines the framework conditions for inter-modal competition and coordination under an approach to transport policy making that reflects the broad variety of mobility needs and aspirations in market economies and reflects the social opportunity costs of alternative ways of addressing the demand for mobility.

The paper discusses integrated land-use planning and transport policy making, the importance of institutional frameworks for integrated transport planning and the fiscal framework for inter-modal competition, including in relation to external costs. Competition for resources between freight and passenger services is considered as well as truly inter-modal issues.

The paper was prepared for the National Transport Development Policy Committee of the Government of India following a Workshop in Delhi in February 2012, supported by the World Bank, Ausaid and the International Transport Forum. At the request of the Committee the paper focuses mainly on transport policy making in Europe but it also draws on experience in Japan, Russia and North America.

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<sup>27</sup> This paper uses the term ‘inter-modal’ to indicate relationships between different modes of transport. The term ‘inter-modal transport’ therefore covers a range of transport services using a combination of modes, either for passengers and freight. The un-hyphenated term ‘intermodal transport’ is reserved for container transport, in conformity with the way this phrase is usually used in North America.

<sup>28</sup> A characterization of policy developed by Kurt Van Dender of the International Transport Forum in the 2012 Transport Outlook (ITF 2012c).

## 2. Transport Policy

Over recent decades there has been a growing focus in transport policy making towards service delivery to end users, in both freight and passenger transport. The policy focus has shifted from intermediate goals such as annual plans and budgets for public transport corporations and annual spending on infrastructure, to final goals in terms of the effectiveness of transport services in providing access to jobs, housing and leisure activities, aiding the competitiveness of businesses and creating the conditions for economic growth. This is reflected in a range of initiatives including requirements for public transport services to publish key performance indicators, governments providing public support for the development of advanced logistics management tools, increasing political interest in congestion and a new transport policy focus on reliability of service and, in a few administrations, the development of analytical tools to focus on the end-to-end journey.

The other major change in European transport policies in recent decades has been the emphasis on efficiency, to both improve services and contain demands on public spending. Introducing and reinforcing competition in the supply of transport services, both within modes and between modes, has been an important part of the drive for efficiency. This has sometimes been aligned with the goal of reducing the size of government in relation to private sector activity and more generally been associated with the aim to reintroduce private enterprise to industries nationalized under conditions of financial crisis during or in the aftermath of the last World War. The model for transport services in Europe is increasingly market led and commercially organized, with public services purchased from operators (regardless of ownership) under contracts or concessions that specify the services to be delivered and the compensation to be paid for services required that are not commercially viable. Inter-modal transport policy in European countries is basically market driven. This approach has been characterized as “co-modality” in recent European Commission policy papers, meaning seeking complementarities between the modes or more simply using the best mode for the job. Current European Union policy towards modal shift, driven largely by public and political concern over climate change, is discussed in a later section. National transport policies seek mainly to coordinate intervention, in terms of taxation, regulation, funding and investment, to avoid waste or undermining policy towards one mode as a collateral effect of intervention in another mode.

### 3. Institutional Frameworks

Institutional organization, and the location of decision-making authority for intervention in the transport sector, is fundamental to inter-modal coordination. In Europe and OECD countries, the majority of transport sector policies are the responsibility of a single transport ministry. Ministries of finance usually retain responsibility for most of the taxes on transportation; fuel excise duty, carbon taxes, taxes on vehicle ownership and annual charges for access to the road network. Finance ministries also usually issue guidelines for appraisal of investments and for the design of public private partnerships. Specialist agencies, such as civil aviation authorities, can have extensive powers over a particular mode but fall under the overall responsibility of the transport minister. This overall responsibility for transport policy under a single Minister facilitates inter-modal coordination.

To be clear, some decisions are the sole responsibility of independent agencies such as aviation authorities and rail regulatory agencies etc., where regulators have been established by act of parliament to be independent both of industry and government. In such cases the onus for coordination is on transparency, with decisions and the reasons for decisions taken made public, and on orderly consultation procedures with stakeholders, including the transport ministry. Where procedures for coordination prove ineffective, or policies prove irreconcilable, the remedy is for Ministers to go to parliament with amendments to the mandate for the independent agency. This again is designed to be a transparent procedure that provides as much protection as possible to the interests of regulated parties from arbitrary changes of policy. (ITF 2011a). The very reason for establishing independent regulatory agencies is to insulate private investors in the regulated industry from capricious changes in policy and avoid conflicts of interest when the government is both the regulator and an active participant in the sector with financial resources at stake. Independent regulation is critical, for example, to successfully attracting private risk-investment to railways that are dependent on operating subsidies awarded by the transport ministry for the delivery of non-commercial public services, or are dependent on access to infrastructure owned by the state or another party.

India and China find themselves at the opposite end of the spectrum of institutional organization, with multiple transport sector ministries, some integrated with a state enterprise providing the majority of services in their sub-sector. This arrangement makes distinguishing between the public interest and the narrower interests of the transport operator difficult. Inter-modal policy coordination tends to be the responsibility of no institution under such arrangements.

Russia has undergone an institutional transition over the last two decades that is instructive. Until the 1990s, allocation decisions under central planning provided a degree of inter-modal coordination, albeit poorly aligned with the public interest. Central planning made modal coordination possible despite the organization of the transport sector in a series of mode-specific ministries integrated with their respective transport operating companies. In 1990, with the end of central planning, an integrated transport ministry was established covering all modes except rail, which continued to be run by a monolithic ministry operating train services itself. However, in 1996 responsibilities for aviation and highways reverted to independent ministries leading to overlaps of responsibilities, policy incoherence and most significantly gaps in policy, notably with respect to sustainable development and intermodal containers.

In the following years, over fifty committees were established to facilitate coordination but, with no powers granted to these bodies, their impact was limited. In 2000, the sector was reunited into a new

Ministry of Transport, with the railways brought into the ministry in 2004 when railway operations were corporatized and re-established as a state-owned company. The earlier fragmentation of the sector is, however, still felt as many decisions on fiscal policy, funding and regulation are taken in other ministries or in industry associations. The cultural change involved in transitioning from a fragmented model of modal ministries to an integrated ministry with separate corporatized transport service operators is bound to take time and meet resistance so authority for policy making across the modes has to be identified clearly in government – either in a comprehensive transport ministry or a ministry or inter-ministerial authority for economic reform - if some areas of policy are not to be captured by vested interests.

### **Financial implications of institutional conflicts of interest**

The political economy of organizational change on this scale is documented by Yoshiyuki Kasai, now chairman of the Japanese railway company JR Central, in his book on the financial collapse and privatization of Japan's railways (Kasai 2003). He also details the impact of institutional conflicts of interest on transport operations. One of the key conflicts of interest for governments in relation to railways is concern to limit annual budgetary expenditure whilst demanding public services to be provided at prices below cost. This is a problem that undermines the performance of corporatized state-owned railways and even more so rail systems operated directly by a Ministry. Mr. Kasai states the problem as follows. Setting the price for a company's goods and services is clearly one of the most important decisions that the management has to make. Since its establishment, all of JNR (Japan National Railways, before privatization) fares were regulated by the Fare Act: the ability to raise fares would only be possible if the Fare Law were to be revised. Moreover, it was not just fares: the annual expenditure budget of JNR, including wages and capital expenditure as well as borrowing plans, were subject to approval from the Diet (parliament) as it was all regarded as an integral part of the national budget. .... Unfortunately through the 1950's the government consistently resisted JNR's repeated calls for proper and timely fare increases. The objective was to keep fares as low as possible in order to assist other industries. This eventually led to financial collapse of the railways, with debts exceeding \$56 billion in 1975. From this point successive governments realized that fundamental change was essential but it took until 1987 for the restructuring and privatization of the company to be executed.

Inter-modal policy in Japan was seriously undermined by this inherent conflict of interest, and from a rail company's point of view, Mr. Kasai believes this is still a problem, albeit to a lesser degree. He states, "The profit adjustment framework (cross-subsidies agreed at privatization) ... causes a distortion of the entire Japanese transportation framework". More specifically speaking, as a result of the profit adjustment, passengers on the Tokaido Shinkansen (high speed train) are forced to pay fares at least 20% higher than they should be in order to support the railway system in the rest of Honshu (Japan's main island) .... If Shinkansen fares were reduced by 20% it would not be possible for planes to compete with rail between Tokyo and Osaka.

Rail policy reform in Europe since the 1990s has, with good reason, made its first priority the ending of cross-subsidies and the payment of full compensation for public service obligations, under specific contracts between the government and rail operators. (Directive 91/440/EEC). Cross-subsidies are still an issue – particularly for the railways of Central and Eastern Europe (ECMT 2005) and some railways in Europe have continued to accrue debts. The intent of European law and direction of policy is, however, clear.

### **Integration of Transport and Environment Ministries**

The trend towards integrated transport ministries has extended in many western European countries

to the incorporation of transport with related government departments in super-ministries. Many Latin countries traditionally integrate public works, housing and territorial development with transport but more recently the trend in many countries has been to integrate transport and the environment. The UK was an early example with the establishment of the Department for Transport and the Environment from 1997 to 2001. Some experts report little success in integrating policy between the sectors from this merger (Preston 2012), but it has left a legacy of environmental issues taking a prominent place in transport sector policy making and effective integration of environmental costs into routine economic appraisals of transport sector investments.

Switzerland has had an integrated ministry for many years, the Department for Environment, Transport, Energy and Communications. Environmental protection is clearly a priority for the Department as will be seen later from a discussion of Swiss inter-modal freight transport policy. France created a super-ministry in 2007, the Ministry for Ecology, Sustainable Development, Transport and Housing. This merged the former Ministry of Transport, Public Works, Tourism and Shipping with the Ministry of Ecology and the Department of Energy from the Ministry of Industry. The creation of the Ministry coincided with a major series of political consultations on environment policy at the highest level with a broad range of stakeholders, known as the “Grenelle de l’Environnement” (a name recalling a political process that settled the social unrest of 1968). These consultations resulted in a more prominent profile for environmental protection and especially climate change policy in transport decision making.

## **4. Integrated Planning and Assessment and Institutional Coordination**

### **UK Project Appraisal Guidance**

The transport planning and economic assessment framework has a primary role in inter-modal policy. The practice of integrated assessment is probably most advanced in the United Kingdom and the Department for Transport provides useful tools and transport analysis guidance on the “WebTAG” pages of its website <http://www.dft.gov.uk/webtag/>. Cost benefit assessment for transport projects was developed in its current form in the UK, specifically to examine the merits of the Victoria Line extension to the London underground system in the 1960’s. Simple financial appraisal techniques failed to capture a major part of the benefits that arose from relieving congestion on other underground lines rather than adding to overall ticket sales revenues in the short term. These benefits could only be accounted for by monetizing the time savings for all users arising from improvement to the network.

Major improvements to the appraisal system were made in the 1990s in response to concern that long term impacts on the environment of major transport projects with a structuring effect on land use and economic development were not adequately accounted for in decision making processes (ECMT 2004). One example was public protest over the extension of the M3 motorway between London and Southampton. The new road cut through an attractive recreational area of hills next to the wealthy and touristic city of Winchester, a tunnel to preserve the area being viewed as unaffordable and undermining the economic case. At its terminus in Southampton to road caused severance problems in a relatively low income residential area and was seen as providing transport for the rich at the expense of the poor. Protest over the environmental and equity issues led eventually to a requirement for assessment of all strategic road investment projects to encompass potential alternatives, catering for mobility demand through investments in other modes. The department published Guidance on the Methodology for Multi-Modal Studies (GOMMMS) to be followed in such cases, forming the basis for today’s strategic environmental appraisals. There is little direct evidence of rail or other modes substituting for road investments as a result of the guidance but it has created a strategic approach to planning that assesses investments in the context of broader transport system networks at a regional level and seeks to optimize the use of land for transport infrastructure along trunk corridors.

Shortly thereafter, a 1998 Transport White paper added to the appraisal system as part of a move away from ‘predict and provide’ solutions to transport problems towards a more integrated transport policy, noting that decisions need to be based on a full range of options and a comprehensive analysis of the impacts using a consistent approach (DfT 2005). To this end, the White paper introduced the New Approach to Appraisal (NATA). The main innovation was a requirement to produce an Appraisal Summary Table (AST) to provide decision makers with the key information they need at a glance. The clear intention is not to pre-empt the decision but rather highlight critical information for decision-makers where trade-offs and compromises might have to be made. The AST includes the results of financial appraisal and socio-economic cost-benefit analysis but also lists the impacts of the project in relation to headline government policy agendas – for example, social equity, poverty relief, climate change mitigation, landscape protection, pollutant emissions, etc.. Some of the indicators presented are quantitative others simply descriptive. This approach to presenting key political information alongside the outcome of economic modeling goes some way to counter arguments that cost-benefit analysis tends to be used and manipulated to justify decisions already taken on other

grounds. The current UK government has further improved the AST approach by adding more detailed information on the business case for the project, structured as follows:

- Strategic Does the proposal present a good fit with wider policy objectives?
- Economic Does the proposal present good Value for Money?
- Financial Is the proposal financially affordable?
- Delivery Is the proposal deliverable?
- Commercial Is the proposal commercially viable?

### **Urban Land-Use and Transport Planning**

Institutional and planning frameworks are of critical importance to effective inter-modal coordination of passenger transport in metropolitan areas. For infrastructure planning and traffic management this begins with design for accessibility rather than mobility. Most trips begin and end with a pedestrian leg. Infrastructure has to be designed to provide adequate, safe, protected space for pedestrians. Where trunk road and rail infrastructure severs access, infrastructure design has to incorporate safe protected pedestrian walkways, with minimum detour and avoiding excessive waiting times at traffic lights. The issues are the same for countries at all levels of development but typically pedestrian access has been neglected during periods of rapid growth in motorization (ITF 2012a). The same infrastructure planning considerations apply to cycling, where adequate bicycle parking at rail and metro stations is an additional requirement for effective inter-modal mobility. Japan has a strong record in incorporating cycle parks in rail and urban planning and Europe's leading cycling nation, the Netherlands, is currently investing significantly to improve its inter-modal cycling facilities (Tiwari 2011 and ITF 2012b).

France's "Plans des Deplacements Urbains", introduced in 1982, are a good example of central government intervention to ensure city planners take a multi-modal approach to optimizing mobility options. All cities above a certain population threshold are required to produce mobility plans. Other countries have adopted similar procedures. These plans also alert planners to the transport impacts of planned housing, commercial and other transport intensive land use developments, allowing for better coordinated transport infrastructure investment or relocation of the development to areas better served by existing infrastructure. The Netherlands pioneered this kind of coordinated transport and land-use planning mechanism with its "A B C" zoning system. However, local governments remain vulnerable to large employers and large contributors to local taxes exerting pressure to have zones re-classified as suitable for transport-intensive uses to permit development (ECMT 2001).

Coordination of planning between different levels of government in metropolitan areas is always a challenge. Zurich in Switzerland, for example, witnessed a decade or so of conflict between city and regional plans for land use development and transport in the 1980s and the 1990s (ECMT 2003). The end result is, nevertheless, a good example of inter-modal planning. Their city's 2001 Mobility Plan was based on:

- Inter-modal mobility, with operational transport chains,
- Mobility management and consulting services for sustainable transport,
- Promotion of public transport for all purposes,
- Promotion of walking and cycling,
- Parking management by regulation,
- Combined traffic and land-use planning.

Major investments in public transport have been made, with local and express regional trams and tunneling under the main station to enable through running tram services. However, some major

investments in regional services were delayed to prioritize pedestrian access to local feeder tram services, benefiting a larger number of existing and new users of the overall public transport system. Almost all residents of the city can now reach a tram or bus stop within 300 metres, with 30 minute maximum service intervals and many lines running with daytime intervals of 6 to 8 minutes (ECMT 2003).

China's national government legislated in 1989 for integrated land use and transport infrastructure planning by local governments, aiming to provide a blueprint for sustainable urban transport development (Pan 2011). All major cities are required to develop transport master plans and the Code for Planning and Design of Urban Residential Areas requires basic services and shops to be accessible by non-motorized transport in the main parts of the city and requires public transport to be accessible within reasonable walking distance of all residents. However, the plans have difficulty keeping pace with the rapid expansion of China's cities and investment in bus networks has not been able to respect the provisions for accessibility because of later legislation requiring an increase in cost recovery from bus operations in the face of burgeoning subsidies. The newer peripheral areas of cities tend to be poorly served by public transport, increasing the cost of access to residents to jobs and services in the centre.

This phenomenon is widespread. Mexico City has invested heavily in metro and BRT systems but the poorer populations in peripheral suburbs are dependent on using informal public transport (private mini-buses) that cost far more per ride than the public buses operated under concessions from municipal governments. Often, several rides are required to make the journey to work or link to the public transport system. Low paid workers can find 25% of their income consumed in commuting costs as a result (Cervero 2011). This problem is exacerbated by fragmentation of government jurisdictions and authority. Bus service concessions are awarded by local government and there are no arrangements for integrated planning of routes and timetables between the Mexico City municipality and the numerous municipalities in the suburban parts of the metropolis. There is also no effective coordination between bus concessions and suburban rail services that fall under the responsibility of the federal government. Rail stations are therefore often poorly served by feeder bus services because the bus companies prefer to take passengers on longer trips all the way to the city centre.

Road congestion makes for much longer commutes as a result (Rivera 2011). Coordination problems of this type also affect bus services in advanced cities such as Hong Kong, where concessions are the responsibility of the lowest level of government and highly fragmented.

Successful examples of matching the geographical scope of transport planning authorities to the catchment area for travel in metropolitan areas are, fortunately, numerous and include Barcelona, the STIF in Paris, Transport for London and the Land Transport Authority in Singapore. These all provide for interconnected, inter-modal public transport services, integrated ticketing across the modes and effective long term planning. Japan and Switzerland excel in providing inter-connecting bus feeder services for railways, and local rail feeder services for national rail. The inter-connected Japanese rail and bus service networks serving the metropolitan areas located along the spine of the high speed Shinkansen rail lines, act as the largest seamless public transport system in the world. The regional rail services and onward connecting buses also serve rural Japan with an integrated national timetable, which operated in paper form long before the internet facilitated itinerary planning. Swiss Railways follow a similar philosophy, rejecting investment in a trunk high speed rail corridor across the country in its Rail Plan 2000, in favour of dispersed investment across the network to raise speeds more moderately everywhere and produce a "clock-face timetable" right across the nation, so that rail

inter-connections and onward bus connections are predictably synchronized at regular intervals. This reduces the time taken for multi-leg and inter-modal journeys and increases the reliability and predictability of the system for the user.

### **Integrated Public Transport Ticketing**

Many cities have successfully introduced integrated ticketing for urban public transport services, with single standard rate tickets or smart-cards valid on rail, metro, tram, bus and cable-car systems. All such systems are dependent on a revenue sharing agreement between the transport operating companies providing the services. This usually takes much longer to negotiate than the development of the common technology for ticketing, and frequently requires central government intervention to broker a deal, or make acceptance a condition for the award of public service concessions.

Transport for London's Oyster Card illustrates how integrated, smart ticketing systems can have considerable payoffs to providers as well as to users. Contactless smart-card ticketing has greatly increased gate throughput capacity, reducing strain on metro terminal capacity. Contactless cards have also speeded up boarding on buses, increasing capacity and speed of service. And fare evasion has been reduced substantially. India's new smart card for using transport systems across the country can be expected to have similar benefits on a larger scale, with revenue sharing arrangements equally critical to success. In London, contactless bank cards will soon supersede the Oyster Card. Switching to a bank account based system, from a card that has to be manually charged with credit periodically by passengers, offers several advantages. It enables the processing of information to be moved from the card reader terminals to back-office computers with major cost savings. Bank account based systems offer the possibility of a universal payment system compatible with systems in any city and country, where the bank has agreed to take responsibility for any fraudulent use of cards before the system detects and rejects an invalid card.

## 5. Regulatory Framework and Charges for the Use of Transport Infrastructure

### Road - Rail Freight Competition

Competition between road and rail freight transport operators is conditioned by relative productivity and the regulatory conditions applying to tariffs and access to transport networks. This also applies to intermodal transport on the railways, maritime containers and truck-rail train services. Road productivity has vastly increased with the building of motorway networks and the liberalization of trucking markets. There is no longer any tariff regulation for road freight in OECD markets and access to the market is conditional only on basic requirements of professional competence and solvency. Working and driving time regulations, introduced largely in the interests safety, affect competitiveness with rail as do night time driving bans in some places and restrictions on carrying some kinds of freight at weekends and in holiday periods in some countries. Most OECD countries allow access to foreign licensed companies and vehicles to the domestic trucking market to a certain extent and in the European Union there is a single market in road haulage with quotas on cross-border traffic phased out for all but the newest member countries. Maximum truck weights and dimension are regulated nationally to protect infrastructure assets and for safety. The European Union has agreed standard weights and dimensions for access to roads internationally, with some member states allowing larger vehicles to be operated nationally on the trunk road network.

Maximum weights and dimension limits can have a significant impact on competitiveness between the modes. The European Union is currently in the process of reviewing its international maximum weight limits for reauthorization. The possibility of moving from the current limit of 40 tons to 60 tons which is the national limit in Scandinavian countries and under trial in the Netherlands is under review and been evaluated in terms of productivity and potential modal shift. For the UK, studies foresee all deep sea container movements shifting from rail to road as a result of such a change (Knight 2008). But the UK market is not typical with short average lengths of haul and therefore relatively high costs per ton kilometer. The impact on continental European railways is expected to be a shift of around 4% (TML 2009).

Exceeding maximum limits by overloading also can have major productivity impacts. It is illegal and highly prejudicial to safety. It is a problem in OECD countries, but not to the extremes typical for Indian roads. Considerable resources are devoted to policing compliance with loading limits and efforts are being directed at finding systemic ways to curb the problem at lower cost than inspecting vehicles on the road. This “chain of responsibility” approach has been taken to its most effective level in New South Wales in Australia, where powers to inspect the financial records of shippers and transport companies have been granted to road safety authorities. Where records of sales and haulage contracts don’t match some very large fines have been applied, for example to grain shippers, with strongly deterrent effect (ITF 2011b).

As road freight productivity increases, railways have to respond in terms of both level of service and prices if profitable markets are not to be lost. As the road network becomes more reliable, higher value, non-bulk loads will tend to move to the roads for the flexibility and door-to-door service that roads can provide. Railways can be handicapped in maintaining their competitiveness in a number of ways:

- Rail tariff controls that are prescriptive and revised only occasionally:

- preventing the negotiation of prices; and
- Preventing pricing according to what the market will bear.
- • The use of freight revenues to partially cover passenger transport costs:
  - With cross-subsidies to maintain low passenger fares in the absence of sufficient government compensation for public services provided;
  - By covering common costs so that passenger train service can be priced at marginal cost even when they consume a major share of infrastructure capacity.
- • Labour costs on the railways divorced from industry norms, through wage agreements, early retirement plans, over-manning, demarcation of jobs etc. State-owned monopolies are prone to this kind of cost inflation as they are insulated from direct competition (but not immune to inter-modal competition).

Most railways have suffered from these problems at some point in their development. European freight railways are free of tariff regulation but freight revenues support passenger services in some Central and Eastern European railways, eroding their competitiveness. Cost recovery rates vary greatly across the region's railways.

All European railways suffered inflated labour costs and where liberalization has proceeded slowly continue to do so. Except for the Baltic States, passenger trains take priority over freight movements affecting the average speed and reliability of freight rail.

National governments in Europe have responded to this loss of competitiveness and agreed a common set of regulations in the European Union aiming to:

- Prevent the accumulation of debts through under-compensated public service obligations,
- Transfer historical debts out of the railways,
- Ensure non-commercial operations under public service obligations are fully paid for by government under contract, and
- Create the conditions for the progressive introduction of competition in all rail markets, beginning with freight.

For both the improvement of finances and the creation of conditions for competition the regulations (Directive 91/440/EEC and subsequent "packages" of regulations, currently being consolidated in a "recast" 2010/0253(COD) being considered by the European Parliament) require separation of rail accounts between passenger operations, freight operations and infrastructure management. They require separate management of infrastructure and train operations and since last year require an independent regulator, separate also from the transport ministry, to enforce the regulations and ensure fair access to the rail network for new entrant train operators.

### **Swiss Inter-Modal Freight Transport Policy**

Switzerland has developed a very complete set of policies to manage road and rail freight transport, spurred by concern to protect its Alpine valleys from excessive road transport and more particularly objection to road noise by local residents. Expansion of the motorway system and the building of motorway tunnels crossing the Alps in the 1960's and 70's made Switzerland a key link for international road haulage between Italy and the rest of the European Community. A night-time and Sunday driving ban was imposed to limit noise nuisance and Switzerland restricted the size of trucks allowed on the roads to 28 tons maximum loaded weight, far below the standard 40 tons in the European Union. Neighbouring countries complained of detour traffic on their roads and harmonization of weight limits became one of the issues for negotiation of a trade treaty between

Switzerland and the EU, finally agreed in 2001. A change in weight limits to 40 tons was agreed and put to national referendum on a package of measures centred on building two new base tunnels through the Alps to carry rail freight transiting the country. The tunnels provide for increased rail productivity by increasing capacity, reducing gradients and radically shortening transit time. The weight limit change for trucks also made a radical improvement to the productivity of road freight. To limit growth in the number of trucks crossing the Alps an electronic kilometer charge (the Heavy Vehicle Fee) for all trucks using Swiss roads was introduced (in 2001) as the key element of the package. The charge was originally calculated on the basis of the external environmental costs of trucks traffic and differentiated by vehicle emissions class. However, the full charge was phased in only gradually, over several years under conditions agreed in the EU trade treaty. Two thirds of the revenues from the road charge are used to finance building of the rail tunnels and other rail investments, one third goes to local government budgets. The other rail sector investments include rail and intermodal terminals in Switzerland and in Germany and Italy to improve rail freight and road-rail services through Switzerland.

Access to intermodal freight terminals, in terms of timing of access as well as capacity, can be critical to the competitiveness of freight businesses. The inclination of a terminal operator is naturally to deny access to competitors. Intervention to impose access may remove incentives to invest, a problem widely acknowledged in the literature (ITF 2010). The most effective role for government in these circumstances is to broker voluntary agreements among the potential users of the facility to manage access cooperatively. Or, as in the Swiss case, to provide funding to improve facilities, even outside its borders.

Switzerland's policy has had a marked impact on the share of road and rail freight crossing the Alps as the accompanying graph shows; modal shares are reversed between the Swiss alpine crossings on the one hand and French and Austrian Alpine crossings on the other hand.

The opening of the first base tunnel last year, however, has not so far had an impact on modal split. This may be for a number of reasons. First the night and Sunday driving bans are an important factor in determining modal choice. Also the size of chemical tankers and are restricted on the roads, making rail the dominant carrier for hazardous goods. The first, Lötschberg tunnel is on a secondary route. Opening of the Gotthard tunnel may have more of an impact. Two base tunnels probably represents an over-investment but was politically desirable to balance expenditure between the regions. It should also be noted that the track access charges levied on trains for using the tunnels have been set at a level that is below marginal costs, so the value of the rail investment remains to be proved - until and unless rail demand becomes sufficient to support higher charges. While Swiss inter-modal policy is the most comprehensive and effective anywhere, its economic efficiency is not entirely proven.

The impact of the Heavy Vehicle Fee on road haulage has been significant. At its introduction in 2001 it represented a 20% increase in charges levied on trucks per vehicle kilometer driven. Coupled with a change in productivity of 18% as a result of the first stage of the weight limit increase the overall effect was that vehicle kilometers driven were 12% lower than they otherwise would have been, according to projections from the Swiss Ministry (DETEC). Perhaps the biggest impact was to provoke a radical restructuring of the Swiss trucking market, with mergers and absorptions of small companies by larger logistics organizations able to better manage operations, consolidate loads and reduce empty running. Germany introduced its own electronic truck kilometer charge in 2005, albeit at a much lower level than Switzerland (see figure) and this resulted in an estimated 13% reduction in empty runs.

**European Union Policy**

Most of the Central European countries have now followed the Swiss and German lead and introduced electronic truck kilometer charges and France follows suit this year with a charge on sections of its motorways that are not already subject to a conventional toll. Central countries with large transit traffic flows are motivated to charge for road use by the kilometer to ensure an adequate contribution to road investment costs from foreign registered trucks. France was spurred to introduce an electronic kilometer charge, despite already using conventional tolls on most of its motorways, largely because of detour traffic on motorways running parallel to the German border, large sections of which were un-tolled as they serve as bypasses around towns including Strasbourg. Most urban stretches of motorway in France are un-tolled to avoid transferring traffic to secondary roads and the electronic charge is also designed to cover the environmental costs of using trucks in all urban areas. All of the European truck charges are differentiated by environmental emissions class of the vehicle but the primary rationale for the charges (outside Switzerland and France) is to recover infrastructure costs in a way that covers transit traffic as well as domestic road users (see table).

Charging System	Vehicles charged	Principal objective	Secondary objective
Swiss HVF	Trucks	Manage truck numbers Environment	Revenue Rail investment
German Maut	Trucks	Revenue Transit contribution	Environment (Euro#) Road wear (axles)
Austrian Maut	Trucks	Revenue Transit contribution	Environment Road wear
Czech toll	Trucks	Revenue Transit contribution	Environment Road wear
Slovak toll	Trucks	Revenue Transit contribution	Environment Road wear
France eco-tax	Trucks	Diverted traffic on German border	Environment Rail investment

The European Union regulates these charges<sup>29</sup>, setting a maximum limit designed to prevent over-charging transit traffic to the detriment of trade and the interests of peripheral countries. The technical and political difficulties of determining the economically efficient level for charges – for example, on the basis of marginal social costs of road use based on road wear and external environmental and congestion costs – means that the maximum charge allowed is calculated according to historic expenditure on the roads nationally. The regulation was modified in 2006 and again in 2011 to allow some differentiation in relation to environmentally sensitive areas and congestion. However, considerably more latitude may be needed in the freedom to differentiate charges if they are to be effective in managing congestion. At the same time, trucks are the primary cause of congestion on only a few roads, serving ports etc., in Europe, where passenger cars are generally much more numerous.

The European Commission has set out its inter-modal policy in a series of white papers. Policy has changed in nuance from white paper to white paper. The 1995 White Paper Towards Fair and Efficient Pricing in Transport and 1998 White Paper Fair Payment for Infrastructure Use, laid the emphasis on establishing the right pricing framework conditions for achieving a sustainable modal split. This involved setting prices for using transport infrastructure in each mode on the basis of the

<sup>29</sup> Directive 2011/76/EU of the European Parliament and of the Council of 27 September 2011 amending Directive 1999/62/EC on the charging of heavy goods vehicles for the use of certain infrastructures.

short run marginal costs of using the infrastructure, including external environmental and congestion costs. The 2001 White Paper European transport policy for 2010: Time to Decide set a more aggressive tone, saying ‘Unless competition between modes is better regulated, it is Utopian to believe we can avoid even greater imbalances, with the risk of road haulage enjoying a virtual monopoly for goods transport in the enlarged European Union. The growth in road and air traffic must therefore be brought under control, and rail and other environmentally friendly modes given the means to become competitive alternatives’. Modal shift was highlighted as a policy objective in itself along with decoupling transport growth from economic growth, nevertheless, the measures to achieve this remained focused on ensuring a fair and efficient pricing and regulatory framework – with a new emphasis on harmonized working conditions in the haulage sector – and the liberalization of railways to improve their competitiveness.

A mid-term review of progress in implementing the 2001 white paper’s policies was published in 2006, with a marked change in emphasis towards modal shift. Although the Commission maintained that this remains a priority, the focus changed towards ‘co-modality’ - or the optimized use of all modes of transport – rather than ‘inter-modality’ (moving traffic off the roads and onto rail and water for all or part of the journey). The review emphasized promoting co-modality via the harmonization of standards and the integration of the various transport modes into efficient logistics chains.

The latest, 2011 White Paper marks something of a switch back to modal shift rather than co-modality. The 2011 Roadmap to a Single European Transport Area (COM/2011/0144) places great emphasis on environmental protection and sets out the following key goals for 2050:

- No more use of conventionally-fuelled cars in cities.
- 40% use of sustainable, low carbon fuels in aviation
- At least a 40% cut in CO<sub>2</sub> emissions from shipping.
- A 50% shift of medium distance intercity passenger and freight journeys from road to rail and waterborne transport.
- All of which will contribute to a 60% cut in transport emissions by the middle of the century.

These goals are highly ambitious but can best be described as aspirational. Intermediate, operational goals based on measures evaluated in terms of costs and effectiveness have yet to be established and are not discussed in any detail in the white paper.

The International Transport Forum’s Transport Outlook (ITF 2012c) acknowledges the difficulties of meeting climate change policy goals of the kind set out in the White Paper, as the following extract describes. Maintaining mobility levels (more or less) but producing them in a considerably less car-reliant manner and with predominantly low carbon technologies is a massive challenge. It means entering uncharted territory in the sense of the structure of the production of mobility and in the sense of switching to a different energy basis for the system at large. ... The mobility aspirations of individuals and households are not broadly aligned with the requirements of the vision. Broadly, car ownership and use remains a household priority when it becomes affordable. Pricing policies have real but somewhat limited potential. Transport demand declines when prices rise, but the response is relatively small and is likely to become smaller as incomes grow. This adds to the appeal of taxes on light-duty vehicles for raising public revenue but reduces the effectiveness of charges for steering behaviour. The point is not that taxes have no effect on mobility choices (they do) but that obtaining large change through this channel will require drastic policies. There most definitely is scope for steering mobility choices through prices and taxes, especially to increase energy efficiency and to reduce congestion. These changes are in many cases desirable but it is not likely that they will lead to

structural change in broad mobility patterns or to considerably slower growth in mobility volumes. Even the traditional policy model of public support for mass transit and rail systems has had only limited success in curbing the demand for car-based mobility. Pushing this approach further will require accompanying policies'. Such policies include strong land-use planning controls and measures to limit car use in cities, probably as comprehensive as the measures developed in Singapore and including limiting the number of cars in circulation.

## 6. Conclusions

Efficient coordination of transport, to ensure the right mode is used for the right task, depends on establishing an integrated transport policy. John Preston in a companion paper (Preston 2012) sets out a hierarchy of key areas for integration as follows:

1. Integration of public transport information.
2. Physical integration of public transport services.
3. Integration of public transport fares and ticketing.
4. Integration of infrastructure provision, management and pricing for public and private transport.
5. Integration of passenger and freight transport.
6. Integration of (transport) authorities.
7. Integration between transport measures and land use planning policies.
8. Integration between general transport policies and the transport policies of the education, healthcare and social services sectors.
9. Integration between transport policies and policies for the environment and for socio-economic development.

Whilst all of these aspects are important, this paper has focused on the three central issues: management and pricing of transport infrastructure; integration of transport authorities; and integration between transport measures and land use planning policies. In Europe and a fortiori in rapidly developing countries intervention to ensure adequate coordination has to be carefully crafted as transport markets are de-regulated, opened to competition and opened to private investment. Competition and private investment can make coordination more difficult, but where current policies do not deliver favourable outcomes this is no reason for delaying reforms essential to ensuring that transport system facilitates economic growth rather than constraining it.