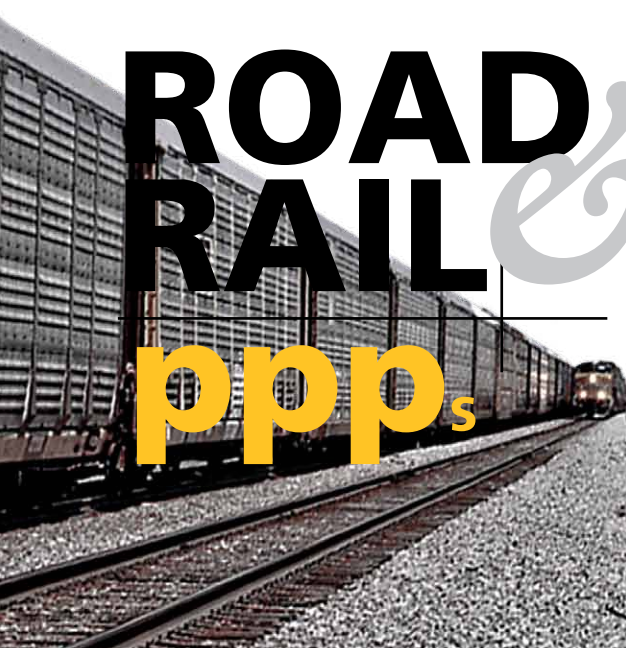


handshake

IFC's quarterly journal on public-private partnerships

- In this issue :
- ROAD:** Brazil's competitive drive
 - RAIL:** Speeding toward tomorrow
 - LOGISTICS:** MIT expert on why logistics clusters matter
 - INTERVIEW:** UPS's sustainable strategies



**ROAD
RAIL** *&*
ppps



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Letter from IFC

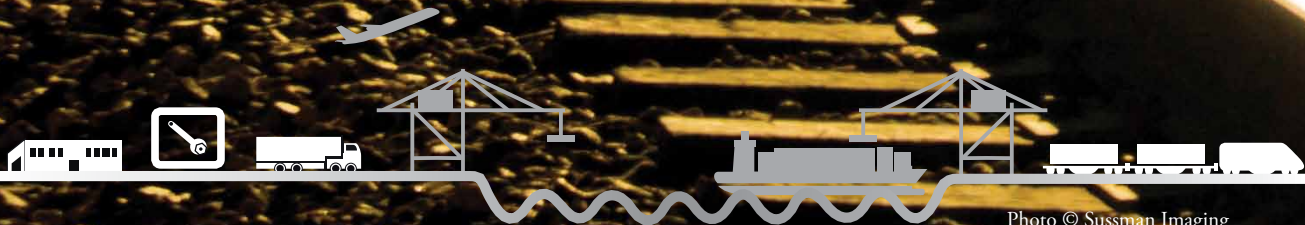
Growth and development are primarily a matter of mobility: mobility of people who can access employment, education and health, and mobility of goods that ensure global economic activity. In our globalized economy, infrastructure and transport services underpin trade, link production centers to consumption areas, and integrate territories beyond administrative boundaries. Road and rail infrastructure and transport services, physically connecting all of these elements, offer everyone the opportunity to contribute to value creation—as well as to enjoy its benefits. “Mobility matters,” as Marc H. Juhel writes in his introduction, because “roads and railways keep development on track.”

That’s why this issue of *Handshake* turns to public-private partnerships (PPPs) in the road and rail sectors. Authors and interviewees explain how PPP approaches have changed the direction of their countries’ highway systems and the future of freight rail. Looking forward, the Director of MIT’s Center for Transportation and Logistics makes the case that logistics clusters are permanently transforming the economy, thanks in part to the roads and railways feeding into those hubs. Ultimately, however, mobility makes possible more than a strong economy—it promotes social and political integration. As Ethiopia’s former minister of transport once told Juhel, “Without roads, there is no democracy.”

Laurence Carter, Director

Tanya Scobie Oliveira, Editor

IFC Advisory Services in Public-Private Partnerships



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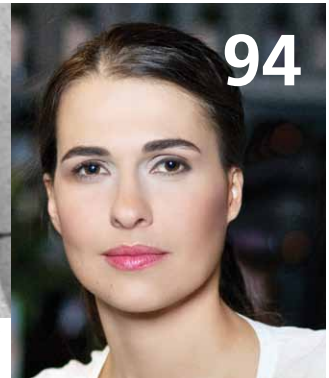
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Mobility matters

Whenever possible, well-functioning corridors should promote multi-modal transport, with road and rail as the core components.

In the developed world, where time and cost drive decisions, multiple transport infrastructures exist to guarantee mobility of people and freight. But in the developing world, where infrastructure is often still incomplete and inadequate, the first order of business is to ensure access of goods, services, and people to external markets. Transport corridors facilitate this access. Whenever possible, well-functioning corridors should promote multi-modal transport, with road and rail as the core components. Investment in high-performing transport infrastructure and logistics optimizes cost and increases the reliability of transport services that are critical for growth and development.

As roads and railways connect, they create opportunity. They link agricultural areas to national or regional markets, unlocking their productive capac-



ROADS & RAILWAYS KEEP DEVELOPMENT ON TRACK

By Marc H. Juhel

ity. By bridging distances between cities and villages, roads and railways fertilize economic and social ground within countries and across borders. Such growth brings countries closer toward regional integration and the promise of improved livelihoods.

Many years ago, Ethiopia's then-Minister of Transport explained to me the place of transport links in the regional psyche. "With so many different ethnic groups scattered across such a large territory," he asked, "how to make it possible for everybody to feel part of the same nation without a comprehensive road network linking them all together?" He answered his own question. "Without roads, there is no democracy," he declared. He understood first-hand that the transport sector promotes social, economic, and political integration.

"Without roads,
there is no democracy."

THE DEVELOPMENT AGENDA

Designing transport projects to maximize their development impact requires a focus beyond the origin and destination points. Let's look at roads. A road segment is part of a network, and

any addition to that network must consider its consequences on the distribution of traffic across the whole spectrum of connections. Then—and this is critical in situations where transport infrastructure is still scarce—an assessment must be made of the services the new road will provide the population. Important questions include: How many people will get access, or better access, to social services like education and health? How much easier will it become for farmers to get their production to markets, and therefore move from subsistence farming to commercial exploitation? How many new job opportunities will become accessible for people living away from economic centers?

At this point, it becomes clear that building a transport infrastructure is just one element of the development agenda. Another element involves how people will be able to use it. For example, what kind of transport services will actually become available to them, and under which conditions? Building a new road in a country where freight services are operated by a monopoly, for instance, may just extend the rent of the monopolist while offering little benefits to producers, unless the road project ushers in industry reform and introduces competition in transport services. These are useful means to an end.

Similarly, rail lines are not developed in isolation. By design, a railway will link economic and social areas where traffic, people, and freight can be consolidated in significant volumes.


Roads and railways that link agricultural areas to national or regional markets unlock a region's production capacity, bringing cities and villages closer together. As roads and railways cross borders, they promise integration that aims to improve the living conditions of the poorest.

Any door-to-door connection within its area of influence, therefore, will almost always involve a combined rail-road transport service. Under-scored again is the need to factor in the network effect, across the whole transport system, of any individual addition.

Even in cases when new rail links are primarily driven by industrial developments—mining projects, for instance—they can potentially contribute to social inclusion objectives if all potential network effects are carefully assessed beforehand. Often enough, well designed and compensated public service obligations may offer remote communities enhanced access to economic opportunities and maximize the beneficial fallout of the new rail infrastructure.

CONSIDER CONCESSIONS

For both road and rail development projects, concessions offer access to additional financing options and a wider range of exploitation techniques. When carefully designed to take advantage of network effects and mesh with the non-concessioned transport system, they can provide a new development impetus by helping close the mobility and access gap that often keeps large segments of the population trapped, literally, in poverty. In these times of shrinking fiscal space, there is no doubt that transport concessions, road and rail in particular, are a powerful tool to keep economic development on track and power inclusive growth. ⊗



By John Kjorstad

To get to *the other side*

Not unlike the philosophical musings that ponder the origin of the chicken and the egg, a similar causality puzzle has long perplexed city planners and proponents of road and rail infrastructure—if you build it, will they come?

Planners need to know that when they build a new road or rail connection, people will use it, justifying the cost of such expensive infrastructure. Cities with strong regional and international transportation links are more likely to have robust economies, but what drives their economic growth: the resourcefulness of a community, or its ability to efficiently connect and interact with a wider group?

Trade is at the heart of economic activity, and infrastructure is at the heart of global trade. However, the full relationship between investments in transportation infrastructure and near- and long-term economic growth is difficult if not impossible to predict. Investment decisions for major projects require expert advice, careful analysis, and ultimately an informed leap of faith.

Dollar for dollar, passenger and toll revenues alone do not always justify the upfront capital and ongoing maintenance resource required for a new road or railway connection. One has to

isolate and consider the wider impact completed projects are likely to have on the gross domestic product of connected regions. In some cases, this requires international cooperation.

The Oresund Regional Development between Copenhagen, Denmark, and Malmö, Sweden is a positive example of what local authorities can achieve working successfully across borders. Transportation is at the core of the Oresund Committee's agenda, which aims to bolster the region's cross-border economy. Its crowning achievement, the Oresund Bridge, opened in July 2000 providing a permanent road and rail link between the two cities and countries. Within ten years, the link has dynamically changed how people commute and work in the area. The increased activity and openness between countries already has regional planners considering further transportation projects as they aim to redress the balance between passenger and freight traffic as well as alleviate growing capacity concerns on the crossing.

CONNECTIVITY AND PROSPERITY

Transportation can define a society, and history has given us some very clear examples of how trade corridors develop and civilizations prosper.

Photo © inhaus creative

Three thousand years ago, the Nile River in North Africa provided ancient Egyptians with a cultural foundation that prompted trade up and down the river; years later, the Silk Road—an organic network of interlinking trade routes—established early ties among Europe, the Middle East, India, and China, facilitating the exchange of goods and ideas. More recently, extensive rail and road networks in Europe and the Interstate Highway System in the United States have supported globalization and nurtured strong economic growth on both sides of the north Atlantic over the past 60 years.

Connectivity and prosperity are intertwined, and the rest of the world is catching up fast. In the past decade, China has made extensive investments in its own impressive transport infrastructure, as well as strategic assets abroad. The other four BRICS (Brazil, Russia, India, and South Africa) are rapidly building transportation assets as well. Some employ public-private partnerships (PPPs) to attract private capital. For example, Brazil financed the western section of Rodoanel Oeste toll road in São Paulo through a PPP in 2009; Russia is currently using a PPP structure to finance its Western High-Speed Diameter project in Saint Petersburg; Indonesia's Jasamarga Bali Toll Road closed in June; and South Africa financed its flagship Gautrain Rapid Rail Link through a PPP in 2007.

THE NEXT PANAMA CANAL?

In other emerging markets, ambitious projects are being drawn up to overcome difficult

natural barriers and provide easier access to routes that have challenged mankind for centuries. In Nepal, feasibility studies have been completed for the \$9.8 billion Mechi-Mahakali and Pokhara-Kathmandu Electrical Railway—a 1,218 km planned network crossing through difficult mountainous terrain and over deep river gorges in the heart of the Himalayas. In South America, the equally ambitious \$3.3 billion Bioceánico Aconcagua Corridor between Argentina and Chile aims to link the Atlantic and Pacific oceans with a 52 km low-base tunnel through the Andes. This would create a historic new trade connection that would not only service Brazilian, Argentinean, and Chilean markets but potentially rival the Panama Canal for international cargo passing through the southern hemisphere.

These projects present unique and difficult engineering challenges as well as high price tags that question their feasibility. If built, will trade follow? Will regional economies grow, delivering additional value-for-money to private investors, users, and public stakeholders?

Some projects will always perform better than others. The physical and cultural environment in which they are constructed creates a complex fabric of unique circumstances dictating outcomes. Predicting these outcomes is perhaps the most difficult job in developing transportation projects. After all, understanding a chicken's motives for crossing a road is not nearly as important as knowing how many chickens are waiting to cross, and how much they're willing to pay for the privilege. 🚗





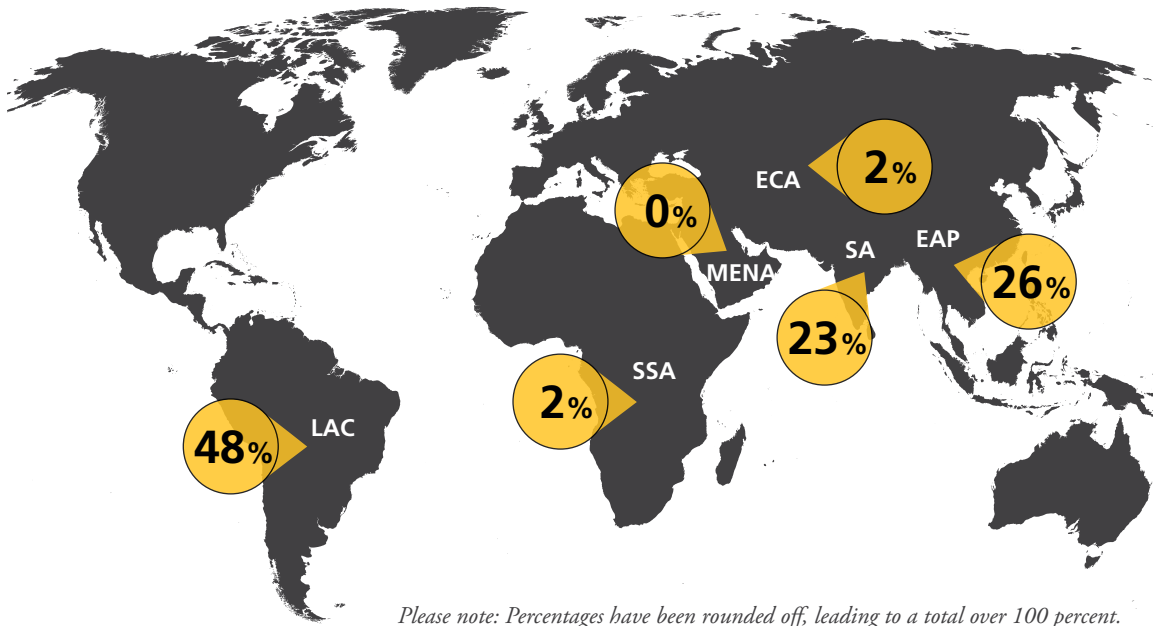
PAVING THE WAY FORWARD

Private investment in roads

Imagine traveling along the Pan-American Highway (47,958 km), Australia's A1 Ring Highway (14,500 km), and the Trans-Siberian Highway (over 11,000 km), and spending \$2.5 million every kilometer. This dizzying figure is precisely what private sector activity has accomplished in the last two decades. Since 1990, by our count, the private sector has been involved in 731 road public-private partnerships (PPPs)—building, rehabilitating, and managing 78,150 km and investing over \$193 billion in developing countries.

By Andreea Militaru & Robbert van Eerd

Investment share in road PPPs by region (1990-2011)



INVESTMENT BY REGION

Between 1990 and 2011, Latin America and the Caribbean (LAC) attracted the largest share of all private investment in roads in the developing world, totaling \$92.5 billion—only \$6 billion less than all private investment in all other regions combined.

CONTRACT TYPES

The most common contract types during the same period were brownfield concessions, greenfield projects, and a (very) few management contracts or divestitures. More recently, we see trends toward more greenfield projects. In the early 2000s, for example, there were about as many brownfields as greenfield projects, while in the last five years, about three-quarters of the projects have been brownfield concessions versus one in five projects being a greenfield.

REVENUE SOURCES

For the 276 road projects for which revenue source information was available, over two-thirds (64 percent) were funded via user fees. Twenty-three percent were funded via a combination of user fees and government payments, while only 10 percent were funded exclusively by fixed payments from the government.

MAJOR TRENDS IN ROAD PPPs

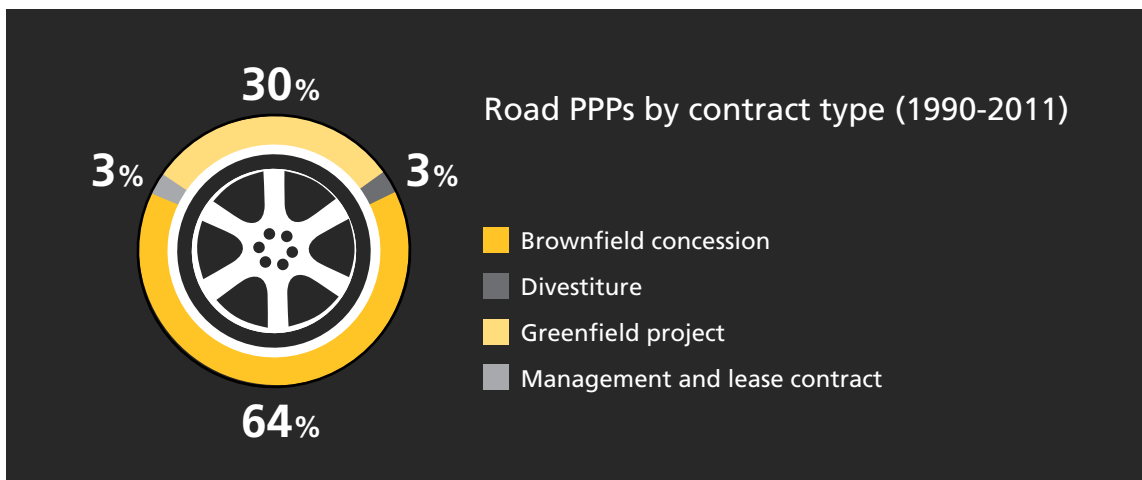
There are three distinct periods in the global road PPP market, distinguished by shifts in regional predominance: the 1990s, 2000-2005, and 2006-2011.

In the 1990s, East Asia and Pacific (EAP) had the largest number of road PPPs (135), closely followed by LAC (127). South Asia ranked a distant third (28), and Sub-Saharan Africa (SSA) came in after that (eight). Although more road projects closed in EAP, the projects were smaller,

both in length (km) and investment (dollar amount). In LAC, 27,064 km of roads were built, rehabilitated, or managed, while EAP only covered 5,769 km. LAC attracted 42 percent more private investment: \$41 billion compared to \$28.7 billion in EAP. The largest road PPP projects in the developing world closed in LAC: Argentina (Intercity Roads corridors 1-9, 11, 17, 18), Chile (Santiago-Colina-Los Andes Toll Road), and Brazil (Ecosul)—all highway concessions of more than 500 km. In the same period, only one large project closed outside of LAC: a 545 km highway divestiture in Jiangsu Province, China in 1997.

The first five years of the 2000s signaled two important changes: activity in EAP slowed down significantly and LAC activity picked up, with 50 percent more projects over the five year period than the entire previous decade.

Most significantly, South Asia showed a steep increase in investment in PPP activity. Forty-



two projects closed, implying, on average, a two-fold increase in the number of projects per year. Private sponsors invested a total of \$2.8 billion, meaning that, on average, the annual investment equaled the combined total investment of the previous decade in South Asia.

The increase in PPP activity in South Asia was driven by India. At the time, India had a “very large network of low-standard roads,” which were “mostly two lane, with high traffic, low service, and slow speeds,” according to a 2004 World Bank report. This led to a focus on high-way brownfield concessions, which represented 76 percent of all road PPPs closed in India.

Sub-Saharan Africa also saw an increase in the number of projects. On average, twice as many projects closed each year compared to the previous period, while investment levels remained steady.

South Asia and Latin America, specifically India and Brazil, will continue to be the center of road PPP activity in the developing world.

In 2005-2011, South Asia continued to rise to the top position with an impressive 189 road projects closed, while LAC ranked second with 88 projects (almost a twofold increase from the previous period). They were followed by EAP with 27 new projects. During this period, India

adopted the National Highway Development Program, which helped spur PPP activity in the road sector. While 100 more projects closed in South Asia as compared to LAC, investment levels in both regions were fairly similar—\$40.5 billion for South Asia and \$39.2 billion for LAC. This confirms an earlier trend, where road PPPs in LAC generally involved a larger capacity and more investment. On average, road projects with private participation in LAC had a capacity of 288.4 km, while the capacity per project in South Asia was three times lower, or approximately 87 km. Road activity in SSA, however, saw a steep decrease: only three projects closed compared to eight in the previous period.

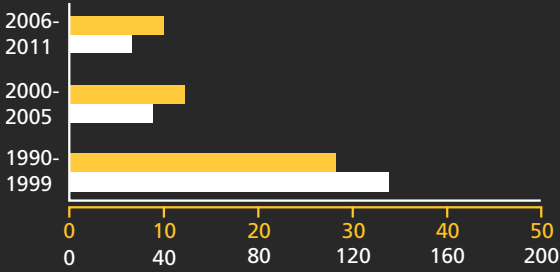
So where are road PPPs not happening? The answer is in the Middle East and North Africa (MENA) and in Europe and Central Asia (ECA) regions. Only two road PPP projects closed in ECA since 1990, involving just \$2.6 billion in investment, while there have been no road PPPs in MENA since 1990.

GOING FORWARD

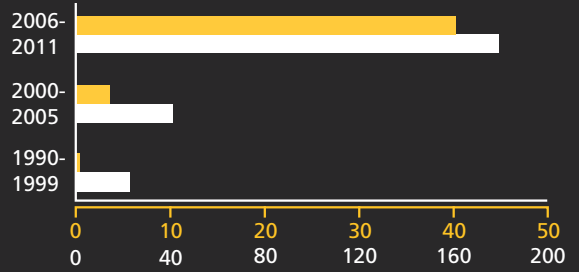
South Asia and Latin America, specifically India and Brazil, will continue to be the center of road PPP activity in the developing world. The government of India intends to increase PPP activity on a state level and Brazil recently announced an ambitious program to modernize and expand the country’s road infrastructure. The national Programa de Investimentos em Logística will involve the reconstruction of 7,500 km of highways. Given the constrained global financial market, the emergence of other road PPP hot spots is difficult to predict. 🚗

ROAD PPPs BY REGION

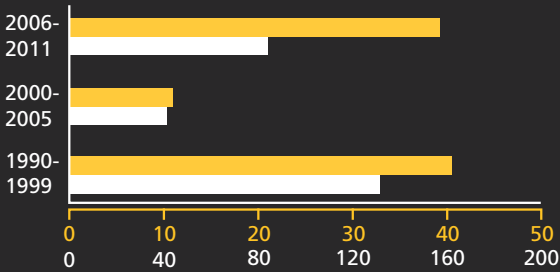
East Asia & the Pacific



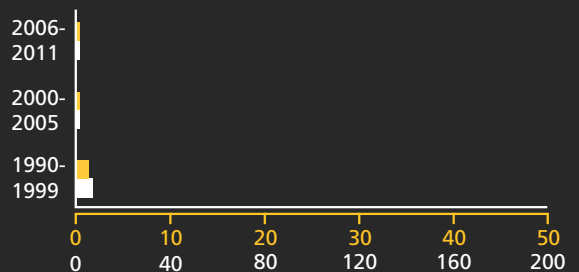
South Asia



Latin America & the Caribbean



Sub-Saharan Africa



Europe & Central Asia



■ 2011 US\$ billions
■ Number of road PPPs

Source: World Bank and PPIAF, PPI Project Database

ROAD



What's riding on

**PERFORMANCE-BASED
CONTRACTS**

By Ben Gericke



Photo © Christopher Walker

Roads are a significant asset to any country—both in terms of the physical investment and the social and economic benefits. Starting in the 1980s, the World Bank's Transport Sector supported several major road reforms, including the introduction and expansion of contracting methodologies, initially on an output basis and increasingly on an outcome or performance basis, to execute rehabilitation and improvement activities. These innovations continue to evolve, based on lessons learned. Efficiency in the provision of road infrastructure continues to improve.

Sustainability remains a major obstacle in the proper management of road networks because most road agencies lack capacity and systems to collect road condition data that would help develop prioritized maintenance, budgets, and work plans. In response to clients' needs, the World Bank in the 1980s developed and supported the first performance-based contracts, notably Argentina's widely known CREMA (Performance-based Road Rehabilitation and Maintenance) contracts. These contracts were longer term than traditional works contracts and included both rehabilitation and improvement, along with several years of maintenance.

Following the successes achieved with the first performance-based contracts, the World Bank developed its first sample bid document for Performance-Based Management and Maintenance of Roads in 2002. These contracts focused mostly on routine and periodic maintenance tasks. In 2006, the performance-based contract evolved further with the Output- and Performance-Based Road Contract sample bid document. This document allowed for the inclusion of rehabilitation and improvement tasks as performance-based activities. The sample

bid document can be used for a wide range of performance-based contract applications, from where the initial rehabilitation or improvement is paid fully per a standard bill of quantities to where tasks are paid on the basis of performance, usually in combination with the performance-based maintenance services. This bid document became the standard document used in World Bank projects with performance-based contract activities.

RESULTS-FOCUSED CONTRACTING

These innovations in contracting methodology resulted in a reallocation of construction risks—and with it, major changes in road asset management. While there were several performance-based contract initiatives that were not carried through to contract award, many resulted in major efficiency improvements, both in terms of road condition and contract cost.

Based on these lessons learned, the World Bank developed the performance-based contracting methodology further. In this iteration, it closely follows the Design-Build-Operate-Maintain-

Transfer methodology, where the contractor designs and completes the required rehabilitation and/or improvements to deliver a certain level of service and thereafter operates and maintains the road for several years (as with the \$166 million contract on a 180 km section of the paved road between Monrovia and Ganta). The performance-based methodology can be applied to paved and unpaved roads, as well as to single road links and road networks.

FINDINGS AND LESSONS

A World Bank-commissioned report noted that the innovations in contracting methodology moved the institution's support closer to comprehensive asset management, where the focus is on the desired benefits over the life of the project. The process of preparing and implementing performance-based contracts forces those responsible for the funding, governance, and management of the road asset to answer critical questions such as:

- What road assets do I own and which of these do I wish to be managed under this contract?
- What is the level of service that we want to provide to the road user?
- What condition are my road assets in?
- What is the forward works program required to deliver the least whole-of-life-cost solution?
- What risks exist in the delivery of the levels of service, and how are those risks best managed?

Overall, the study confirmed that performance-based contracts tend to:

- Provide a better focus by the road agency on governance as a result of the separation from the day-to-day operational activities;
- Deliver a more consistent (and/or better) service level across the network;
- Reduce costs and/or set costs at a fixed level to enable for long term fiscal planning by the road agency;
- Better allocate risk;
- Improve workmanship; and
- Address internal labor shortages where the authority may not have the internal resources/capacity to manage a network according to the traditional model.

While many of these desired outcomes might be achieved via alternative contracting means, the performance-based contract specifically requires that all of these concerns be addressed together. Indeed, this is often perceived as the key benefit of the contract model: it forces a paradigm shift and consideration of all the principles of good asset management.

MOVING FORWARD

Successful implementation of performance-based projects requires strong commitment from government officials. This commitment should translate into a proper contracting environment—specifically, multi-year financing commitments and a well-informed contracting community, with good internal understand-

ing of the contracting methodology. This results in a better procurement process and eventual contract management. Governments should undertake a comprehensive study of the affected road asset and its current condition, the required future levels of service, and an identification and eventual allocation of all project-related risks. Recommendations from this study should then be used to define the performance-based requirements included in the bidding document.

For governments implementing a pilot program, it is essential to understand the value of their road assets and then to plan how this value could be preserved or increased over time. This asset management plan should recommend the amount of works and resulting funding required to provide and maintain the road network at a certain service standard. Such plans would then be used as a basis to decide to what extent and where performance-based contracting could be introduced and expanded. The desired result of a well-constructed contract—sustainability of the road infrastructure—can bring social and economic benefits for generations to come. 🚗




The key benefit of the contract model: it forces a paradigm shift and consideration of all the principles of good asset management.



EVERYONE'S BUSINESS

New partnerships for road safety



During the last decade, road safety has become an international public health crisis in low and middle-income countries with rapidly increasing motorization rates and changing socioeconomic patterns. But these countries are solving the problem with new partnerships that strengthen their public health systems as well as their economic development objectives.

Thanks to steadily growing annual incomes, the pace of vehicle ownership has increased in 70 countries, home to around 4 billion people. But more cars on the road translates into more injuries on the road. Within these middle-income countries, even a stabilization or limited drop in the frequency of road traffic injuries (RTIs) will be insufficient to compensate for the massive growth of their vehicle fleet.

There is a compelling case for the private sector to work alongside governments and civil society

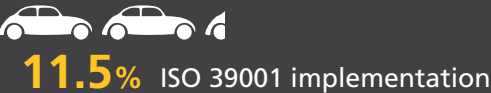
to reduce the burden of RTIs, which are estimated to cost low and middle-income countries (LMICs) 1 to 3 percent of gross domestic product. This role was defined in a recent UN General Assembly resolution declaring 2011-2020 the Decade of Action for Road Safety.

Harnessing the private sector's unique ability to influence driver behavior is not a new idea. In countries with stable vehicle ownership rates, insurance companies and concession operators have long been in the vanguard delivering

By Tawia Addo-Ashong & Brendan Halleman

education, research, incentives, and infrastructure, as RTIs directly affect their bottom line. More recently, concession contracts have begun including explicit incentives tied to the achievement of pre-agreed road safety outcomes.

Most Effective Action to Stabilize and Reduce Global Road Deaths by 2020



ROADMAP TO RELIEF

Work-related trips—a category which includes professional drivers and salespeople but excludes commuting—account for upwards of 32 percent of vehicles in use across LMICs, representing a significant business and image risk. So corporations are modeling innovative ways to work with the public sector in the delivery of targeted road safety programs and international road traffic safety management standards. In LMICs, where comprehensive road safety legislation is often lacking, such programs can help spread good practices on the ground and ultimately encourage the adoption of stricter traffic safety laws.


Businesses also bring new resources, professional expertise, rigorous operating practices, and a culture of planning, innovation, and accountability, which complete the skill set sometimes lacking in governmental road safety agencies. The private sector often delivers leadership and name recognition to elevate RTI prevention campaigns as well. This leverages additional public resources and garners the attention of national policymakers. More resources and attention will ultimately guarantee that growth in the vehicle fleet tracks alongside awareness of how to manage that growth. 🚗

Read more here about the World Bank's support for the Decade of Action for Road Safety.

PARTNERSHIPS MAKE A DIFFERENCE

Responding to Africa's road safety crisis, TOTAL, a market leader of petroleum products distribution, and the World Bank joined forces in 2010 to launch an initiative for road safety along Africa's main transport development axes (known as the "NEPAD Corridors"). Leveraging their specific resources, partners of the African Road Safety Corridor Initiative (ARSCI) are working to reduce road traffic injuries through awareness campaigns and best practice networks. ARSCI interventions are currently being rolled out along two corridors in Central and East Africa.





Annually, over 1.2 billion people travel on Brazil's highways, and in the last two decades, government recognized that modern, well-maintained roads are key to sustained economic growth. To achieve this, officials made a commitment to accelerate the development of infrastructure to improve the country's competitiveness, reimagining Brazil's roads from one end of the country to the other.

Brazil's competitive

DRIVE

Despite Brazil's size and influence—it is the sixth largest economy in the world and is predicted to become the fourth largest by 2050—the country faces a substantial infrastructure gap that threatens to limit growth and competitiveness. This is especially true for the transport sector. Without a railroad network, and with many stretches of unpaved roads, trade costs inevitably increase. This poor transportation infrastructure ultimately prevents the country from reaping greater benefits from international trade.

To develop infrastructure that will allow Brazil to achieve its promise, the Brazilian Development Bank (BNDES), the Inter-American Development Bank (IDB), and IFC collaborated to create the Private Sector Participation Program (PSP Brazil) in 2008. The PSP Brazil alliance implements innovative public-private partnerships and fosters best practices through the provision of consulting services to regional and municipal governments.

The first PSP Brazil project, a groundbreaking concession to expand, rehabilitate, operate and maintain 667 kilometers of federal roads in the state of Bahia, closed in October 2009. It succeeded in introducing a new contractual structure that served as model for the development of other federal and state road transactions. In particular, this transaction—BR116/324—established the performance-based concession as a model for later federal and state road transactions.

The concession of the BA093 highway system, which closed in August 2010, was also precedent-setting. It became the first PPP to be structured for an entire highway system, the first to encompass an entire metropolitan area, and the first to adhere to the Equator Principles, guaranteeing that the project will be developed in an environmentally and socially sustainable manner.

Both of these transactions will improve economic resilience and encourage broader development throughout the region, including sought-after expansion in trade. Equally important, they will improve safety and access to basic services such as hospitals and schools for millions of Brazilians.

In the following interview, Henrique Amarante da Costa Pinto, BNDES' Superintendent for Project Development, places these developments in context. BNDES is the main financing agent for development in Brazil, and since its founding in 1952, it has played a fundamental role in stimulating the expansion of industry and infrastructure in the country.

Road Scholar

***Henrique Amarante da Costa Pinto** has worked for the Brazilian Development Bank (BNDES) since 1982, and currently is Superintendent for the Project Development Division. BNDES is the main financing agent for development in Brazil, and since its founding in 1952, it has played a fundamental role in stimulating the expansion of Brazil's industry and infrastructure.*

Lessons from an expert on Brazilian highways

Interview by Paulo de Meira Lins

The Brazilian road concession model has gone through significant changes, beginning with concessions including BR116/324, developed by BNDES and IFC. What motivated the changes?

The evolution of the model can be attributed to Brazil's experience in the first road concession contracts, where the quality of the services under contract could not be maintained over the long term without increases in tariffs to fund new rehabilitation of existing infrastructure. There was also a general move internationally, throughout the 1990s, toward performance-based contracts for infrastructure.

The innovations introduced by the BR116/324 contract helped set a new national standard. What were they?

The main innovations of the BR116/324 contract are threefold: a focus on performance parameters; introduction of the concept of the "traffic trigger"; and the "reequilibrium discount."

With the focus on performance parameters that can be objectively measured, we see the use of short, medium, and long term objective performance parameters. The private operator has the freedom to employ innovative technologies and construction, methods, and materials. This introduces efficiency and accountability into the

contract. These performance parameters create a clear expectation of outcomes, generating transparency both for the private operator and the regulator.

By introducing the concept of the “traffic trigger” into the contract, we see when demand requires an investment in increased capacity. Specifically, it identifies a volume of traffic that, if reached, obligates the concessionaire to increase roadway capacity in order to maintain a minimum level of service to the users. This means that the contract does not need a schedule of pre-determined investments, as was the case in the first contracts. The increase in capacity is a result of maintaining a pre-agreed level of service as traffic exceeds certain pre-agreed levels.

BR-116

The BR116/BR324 project was the first road concession developed by the Brazilian federal government in northeast Brazil, the country’s poorest area. It comprised 554 km of BR116 and 113 km of BR324, as well as sections of two state roads, BA526 and BA528. Both BR116 and BR324 are in heavy use: on average, 25,000 vehicles travel these roads daily.

Initially conceived as a public-private partnership due to Brazilian market conditions, the project was ultimately developed as a 25-year concession financed by toll revenues from seven new toll stations. Its structure was based on performance, with the concessionaire responsible for meeting various road condition and operational performance standards at different stages of the project.

An auction model, the bidding process developed for this project, promoted international participation in Brazilian road concessions and resulted in strong international interest. Two bidders prequalified and the auction was won by the Rodobahia consortium, a partnership of Spain’s Isolux Corsan and Brazil’s Engevix and Encalso. The Rodobahia consortium requested a toll rate of \$1.23 for a two-axis vehicle, 21 percent lower than the maximum asking price of \$1.50. Toll collections will begin after the concessionaire makes the initial priority rehabilitation investments and will be indexed annually for inflation. Certain sections of the roads will be expanded to two lanes if specific traffic thresholds are reached.

The project will benefit thousands of people who use the roads for long distance travel as well as for local commutes to jobs, schools, hospitals, and other services. It will also improve access to the Port of Aratu and contribute to greater social, economic, and regional cohesion by integrating the northeast and southern regions.

Finally, the “reequilibrium discount” is used to reduce the tariff when performance parameters are not being met. It is determined through the application of a discount, which is expressed as a percentage of the original tariff for each performance parameter. A table of discounts is pre-defined in the contract. The discounts represent the resources that are not invested as a result of a failure to meet performance parameters. It functions independently from the application of contractual penalties. Under a penalty, the concessionaire is subject to a reduction in payment for failing to meet performance parameters established in the contract.

To guarantee the application of these contract innovations, the regulator must apply a robust structure to measure the performance parameters and to apply the instruments established in the contract.

How did the BR116/324 contract change the country’s understanding of risk?

Here is where another significant innovation comes into play: the allocation of risks in relation to the restoration of economic-financial equilibrium. In this case, the contract clearly establishes which risks each party is responsible for assuming, and the allocation of these risks is linked to restoration of economic equilibrium. The original proposal for BR116/324 was a complete shift from the use of the static economic equilibrium model—based on the financial model presented by a concessionaire with prices, traffic estimates, return on investment fixed at the time of bid—to a dynamic model called

the “marginal cash flow model,” which uses data available at the time of the event to restore equilibrium.

What is the future for private sector involvement in Brazilian road infrastructure?

There has been a paradigm shift over time, and the model will continue to evolve. It’s useful to look at the history. Initially, the private sector was interested in building roads. They didn’t understand a concession as a delivery of services, but as a works contract. As time passed, private operators began to understand that concession was a different business from building infrastructure, and many of them developed specific business entities to respond to the concession model.

Most recently, the Brazilian road sector has become very competitive. For example, one project of only 125 km, developed by BNDES and IFC in Bahia in May 2010, attracted nine bids, including from international companies, resulting in a discount of 31 percent. Last January, another project structured with support from BNDES, BR101 ES/BA, attracted eight bids, resulting in a discount of 45 percent.

How have changes in the perception of Brazil internationally helped the road sector?

Brazil is now a center of excellence capable of attracting international investment for infrastructure, particularly as developed markets are looking for opportunities further afield.

Government has declared that without private investment it will be impossible to respond to this need. To that end, it has recently launched a large road and railway concession program. In the road program alone, 7,500 kilometers will be concessioned, equivalent to 140 percent of the federal road network. 🚗

BA-093

The BA-093 interstate highway system is located in the state of Bahia in northeast Brazil, and is composed of a series of roads stretching over 126 kilometers. The system connects the entire metropolitan region of Salvador, the capital of the state of Bahia, with the main logistical and industrial hubs of the state, including the airport, the port of Aratu, and three key industrial hubs.

The 60-year-old BA-093 system was in a severe state of disrepair that negatively impacted tourism and the local economy—in fact, 30 to 40 percent of exports needed to be rerouted to out-of-state ports. To remedy this, the government of Bahia hired PSP Brazil in May 2008 to structure a concession for the operation, rehabilitation, maintenance, and expansion of BA-093, transferring investment responsibility to the private partner for 25 years. The road network, to be operated by the winning consortium, will include five urban tolls.

The auction took place in April 2010 at Bovespa, Brazil's securities, commodities, and futures exchange. Bidding was highly competitive, with nine bidders participating, including both local and international players. The Bahia Norte consortium, composed of Invepar (a subsidiary of OAS Construtora) and Odebrecht, won the bid with a tariff of \$1.31 per axle, a discount of 31 percent over the base price of \$1.89.

The project is expected to mobilize \$455 million in private investments. Operational costs are expected to amount to approximately \$452 million throughout the concession period. The winning consortium pledged to undertake emergency repairs and rehabilitation of the highways within the first six months of the concession and to expand capacity after the third year. The system will be completed by 2020.

Steering Colombia's *future*



Like other countries in Latin America, Colombia has been expanding its road network through different public-private partnership (PPP) models, and a number of projects have been awarded under a broad range of contractual structures. Over the years, however, many of these projects suffered construction and maintenance delays, leading to contract renegotiations. In addition, these projects attracted very limited participation from international investors and local pension funds.

Colombia's geographical quirks—dual coasts, drastic variations in altitude, and a large landmass—contribute to the challenge of developing an effective transportation infrastructure. The country's post-1991 constitution attempts to address these longstanding issues, and the resulting waves of projects, known as road concession “generations,” have created unprecedented opportunities.

In the following section, *Handshake* tracks the evolution of four generations of Colombian road PPPs. An interview with Luis Andrade, the President of the National Infrastructure Agency for Colombia, ahints at what may lie ahead for Colombian roads. The final feature on the prize-winning Ruta del Sol, which laid the foundation for the fourth “generation,” shows how this new strategy is already setting the standard for road projects in the region. Colombia's uniqueness—once considered a liability—may prove the inspiration for an entirely new approach to infrastructure.

FIRST GENERATION

In the Colombian road sector, the 11 contracts signed between 1994 and 1997 are considered the first generation of concessions, and these concessions benefit from a government-provided minimum revenues guarantee. However, the financial crisis of the late 1990s prevented the government from fulfilling its contractual obligations under the guarantee payment. This resulted in many renegotiations to reestablish the economic equilibrium of the concessionaire.

Adding to these woes, the government did not require turn-key contracts that bound concessionaires to a pre-agreed construction cost, and this resulted in government paying up to 30 percent more than originally planned for capital expenditures in some cases.

Two contracts signed in 1997 and 1999 applied new contract provisions in response to the challenges that arose in the first generation. These provisions included:

- A more detailed consideration of risk allocation;
- Provision for more detailed technical documentation during the bidding process;
- Protection of investors through contractual compensation mechanisms; and
- The inclusion of step-in rights for lenders.

In addition, the minimum revenues guarantee was abandoned. (A World Bank line of credit allowed the government to make good on its outstanding obligations.) Instead, contracts varied in length through a mechanism set at bid. Each bidder was required to propose an expected future level of total revenue. The bid presenting the lowest value won, and once revenues reached this expected amount, the concession would end.

These solutions improved the status quo, but problems continued. For example, road capacity was planned on the basis of 20-year traffic projections, and all the investments were made in the first three years, which resulted in overcapacity. Also, there was no integrated vision; each project was considered on a stand-alone basis rather than as part of an integrated network. Lastly, land acquisition remained a government risk and responsibility (just as for the first generation), which resulted in delays and increased costs due to the government's few dedicated resources.

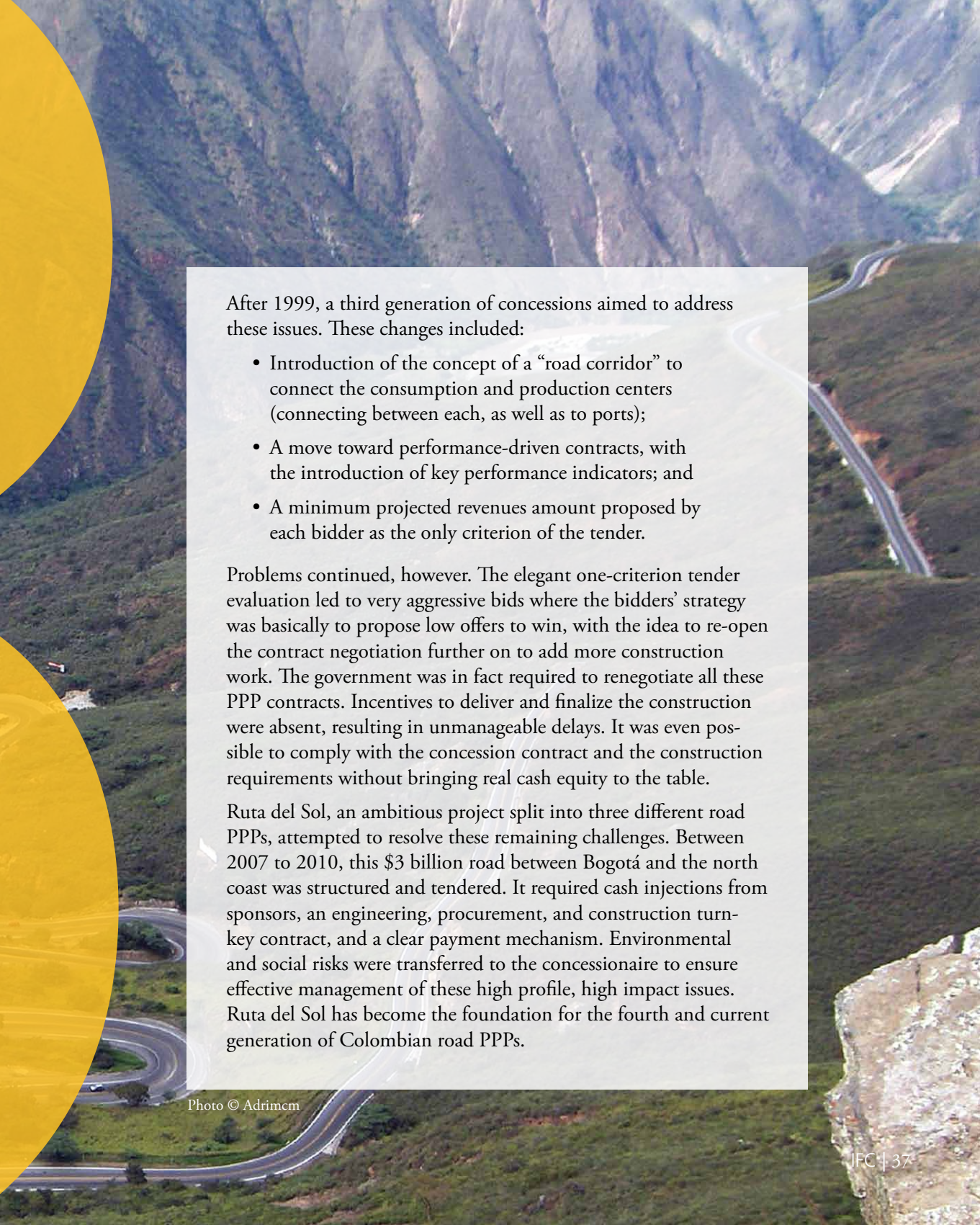
Photo © Pattoncito



SECOND GENERATION

An aerial photograph of a mountain valley. A wide, brown river flows through the valley floor. The surrounding hills are covered in dense green forest. Several roads are visible, including a winding road on a hillside and a multi-lane road in the foreground. A large, stylized yellow graphic, resembling a letter 'S' or a similar shape, is overlaid on the image. The text 'THIRD GENERATION' is written in bold, black, uppercase letters across the middle of this yellow shape.

THIRD GENERATION



After 1999, a third generation of concessions aimed to address these issues. These changes included:

- Introduction of the concept of a “road corridor” to connect the consumption and production centers (connecting between each, as well as to ports);
- A move toward performance-driven contracts, with the introduction of key performance indicators; and
- A minimum projected revenues amount proposed by each bidder as the only criterion of the tender.

Problems continued, however. The elegant one-criterion tender evaluation led to very aggressive bids where the bidders’ strategy was basically to propose low offers to win, with the idea to re-open the contract negotiation further on to add more construction work. The government was in fact required to renegotiate all these PPP contracts. Incentives to deliver and finalize the construction were absent, resulting in unmanageable delays. It was even possible to comply with the concession contract and the construction requirements without bringing real cash equity to the table.

Ruta del Sol, an ambitious project split into three different road PPPs, attempted to resolve these remaining challenges. Between 2007 to 2010, this \$3 billion road between Bogotá and the north coast was structured and tendered. It required cash injections from sponsors, an engineering, procurement, and construction turn-key contract, and a clear payment mechanism. Environmental and social risks were transferred to the concessionaire to ensure effective management of these high profile, high impact issues. Ruta del Sol has become the foundation for the fourth and current generation of Colombian road PPPs.

FOURTH GENERATION

The signing of a new PPP law (“Ley 1508”) distinguishes this generation from its predecessors. The law limits additions up to 20 percent of the total value of the concession contract, and allows prequalification. Additionally, this fourth generation will provide a standardized contract, reflecting the lessons of the earlier challenges. It will facilitate work for bidders as well as the government. Nevertheless, from a technical standpoint, environmental and social risks will remain at the heart of discussions, as private players will have to assume an important part of these risks.

The scale of the fourth generation road PPP program is vast, with over 5,000 km of road under consideration. Its size has piqued the interest of many international players, but this causes some concern. Estimates put the financing need at over \$5 billion, a tall order in a global environment comprised of tight capital markets and a limited revenue base from tolls or government coffers.

Participation of international players is critical to the fourth generation’s success. After all, Ruta del Sol introduced international best practice, but even this mega-road project could be financed through Colombia’s financial market. Today the scale is greater, as is the potential. The fourth generation has everything it takes to demonstrate that Colombia has the transparency, capacity, and international good business practices to attract the international audience that will propel it onto the global stage. 🚗

Ruta del Sol

In 2007 Colombia's Ministries of Transport, Finance, and Planning began working with IFC to structure a concession for Ruta del Sol, a 1,071 km highway to connect the interior of the country and the capital of Bogotá to the Ports of Santa Marta and Cartagena on the Caribbean Sea. When completed, Ruta del Sol will reduce accidents, travel time, and transportation costs. It will also boost manufacturing, tourism, agribusiness, and real estate development.

Even before its completion, however, Ruta del Sol has become a model for future road concessions. The project won Private Finance International's Transportation Deal of the Year in 2010 for Section 2 in recognition of its pioneering approach. The fourth generation of Colombian road PPPs are based on this model.

The \$2.6 billion project was divided into three segments:

Section 1: Villeta to El Koran, a double lane greenfield road, which will reduce by one hour travel time for the 78 km between Bogotá and Puerto Salgar. Given its high risk profile, it was structured as a seven-year medium-term concession. The government intends to retender it as a toll road concession in the future.

Section 2: Puerto Salgar to San Roque, covering 528 kilometers of flat terrain, which will improve access to major production centers.

Section 3: San Roque to three locations near the Caribbean Coast—Carmen de Bolívar, Ciénaga, and Valledupar—which are important routes for freight trucks traveling to Cartagena and Santa María. This project covers 465 km of semi-flat terrain.

For Sections 2 and 3, the concessionaire is paid through toll revenues and availability payments. It is a variable-term concession that expires once a pre-agreed net present value of revenues is reached, limited to a maximum term of 25 years.

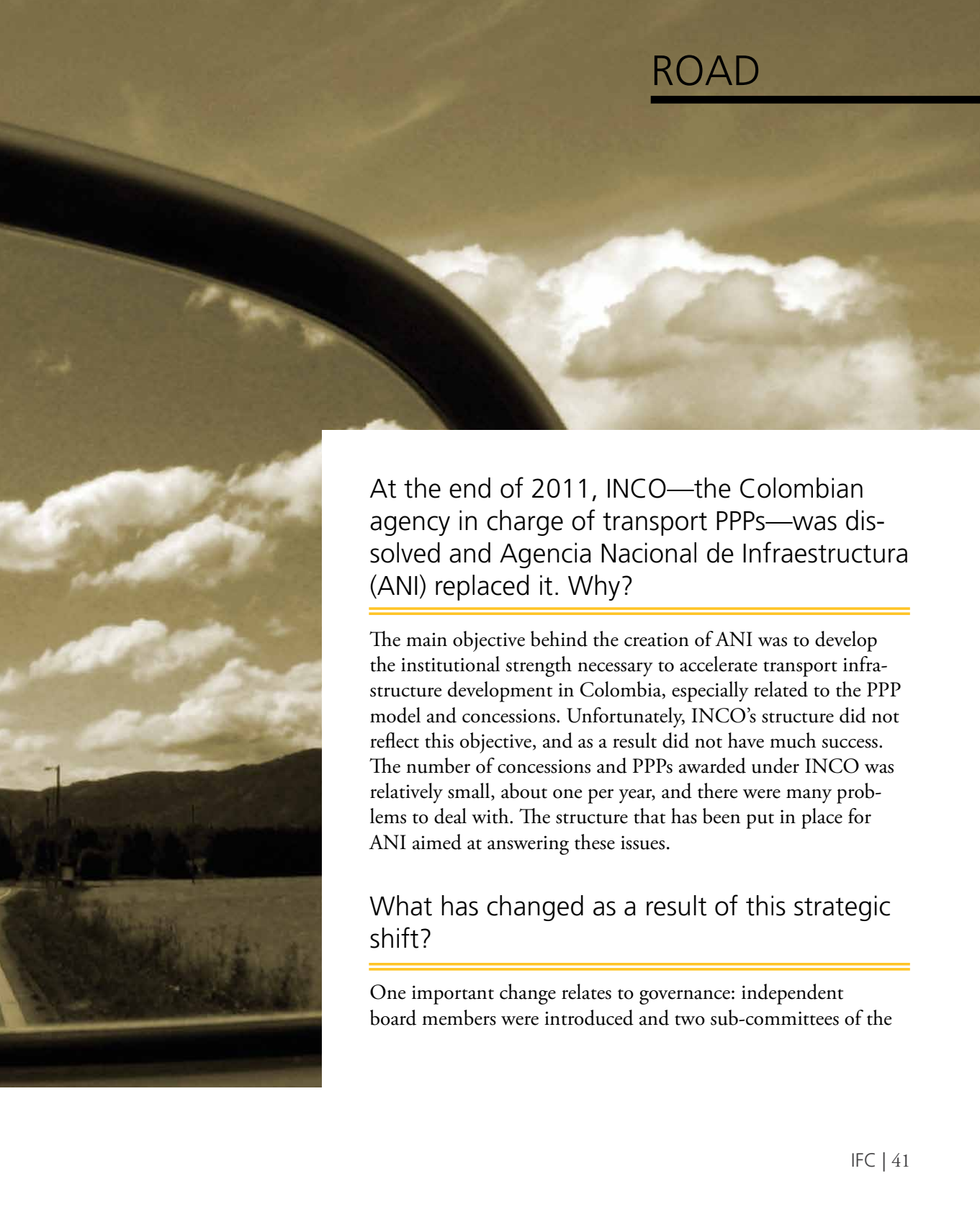
Project-specific budgetary allocations will be assigned by the Ministry of Finance to each concession and transferred annually to individual concession trusts. The funds will be payable to the concessionaires upon completion of contractually-defined construction milestones. Deductions will be applied to the payments if the concessionaire does not meet minimum road condition and operational performance parameters, creating an incentive for compliance with construction and operation and maintenance goals.



Colombia *turns a corner*

Luis Andrade is the President of the National Infrastructure Agency for Colombia (Agencia Nacional de Infraestructura). Prior to joining the government last year, he was director of McKinsey & Company for Colombia and launched its offices in São Paulo and Bogotá. An industrial engineer by training, he also has an MBA from The Wharton School of the University of Pennsylvania.

Interview by Philippe Neves



At the end of 2011, INCO—the Colombian agency in charge of transport PPPs—was dissolved and Agencia Nacional de Infraestructura (ANI) replaced it. Why?

The main objective behind the creation of ANI was to develop the institutional strength necessary to accelerate transport infrastructure development in Colombia, especially related to the PPP model and concessions. Unfortunately, INCO's structure did not reflect this objective, and as a result did not have much success. The number of concessions and PPPs awarded under INCO was relatively small, about one per year, and there were many problems to deal with. The structure that has been put in place for ANI aimed at answering these issues.

What has changed as a result of this strategic shift?

One important change relates to governance: independent board members were introduced and two sub-committees of the

board were created to support the objectives of structuring and managing existing contracts. These sub-committees are composed entirely of independent board members, who are not part of government or industry.

A second important change is an increase in salaries. The compensation was increased by around 50 percent to allow ANI to compete with the government sector as an employer. The staff of ANI still earn less than they would in the private sector, but well in relation to the rest of public sector. So people who want to serve in the public sector now see ANI as a very good professional alternative.

There have been other changes in the organizational structure to strengthen previously weak areas, including risk management and legal issues. We also introduced the concept of team work and performance management, trying to emulate best practices in the private sector.

The only way that [Colombia] could make a significant difference in the infrastructure development was to leverage PPPs.

How does Colombia's ambitious program for road PPPs support the country's new focus on globalization?

Without a competitive infrastructure it would be difficult for the country to take advantage of the opportunities provided by globalization and international trade agreements. It's that simple.

Why the PPP model over the alternatives?

We chose the PPP model because the public works model has shown many deficiencies in the past. For example:

- It does not have the right long term incentives, as the people who build are not the same who operate and maintain, so when they build the infrastructure, they don't think long term. We saw this most recently with the heavy rain season. The roads developed under PPP schemes had problems but could be repaired pretty quickly, whereas the roads that had been constructed under regular public works had really serious problems. This could be attributed to better design by the PPP operator who, by nature of the contract, has the incentive to care about future costs, and also the better preventative maintenance under PPP contracts.
- Another element in favor of PPPs is that under the right circumstances we can recover a large

part of the infrastructure costs through user fees or tolls, taking pressure away from the government deficit.

- Finally, the impact on the government budget is predictable and spread out over the life of the concession, rather than upfront. Payments can be conditional on availability and performance to provide the right incentives.

In the end, the only way that we could make a significant difference in the development of infrastructure was to leverage PPPs.

What can Colombia achieve with the recently enacted PPP law that was not possible before?

Although many of the things we are doing now were possible with the previous scheme, the new law improves certain concepts to assure a better legal environment for concessions so that contracts can move forward.

One significant change is the incentive for the private sector to present unsolicited proposals. In the last 20 years, we had 25 road PPPs and all were initiated by the government. There were zero unsolicited proposals. Since the new law went into effect, we received 13 unsolicited proposals in roads and four in railways, for a total investment amount of 14 billion pesos or \$8 billion. So the main thing this law has changed is the incentive for the private sector to bring forward unsolicited offers.

What advice would you give governments facing an infrastructure gap similar to Colombia's?

First: Look for help and participation from the private sector. Unless the country has an ample budget surplus, which most countries do not, it is impossible to do a very ambitious project just by leveraging the year's fiscal resources. Search for ways you can find private sector financing and look for ways that users and the government can make the project financially viable.

Second: Present clear and stable rules. For example, find ways to solve disputes that do not have to go through the courts, but which can leverage arbitration schemes. This assures the private sector that disputes will be promptly and fairly decided. Another example is to ensure a juridical stability in some key issues of the concession contract, to allay investors' fears that the rules can change in the course of a very long-term contract.

Finally: To develop good projects and good contracts, you need to invest money. Specifically, to have a well-structured project you need to invest around 0.5 to 1 percent of the value of the project in its development. It's a significant amount of money, but without that investment the other 99 percent is likely to fail. 🚗



Rewriting the rules of the road

Gajendra Haldea is Advisor to the Deputy Chairman, Planning Commission, Government of India. His largest PPP transaction is the \$3 billion Hyderabad Metro Rail project currently under construction. The Highway Model Concession Agreement that he authored has become a model for other national infrastructure projects, and is now being adapted for a \$2 billion sea link in Mumbai. He is the author of Infrastructure at Crossroads: The Challenges of Governance, recently published by Oxford University Press.

You have been a key policy shaper and have played a critical role in the infrastructure development space in India, particularly in the area of public-private partnerships (PPPs). How did this journey start for you and lead to your current role as Advisor to the Deputy Chairman, Planning Commission?

I joined the Finance Ministry in 1993 as Joint Secretary (Infrastructure), and at that time the Government of India had begun the process of policy formulation for enabling private participation in infrastructure as part of its economic liberalization. In 1999-2001, I wrote the Electricity Bill that became law in 2003, and I also advised several state governments. In 2000, I published the first Model Concession Agreement (MCA) for national highways, which in effect became the template



The most critical factor that enabled India's rapid progress was the standardization of documents and processes.



for subsequent government MCAs. I joined the Planning Commission in 2004, when the Committee on Infrastructure was set up under the chairmanship of the Prime Minister, and I headed its Secretariat. During the past eight years, we have worked toward creating the entire architecture for PPPs.

The Indian experience using PPPs to develop the national highway network is widely recognized as a success. What factors were most important?

The most critical factor that enabled rapid progress was the standardization of documents and processes. Besides Model Concession Agreements, we have standardized the bidding docu-

ments and technical standards. The appraisal and approval processes have also been streamlined. As a result, a large number of PPP projects have been awarded and built. According to a recent World Bank report, India is the top recipient of PPP investment among developing countries.

The Model Concession Agreement is recognized as one of the most innovative aspects of Indian PPPs. How many MCAs have been prepared? What are some of the most innovative aspects of the MCA?

We have published 12 MCAs in sectors including highways, urban rail, airports, ports, power transmission, and railway stations. Currently, we are working on five new MCAs in different sec-

tors. The MCA serves as a ready-to-use contract conforming to international best practices. It balances the diverse interests of various stakeholders, minimizes the potential for malfeasance, and protects public servants, investors, and lenders from unintended outcomes.

What were some of the biggest challenges that the highway PPP program faced in the initial period, and what challenges remain?

The main challenge came from incumbent officials who tend to resist any initiative that interferes with their conventional contracts. It takes a long time to change mindsets, especially

replicated. If you take up a few projects first and evolve an MCA later, several years could be lost.

The Viability Gap Funding (VGF) model has been a cornerstone of the PPP program in highways. Yet, in certain cases, the level of traffic is low and tolls supplemented with a VGF capped at 40 percent of capital costs do not make the project viable. In such cases, does the Government of India use availability payments-based models?

Viability gap funding of up to 40 percent of

The main challenge came from incumbent officials who tend to resist any initiative that interferes with their conventional contracts.

when vested interests are at work.

What advice would you give countries undertaking their first PPP transactions? Is it advisable to first develop success stories on individual transactions and then incorporate country-specific leanings to evolve a Model Concession Agreement?

An MCA should be drafted around the first transaction itself. It can then be improved and

project costs is a high level of financial support, especially when the cost of land is borne by the government. If a project is still not viable, the government should either reduce its capital costs or increase the revenue potential. If that does not work, the government should build the project itself. Use of the availability based model implies deferred budgetary payments, which are akin to government borrowings. Since the cost of private capital is much higher, the better course is for the government to borrow directly and build projects through turnkey contracts. A significant part of the efficiency in PPP projects arises from

the turnkey approach, and the public sector too can capture this. Moreover, availability based payments are off-budget liabilities that could create excessive burdens for future generations.

What factors should government agencies keep in mind as they set out to develop PPPs, specifically in relation to project preparation, regulation, and monitoring of the contract?

Preparation of a feasibility report is the first step, but the heart of a PPP project is the concession agreement, which should form the basis of competitive bidding. Since infrastructure projects provide public services, the concession agreement also serves as a statement of public policy. A contract is as good as its enforcement. If the

project authorities do not monitor its implementation, the users or the public exchequer could lose out. All these aspects need to be institutionalized as countries move toward greater reliance on PPP. 🚗

This interview was made possible with the help of IFC's Isabel Chatterton, Bhanu Mehrotra, Pankaj Sinha, and Rachel Jacob.



Photo © Harshad Sharma

ROLLING OUT ROAD PPPs

Due to constraints in public funding during the last decade, public-private partnerships have come to play a major role in the development of highways in India. Government has created an enabling policy and regulatory framework to attract competitive private investment, and the response has been very encouraging. The cornerstone of India's success in this area is the adoption of standardized documents and processes that have led to a rapid roll out of projects.

As a result, the share of private sector investment in the road sector has increased from about 8 percent in the Tenth Five Year Plan (2002-07) to about 20 percent in the Eleventh Five Year Plan (2007-12). This includes national highways as well as state highways. According to the World Bank, India has been the top recipient of PPP investments among developing countries in recent years.

—Gajendra Haldea



Photo © Clare Bell

FULL SPEED AHEAD

*Economic cost-benefit analyses
pave the way for decision-making*

An economic cost-benefit analysis (CBA) allows the government to assess the net benefits to society of projects and select the one that generates more benefits. An economic CBA also minimizes public opposition by showing that benefits to society are the deciding factor in implementing a project.

By Alfonso Guzman & Francisco Estrázulas

Consider this scenario: A small Latin American country is about to launch its public-private partnership (PPP) program. The PPP promotion agency aims to select a highway project that will start the program on a positive note. To signal to the PPP community that it means business, the agency selected the rehabilitation and expansion of the existing highway that connects the capital city to the airport, known as the “Airport Link.”

This project is low risk. After all, traffic is high, users can afford the toll, and construction risk is low. It’s also financially viable because revenues exceed costs, requiring no fiscal contributions. The motivation behind this selection is straightforward: implementing a project that is unlikely to fail will set a good national precedent and increase the attractiveness of PPP programs in general.

During the agency’s presentation to the government ministry that would implement the project, the minister raised the point that the main challenge to the PPP program wasn’t to capture the interest of the PPP community, but to ensure citizens’ support for this new way to develop infrastructure. He then urged the PPP promotion agency to consider prioritizing a project with high economic returns to show the general public that PPPs increase community wellbeing.

To support this theory, the minister proposed the “Regional Connector,” a greenfield highway in a region of the country with great, yet unexploited, production potential due to its poor highway infrastructure. Also, this project is a section of a regional highway corridor that is key to increased trade among countries in the region. However, this project has much higher risks—

CBA PRIMER

- **Willingness to Pay:** Perceived value of the benefits to users of the highway.
- **Financially Viable Projects:** Revenues exceed the costs of the project.
- **Economically Viable Projects:** Benefits that society derives from the project are greater than the costs to society.
- **Viability Gap:** Difference between revenues and costs of the project.

construction and traffic risks especially—and has no chance of being financially viable without government intervention.

Which project should the government select?

COMPARING PPP PROJECTS

The answer is clear. An economic cost-benefit analysis (CBA) allows the government to assess the net benefits to society for each of the projects and select the one that generates more benefits. It leads us to the conclusion that the Airport Link is not economically viable, despite being financially viable. Here’s why: Based on the current traffic, user fees/tolls on this highway, without any improvements, could raise \$150 million (net present value) through tolls—that is, the present value of the tolls that users would be willing to pay even though they currently

don't. (The numbers used in this article are made up, but based on historical case studies.)

the project will require a government subsidy of \$200 million.

A PPP project will be economically viable if the total benefits that society derives from the project are greater than the total cost to society. A subsidy is one of the costs to society.

With the proposed rehabilitation and expansion, the toll revenue could increase to \$200 million. Drivers would be willing to pay more because of the time savings, increased safety, and other benefits that the improved highway would provide. However, the cost of the expansion and improvements is \$100 million. Therefore, although the project is financially viable (revenues of \$200 million - investment \$100 million = \$100 million) and low risk, it is not economically viable (marginal increase in toll revenue \$50 million > \$100 million investment). This is likely to generate opposition from the public, who will feel they are overpaying for the additional benefits that they are receiving.

ECONOMIC VIABILITY VS. FINANCIAL VIABILITY

The Regional Connector, however, is economically viable although it is not financially viable. The project costs \$400 million, while the expected revenues for the investor are \$200 million. Therefore, to attract private capital,

Here's a critical point: the project will be economically viable if the total benefits that society derives from the project are greater than the total cost to society—the subsidy being one of the costs to society. In the case of the Regional Connector, the government estimated—through an economic CBA—that the competitiveness benefits to the local producers in the region amount to \$100 million, while the benefits to the country from the increased regional trade are \$150 million. These benefits, plus the expected revenues—which reflect the direct benefit that users perceive—add up to \$450 million. This is greater than the total cost of the project (\$400 million). Therefore, the \$200 million subsidy for the Regional Connector is justified, and the project is economically viable.

The main danger in subsidizing a PPP project is that the government may be transferring too much taxpayer money to the PPP investor—that is, the investor will receive more than the benefit that it provides to society. This would trigger public opposition, as the government will be

perceived to be a defender of the interests of the private investor rather than the public interest.

But an economic CBA can give government the information needed to dispel these concerns. It can also be an effective tool earlier on in the process—that is, when deciding whether to implement a highway project as a PPP or through the traditional public financing alternative.

FRONTIER MARKETS

When deciding whether to implement a highway project through a PPP, many governments implement the U.K.-style Value for Money (VfM) analysis. This is a rather complex analysis that looks at the costs of both alternatives and recommends the lower cost alternative—assuming that the value of the project is the same under both alternatives. The deciding factor in this calculation is the cost ascribed to the risks that the government would transfer to the private party under the PPP arrangement. This is a methodologically difficult calculation, particularly in frontier markets where the data sets are not available or unreliable. This is why certain countries—such as New Zealand—have adopted the comparative CBA.

By using comparative CBA, government analysts avoid having to ascribe costs to risks. Instead, they directly estimate costs under each delivery model—PPP or Public Finance. Also, in comparative CBA, they directly estimate the benefits of projects, which may vary under each alternative. This is particularly significant in developing

countries where assets may not be maintained and, therefore, some of the benefits may not be delivered under the public alternative.

In the comparative CBA, the government selects the option that generates the largest net benefit to society, rather than the one that costs least.

MINIMIZING PUBLIC OPPOSITION

As foreseen by the ministry in charge of highways, public opposition—particularly in emerging markets such as the small Latin American country under consideration—is a sure-fire way to derail a PPP project, and even a newly established PPP program. Opposition can be powerful enough to stop the government's PPP approval process, cause delays during construction, or even threaten revenues during implementation.

Economic CBA can help mitigate these risks by showing that benefits to society are the factor determining the decision to implement a project. This analysis can also justify the use of subsidies by letting people see the value that they get from the subsidy. Furthermore, the government can involve the beneficiaries in determining the value of benefits and costs to society to ensure ownership of the results. Then, by socializing the results of the “validated” CBA, the government can further reduce the likelihood of public opposition, mitigating one of the key threats to PPPs in frontier markets. That's a scenario worth pursuing. 🚗

The (Silk) road less traveled

International Road Transport Union facilitates trade



By Umberto de Pretto

Globalization and containerization have brought unprecedented changes to European-Asian transport links. With the bulk of world trade concentrated in a few major ports, remote areas have suffered from a desertification of trade, which has hurt economic development. To remedy this, the International Road Transport Union (IRU) works to reopen trade along the ancient Silk Road. It also campaigns to double the use of bus and coach services to achieve sustain-able mobility everywhere in the world. Success of both goals would stimulate trade, investments, tourism, and local employment.

The biggest impediments to land trade routes between Europe and Asia, according to a U.S. Chamber of Commerce study, include administrative barriers and inappropriate border procedures. International Road Transport Union (IRU) pilot projects support this conclusion, revealing that these administrative barriers and inappropriate customs procedures account for almost 40 percent of road transport time along the Silk Road. About 32 percent of transport costs are from unofficial payments and levies paid by transport operators in transit and at borders. One could expect the same or even more dramatic findings in Africa, the Middle East, and Latin America.

These invisible barriers to trade block development, sustaining poverty's status quo. But countries that implement the key UN multilateral trade

and international road transport facilitation instruments, such as the UN Harmonization and TIR (Transports Internationaux Routiers) Conventions, could change this.

LIFELINES ON WHEELS

Use of the Silk Road would help solve trade issues, but sustainable mobility is just as critical to reducing poverty around the world. Buses and coaches are often lifelines to jobs, education, and healthcare for many citizens. These vehicles reach areas that rail and air do not, especially for low income people, those who cannot drive, and people with disabilities.

Official data identifies buses and coaches as one of the best collective transport solutions for short and long distances. Safe, green, efficient, affordable, and socially inclusive, buses and coaches are an optimal response to current and future mobility challenges when used effectively. But policymakers tend not to integrate buses and coaches into transport policies. Worse, they may design ill-informed, improper, and even restrictive legislation.

To remedy this, the IRU's Smart Move campaign provides accurate, reliable, up-to-date facts

and figures, so that informed legislation feeds policies that double the use of buses and coaches and encourage citizens to use them whenever possible.

Doing so could take hundreds of millions of cars off the road, returning the existing infrastructure to a more sustainable transport mode. Moreover, achieving Smart Move's objective of doubling the use of bus and coach transport would create millions of new jobs linked directly or indirectly to daily operations.

Both of these IRU goals—facilitating the international movement of goods on the Silk Road and doubling the use of bus and coach services—are realistic and achievable policy objectives. They can be achieved if political priority is placed on removing barriers to road transport by implementing required measures, incentives, and policies that steer road transport toward an efficient future. 🚗

This article was made possible with the help of Virginia Tanase, Senior Transport Specialist in the Transport, Water, Information & Communication Technologies Department of the World Bank.

The International Road Transport Union (IRU) is the implementing partner of the TIR (Transports Internationaux Routiers) Convention under UN mandate. The TIR Convention facilitates and secures international road transport around the world, allowing customs-sealed vehicles and freight containers to transit countries without border checks. It contributes significantly to reducing border waiting times while enhancing security, decreasing costs, and significantly increasing road transport efficiency in many regions of the world. It is the world's only universal customs transit system.



Turkish Delight

FASTER BORDERS, FASTER GROWTH

Trade growth is a priority for Turkey's government, which has ratified the highest number of UN trade and transport facilitation and security conventions in the region. The effective implementation of these UN multilateral instruments, coupled with public-private partnership initiatives led by the Turkish Union of Commerce and Commodity Exchanges (TOBB) to improve border crossings, has significantly contributed to the development of foreign trade by increasing the efficiency of border crossing procedures. Border waiting times, which formerly took hours if not days, have decreased to minutes.

Turkey has also recognized that road transport drives its trade, and it has taken significant measures to strengthen the Turkish international road transport industry. As a result, the Turkish road transport industry is arguably the strongest of the entire region, accounting for 41.7 percent of Turkey's exports and 23.6 percent of imports. Turkey is consequently the world's biggest user of the facilitation and security provided by the TIR System.

These concerted efforts to facilitate trade and, by extension, international road transport, have increased Turkey's exports by 310 percent over the past 10 years, according to a Republic of Turkey Ministry of Transport, Maritime Affairs and Communications Country Report (October 2011). Imports have increased by 340 percent, according to the same report, making Turkey the ninth fastest growing economy of the world with an 8.5 percent gross domestic product growth rate. 🚗

from **A** → **B** with **R&B**

By Jeff Delmon

“The person attempting to travel two roads at once will get nowhere.”

—Xun Zi, Chinese Philosopher, d. 237 BC

Welcome to the second installment of our walk through transport public-private partnerships (PPPs). Last edition we tackled ports and airports. This time we turn to roads and bridges (“R&B”—to save ink on spelling it out, plus it suggests a few cool catchphrases).

R&B is A to B: moving people and goods between fixed geographical points. It is more uni-dimensional than ports and airports, with only limited opportunity for revenues from tertiary services (like road side services) compared with other transport PPPs. Advance planning and studies are important for ports and airports, but for R&B they are critical. After all, a road is unlikely to surprise with super-profits. If the initial studies do not show its potential, it is unlikely to have potential.

But those early studies are especially vulnerable to the optimism bias that infects most demand surveys. As fixed links, R&B should be susceptible to clear traffic surveys. Demand assessments, however, are more art than science—requiring a careful balance of planned and likely economic growth, demographic changes, use changes, and improvements in linkages (ports, rail, airports, interconnecting roads, and competing roads).

Construction plays a particularly important role in R&B. Sponsor teams are usually led by the construction contractor, since that contractor is going to make large profits on the construction contract. This means the anchor investor may be particularly influenced by the profits to be earned during construction, more so than during operation. Government and lenders will want to ensure that these core investors remain commit-

ted to the success of the project over the long term, even if this is not financially efficient.

Operation is relatively straightforward, excluding electronic tolling and a few whizzy technologies, but the added value for government of a secure maintenance program is fundamental. In most countries R&B maintenance is poor. This costs the country, since replacing roads due to poor maintenance is about three times as expensive as maintaining them well, but road maintenance is easy to cut when budgets are lean or some other more exciting expenditure is proposed. The discipline of PPP maintenance can save a bundle for R&B.



Private involvement helps to ensure that projects are driven by economic and commercial priorities rather than political preferences.



For these reasons, R&B is less like financing a business (like airports and ports) and more like financing a service (like power generation, water treatment, hospital facilities, prison facilities, and similar operations). This means that assessing an investment in R&B focuses on construction cost, demand forecast, and tariff formulae. The latter is broadly divided between toll-based

or availability payment-based revenue streams for the concessionaire. The former looks to users, the latter looks to contracting agency payments. Hybrids of the two include shadow tolls (where the contracting agency pays part or all of the toll that would otherwise be charged to users) and traffic/revenue guarantees (where the contracting agency compensates the concessionaire if traffic and/or revenues are insufficient).

As always, where government bears downside risk (risking part of the cost if the project does not do as well as hoped), government should benefit from upside (when the project does better than expected). This is often achieved through an escalating sharing of revenues above expected levels.

A few comments about R&B PPPs are in order, in reverse order of importance:

“PRIVATE”

The private partner has a key role to play in R&B. While the technology for R&B construction is not overly sophisticated (with obvious exceptions of complex bridges, tunnels, elevated sections, and difficult soil conditions), the private partner can help save money through procurement efficiencies, construction efficiency, life-cycle maintenance/management, and a long-term perspective on the design of the R&B. Less critical but still important are the efficiencies available through operating practices, tolling technology, and cash management. (The

volumes of cash managed through toll booths and other tolling mechanisms can be managed carefully to maximize value and reduce transaction costs where incentives are rightly designed.)

Private finance, as with most PPPs, provides additional sets of eyes to oversee project preparation, test project viability, and ensure careful implementation of an R&B project. Public procurement of R&B often results in cost overruns, delays, and other complications related to lack of forward planning and analysis. While private financing of PPP requires more time and investment in early project preparation, these investments reap rewards in reducing the waste that can often result from public procurement. The benefit of private oversight and assessment is probably most obvious in testing the viability of projects—in particular project selection, alignment selection, and traffic forecasts. Private involvement helps to ensure that projects are driven by economic and commercial priorities rather than political preferences.

“PUBLIC”

Public inputs into R&B are even more important than many other PPP projects. The government will provide essential aspects of an R&B project that the private sector will be less capable of delivering. For example:

- Demand for R&B services is intrinsically linked to government policy and actions. Road traffic will depend on economic growth, transport policy, toll regime, and competing transport links. It is therefore important that the government play a

central role in managing demand risk and helping to ensure robust revenues for the project.

- The public sector will provide land, often large amounts of land, for the works, construction of the works, lay-down areas for construction material, and disposal of spoil from construction (in particular tunneling works). The government is well advised to acquire land before receiving bids to avoid delays (and associated liabilities) due to land acquisition complications. The government will also need to help with licenses and permits.

“PARTNERSHIP”

Most important to a successful R&B PPP is the partnership between public and private. The roles of the two are so closely entwined that the partnership becomes all the more critical to the success of an R&B PPP. R&B is not a stand-alone asset that provides a service. It is part of a network, linking roads, interchanges, and competing transport facilities. Therefore, the transport policy heavily influences the success or failure of an R&B PPP, and equally proper management of the R&B will influence what the government can do with its transport policy. Changes in policy will influence and be influenced by the success of the PPP, so the concessionaire needs to be closely consulted and may help guide the government when implementing new strategies and technology. For example, electronic tolling can help both government and concessionaire, but will need to be implemented

in a manner that fits with the practices of both partners.

Ideally, design of R&B will be allocated to the private sector to benefit from value engineering, long life-cycle perspective, and latest technology. However, R&B, in particular bridges, can represent important public image issues. Government may want a say in the design and overall aesthetic. The entity responsible for regulating R&B construction (if there is one) may not be familiar with regulating privately managed R&B, creating extra risk for the private investor. The government may therefore wish to determine the basic design. This reduces the opportunity for private investors to influence design and achieve efficiencies, but may result in a more sustainable balance of risk. Nice stories about quick fix R&B through direct negotiations without extensive preparations are usually no more than nice stories, and will end up costing the government.

So, in summary, R&B is not for the fainthearted. It requires government involvement, advance planning, and in particular the three “L”s—land, land, and land. Money and time invested in these early preparations will accomplish the fourth, equally important “L,” leveraging significant benefits for everyone involved. 🚗

Photo © Daniel Larsson



the long and winding road

Road and rail PPPs in Africa

Nick Rouse became Managing Director and Fund Manager of the Emerging Africa Infrastructure Fund (EAIF) and GuarantCo in May 2005, after working for Barclays Bank for 33 years. His involvement with EAIF dates from the Fund's inception and he was a member of its Credit Committee and a Non-Executive Director between 2002 and 2005. In his current role, he has overseen the completion of 48 deals with a notional value of \$926 million, the vast majority of these in Sub-Saharan Africa. He spoke to Handshake about African road and rail public-private partnerships (PPPs).

Road and rail PPP transactions in Africa seem to present challenges that may not exist in other sectors. Why?

PPPs are difficult in general in Africa. If you look at the power sector, there have only been 16 independent power projects of any reasonable size since 1995, and the power sector is actually much friendlier to PPPs than road and rail—so that tells you something generally about the difficulty of PPPs in Africa.

With road and rail specifically, what makes it even harder is the direct market risk against end users, whether it's for freight on rail or trucks on road, retail customers, or personal customers. Understanding patronage numbers is always difficult, and to get the private sector interested in PPPs for road and rail, there has to be confidence in future end-user generated cash flow. But in Africa, where people are very poor, tolls represent a significant cost and users will simply choose different routes or choose not to travel.

Are publicly maintained roads a better answer for the continent?

The publicly funded road model has not worked very well in Africa either, because the roads simply don't get maintained. There's a famous joke in Kenya: "There's no word for 'maintenance' in Kiswahili." This is why the turn to PPPs. And when they work, they work well. Tolloed turnpikes in the 18th and 19th centuries trans-

formed U.K. and U.S. roads because people were charged and insisted on a quality of service. They wouldn't pay for poor roads, so the owner of the turnpike had to keep them in proper repair and employ people to do that.

What about rail?

Rail is a little bit easier. Rift Valley Railways in Kenya and Uganda, which covers the original colonial railway which the British built from Mombasa to Kampala, gets its strength from the freight business. In general, African railways are essentially a freight business because private operators are not keen on passenger traffic. Passenger trains clutter up the tracks and generate little revenue. Also, because the track has often not been maintained, rail speeds are low so optimum track usage is vital. For financial reasons, this results in prioritizing freight.

Do rail PPPs for freight eventually pave the way for passenger rail business?

The railways tend to be single track, not conducive to lots of passenger traffic. So it gives you the capacity for general freight as well as passengers in theory, but in practice it can be difficult. Freight rail PPPs, especially heavy freight, have been the only real successes. For example, in West Africa, there are railways to take the iron ore and minerals out and ship them from the interior or the coast. It's a bulk freight business, and people are interested in that.

Is there a demand for passenger rail traffic in Africa?

There is, but we should separate long distance rail from commuter rail. Commuter rail holds a lot of potential and I think PPPs will work there. Practically speaking, the concessions seem to take forever to negotiate because decisions are driven politically. There's an issue about government capacity to negotiate these concessions, so you have to try to take the politics out of it.

What's your advice for officials who want to pursue road or rail PPPs?

It's worthy of the time and effort because Africa clearly needs much better transport links. Road and rail are fundamental infrastructure, but you have to figure out who is going to pay. For railways, freight will be the answer. I think Africa will get railways built and refurbished where there is good freight traffic.

For roads, because it's difficult to get people to pay, you need a really strong model. You have to identify where there can be considerable time savings compared to the other route, with no alternatives and no way for people to get around it. And again, it's promising when these roads provide a significant advantage for freight traffic. Overall, though, there are few role models, so you have to look at each project individually. ☸

A TOOL FOR URBAN EXPANSION

Mass Rapid Transit

By John Leber & Cledean Mandri-Perrott

As the world experiences rapid urbanization, there is growing interest in using Mass Rapid Transit (MRT) to solve urban transportation problems. Yet developing MRTs is a complex and capital intensive process. Governments and public authorities are using a variety of public-private partnership (PPP) models to leverage resources and expertise.

MRT is a bus or rail-based public transport mode operating on fully or partially exclusive rights-of-way—also known as the “alignment.” This alignment can be at-grade (i.e., surface-based), elevated, or underground. Some of the most common forms of MRT are metros, streetcars, tramways (sometimes referred to as light-rail transport, or LRT), and bus rapid transit (BRT).

BENEFITS OF MRT

MRT solutions are increasingly preferred by policymakers because they provide high carrying-capacity coupled with energy efficiency. MRTs support strategies for reduced air pollution and




encourage higher density development and better use of scarce, expensive urban space. They can also promote greater equity and mobility for a larger segment of the population.

CRITICAL SUCCESS FACTORS

MRT solutions are typically customized to a particular city or transportation corridor. Coordination is necessary among various levels of central and urban governments that have overlapping responsibilities and policies. Managing such complexity and the associated risks can be a daunting challenge for even the most experienced and sophisticated public authorities. Critical success factors for MRT schemes include:

RAIL

- Completing robust engineering feasibility studies to ensure viable technical design solutions (particularly for elevated and underground MRT).
- Having a good understanding of the minimum passenger volumes (ridership) so that the system and its operations can be dimensioned accordingly.
- Ensuring that the operation of the system is responsive to customer needs such as comfort, speed, and punctuality, and that the system is safe and reliable.

MRT Type 	Speed 	Peak Capacity (pax/hr)**	Technical Traits 
Streetcar/Tram	Low (less than 30 kph)	Low (5k or less)	<ul style="list-style-type: none"> • Frequent street crossing • Primarily at-grade • Single-car configurations
Light Rail Train	Low-medium (avg. 30 kph)	Low-medium (10k-20k)	<ul style="list-style-type: none"> • Mostly at-grade • Single and double car configurations • 2-3 lanes from existing road
"Light" Metro	High (avg. 45-65 kph)	Medium-high (15k-30k)	<ul style="list-style-type: none"> • Either elevated or underground • Requires grade crossing
Heavy Metro	High (avg. 45-65 kph)	High (60k or more)	<ul style="list-style-type: none"> • Either elevated or underground • Complex civil works

*passengers/hour at peak

- Understanding the fare structure and how that structure may affect demand.
- Designing operations and maintenance to maximize the system life, and adequately budgeting for regular operations and maintenance expenditures.
- Considering continued investment in the system design and contractual mechanisms that allow for this investment.
- Considering integration of the MRT scheme with other transportation modes (pedestrian links, parking, rail, and airport links) to ensure a comprehensive urban transport strategy.

Together, these factors can ensure that the MRT solution, and the PPP mechanism in place to deliver it, are tailored to the particular needs of a city or transport corridor.

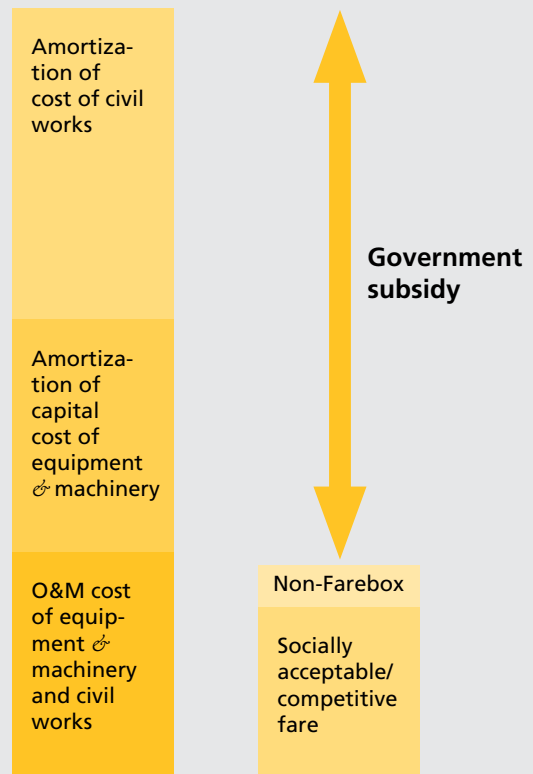
THE ECONOMICS OF MRT

MRT projects involve large capital expenditures for the design and construction of the system, along with significant operation and maintenance costs (O&M). Revenues generated by the system (known as farebox revenues) are generally set by public authorities with political, social, transport, or urban planning objectives in mind. As a result, farebox revenues rarely cover operating expenses, and rarely cover the full cost of the project. As the graphic to the right shows, for a project to succeed, more often than not the funding gap must be met by some form of government subsidy.

A common misconception is that the gap between the farebox revenue and the cost of

service can be made up with other forms of revenue, such as advertising and real estate development. Typically, revenues from advertising in stations and trains are not significant. Figures represent around 4 percent of farebox revenue; station concessions such as small kiosks, newsstands, and vending machines may generate an additional 7 percent. Similarly, real estate development or capturing increased land values directly linked to MRT presents challenges.

True Cost of Service



TRENDS IN MRT PPPs

PPP models for MRT projects can range from full system concessions, where the private sector takes design, construction, and operation risk, to outsourcing of operation and maintenance, where the role of the private sector is limited to operations risk. Appropriate risk allocation is a defining quality for a successful PPP—risk should be transferred to the party that is best suited to manage it.

Some of the advantages for cities developing MRT projects through PPP structures include placing the risk of development and construction with the private sector to achieve improved system design, faster completion, and lower cost, and leveraging the diversity of expertise and experience of a worldwide operator. Together, these can help achieve more innovative and cost-effective approaches to service delivery.

More recently, the trend for MRT PPPs is a move away from full concession and investment risk, toward public financing of capital investment with private operation and management. These contracts, which would appear to be easier to structure and manage, pose their own inherent challenges. Although under an O&M contract structure, ownership of the assets remains with the government metro authority and some or all of the operation and maintenance risk of the metro system is transferred to an O&M operator, the typical commercial incentives are not present. This is because the operator has not had a financial stake in the development of the project and its payments are normally not directly linked to the revenue received from the system's customers.

This structure also does not allow lenders to watch over the operator, which acts as a form of internal oversight. Care needs to be taken to ensure that the contractual terms avoid the potential for “asset sweating,” where the operator defers maintenance on assets to reduce costs.

Contracts can be designed to overcome some of these issues by incentivizing the operator to behave as if it owned the system. One method of accomplishing this is through a financial structure that encourages ridership, thereby creating the incentive for the operator to ensure the system's performance is attractive to customers.

Another method is through a carefully-defined regime of key performance indicators (KPIs) that covers a variety of O&M areas, such as punctuality of train services, and ensures the best use of the system's assets. Payment deductions and bonuses would be based on the operator's performance, incentivizing the desired behavior. In many instances, both of these methods (rider-ship incentive and KPIs) are used in tandem.

As MRT becomes a tool for urban expansion, it is important to take stock of its record. Understanding the importance of effectively allocating risk between the public and private parties, and developing structures that are flexible and responsive to the public's needs, will power MRTs forward in a rapidly urbanizing world. 🚆

4 HEAVY RAIL/METRO PPPs

Seoul's Metro Line 9



The Seoul Metro Line 9 Corporation developed, operates, and maintains the Seoul Subway Line 9 Section 1, a 25.5 km subway line with 25 stations. The company benefits from minimum revenue support from the government for the first 15 years of the 30-year concession. The other eight lines are publicly owned and operated. The Seoul Metropolitan Government concessioned Line 9 to a private operator to increase productivity and set a benchmark for the public operators of the other lines.

Bangkok's Skytrain



Bangkok's extraordinary levels of traffic congestion suggested that demand was robust enough to support a large, complex rail system. But debt and equity investors in Skytrain eventually suffered considerable losses when actual ridership figures fell well below preliminary estimates. Why? Poor integration with other modes of transport and difficult access to the system for users. Once these problems were addressed, ridership improved.

Stockholm's Metro



The Stockholm Metro ran successfully for years under a purely public sector model. In 1990, Stockholm Transport awarded five- to ten-year operations and maintenance contracts for its three metro rail lines, its light rail system, the suburban railway service, and commuter rail services. This approach has allowed Stockholm Metro to improve service and reduce costs through competitive tendering, and to tap into private sector expertise to chart the course for the system's next 50 years.

São Paulo's Yellow Line (Line 4)



By 2012, a critical section of São Paulo's Yellow Line, built by the ViaQuatro consortium, will be 12.8 km long. The concessionaire has spent \$450 million on equipment and rolling stock, and estimates that its total investment will reach \$2 billion during the 30-year operating contract. During the opening celebrations, officials predicted that São Paulo's urban rail network would reach 420 km by 2014. The Yellow Line was implemented as a PPP to share development and operational risks with the private sector and to reduce the state government's capital expenditure, allowing investment in other priority projects.

+2 LIGHT RAIL PPPs

Wellington's Cable Car

The Wellington, New Zealand cable car carries around 3,000 passengers each day from the Central Business District to the university and suburbs on the steep hills above the capital city. The cable car was built with private finance by the Upland Estate Company (UEC). The cable car was completed in 1902, at an estimated cost of £17,479 (equivalent to \$1.6 million today). By 1926, annual ridership was 2 million. However, by the 1940s, competition from council-run buses resulted in the purchase of the cable car by the Wellington City Council.

The Council operated the cable car for 44 years until 1991, when national legislation required council-owned passenger transport services to be corporatized or privatized. This led to the formation of the council-owned Wellington Cable Car Limited (WCCL). WCCL initially tendered out contracts for maintenance and operation to private firms. Serco had the operating contract from 1997 to 2007, and since 2007 WCCL has managed it. Operations and maintenance take place in-house.

Washington, D.C.'s Tram

For 100 years, streetcars were a common mode of transportation in Washington, D.C.—until the system was dismantled in 1962 as part of a switch to bus service. In the late 1990s, however, the city began considering a series of rapid bus, light rail, and streetcar projects. Plans for a 60 km eight-route tram network were unveiled in 2010 and three low-floor cars were purchased from Czech supplier Skoda-Inekon. The first two lines will be built along blighted commercial corridors. Initially, the system will be funded and owned by the District of Columbia Department of Transportation (DDOT), and operated by a third party. The trams will operate on-street.

In July 2012, D.C. selected a private contractor to run the first phase of its streetcar system. RATP Dev McDonald Transit Associates will be paid \$4 million a year to handle the day-to-day operations of the 2.2 miles of track along the H Street N.E. corridor for five years. The company will also oversee training and maintenance facilities. DDOT will retain ownership of the line and control fares. Construction of the line is expected to cost \$50 million and open in the summer of 2013. DDOT is considering a PPP to speed up the development of the rest of the system.

NEXT STOP: LIGHT RAIL



Where

Cities across the globe are looking to improve transportation in response to ever-expanding urban populations, and thus modern LRT systems are being introduced in many cities worldwide, often under a PPP. Over 450 systems are in operation worldwide, with many more at various stages of development. Major cities such as Paris and Washington, D.C. are building their first tramlines since World War II (see feature next page), while Asia and the Middle East are actively pursuing new systems.



What

Light Rail Transit (LRT) is an urban rail public transportation system that can be developed in stages from a tramway to a rapid transit system. It has less capacity and is slower than urban heavy rail or metro systems.



Why

By 2030, urban areas will be home to more than 4.8 billion people, making the implementation of efficient and sustainable public transportations systems more essential than ever. Light rail systems are an increasingly popular solution.

Affordable, environmentally friendly, and socially responsible LRT systems can support urban development and renewal. When well planned and implemented, they can provide vital access to city centers while helping reduce congestion and emissions, and enhance quality of life.

Electric tramways are almost certainly the most sustainable form of motorized transport available. The vehicles and tracks are easier to produce, operate, maintain, and recycle. Unlike roads, tracks have a 50-year lifespan and don't require periodic resurfacing. With all these benefits, it's no surprise that trams succeed at getting motorists out of their cars and cities on the right track.

TRAMS

then & now

Siemens & Halske opens the first electric tramway to provide Berlin's public transport services.



1881



Photo © Metro Transportation Library and Archive

1900s

For 25 years trams dominate every major city in the world. It is the "golden age" of trams.

The Great Depression of the 1930s leads to the rapid collapse of many systems. The motorbus takes over.

1930s

RAIL

World War II hastens the decline of trams but ultimately allows for their reconstruction in several European countries.



Urban planners search for ideas to save cities from sprawl and economic decline. Light rail is reborn and trams, once again, claim city streets.

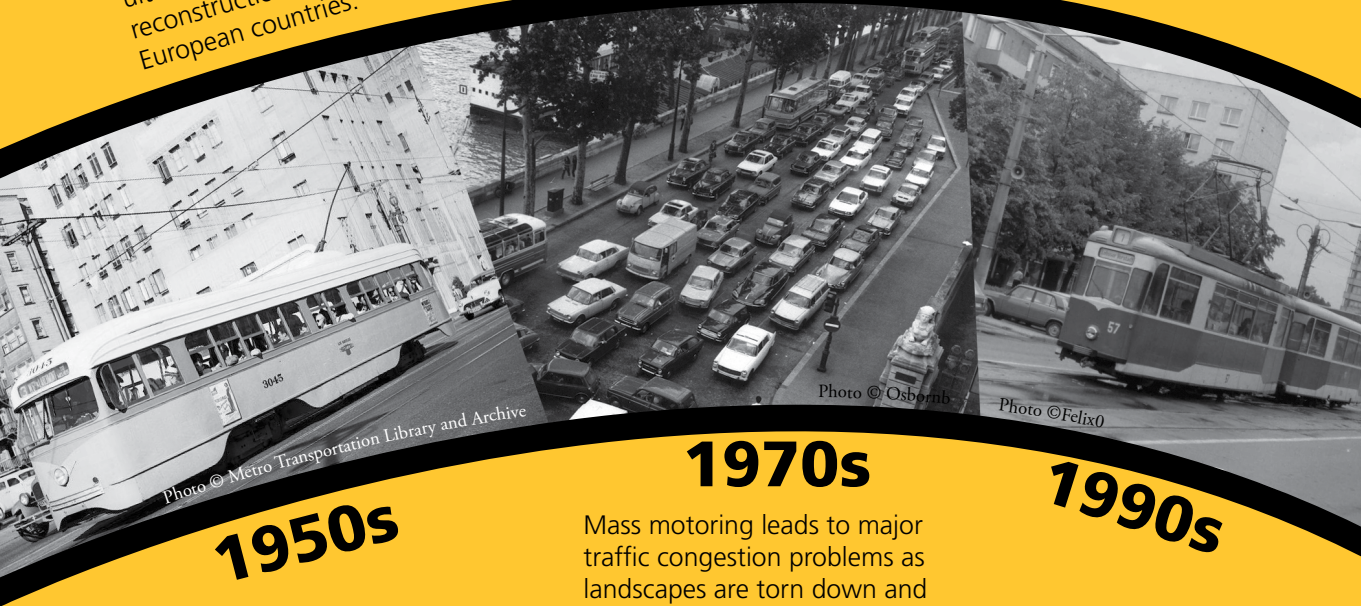


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Photo © Osborn

Photo © Felix0

1950s

1970s

1990s

Mass motoring leads to major traffic congestion problems as landscapes are torn down and city centers decline. The disadvantages of motorization start to become evident.



TRAINS OF

THOUGHT

Rail concession models in Sub-Saharan Africa

By Pierre Pozzo di Borgo

Railway privatization debuted in the late 1980s in the United Kingdom and quickly expanded into Latin America. But Sub-Saharan Africa's (SSA) experience has proven particularly relevant to development practitioners because it has taken place in an extremely challenging market environment. Most of the formerly state-owned railway companies in SSA (outside South Africa) have now been transferred to private operators under various forms of concession contract, and today more than 70 percent of the rail networks in SSA are now in the hands of private operators.

Well-performing and reliable railway operations are important for Africa's transport systems and economies. In addition to dedicated mining railways, which are used to cheaply and reliably transport large volumes of export cargoes over long distances, general freight and passenger railways also play a key role in supporting economic growth. This is even truer for Africa's landlocked

countries, which are especially vulnerable to high transport costs.

The experience of Sitarail in Côte d'Ivoire/Burkina Faso illustrates the positive impact that a well-run railway can have on a landlocked country's economy. It provides a competitive transport link between Burkina Faso and West Africa's main port of Abidjan, and its estimated



Photo © Javier Calvo

direct economic impact, comprising mostly fuel import and truck transport savings, is projected to top \$280 million between 2008 and 2017. Almost all of this impact (96 percent) is likely to accrue to Burkina Faso, and is mostly attributable to transport cost savings.

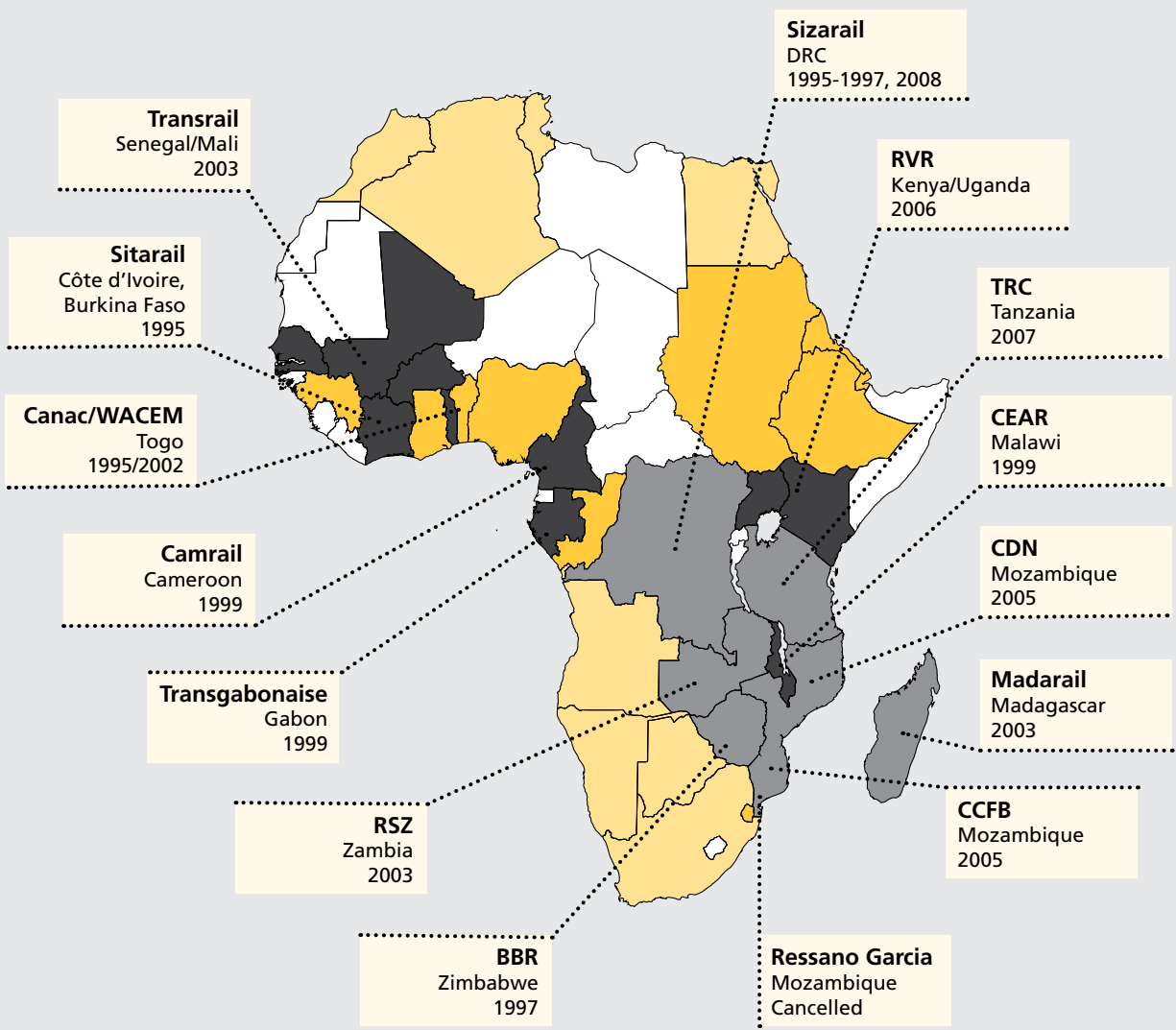
WHAT'S RIDING ON THESE RAILS?

The global performance of railway concessions varies. On the one hand, concessions have resulted in increased labor and asset productivity, higher market share for freight services, lower overall government subsidies, and improved financial viability. On the other hand, they have failed to deliver the level of private investment originally envisioned, or the expected improvement in the quality of passenger services. Overall, the expectation that concessions would achieve long-term financial sustainability without the financial support of governments has not been realized. Why is this? Theories include:

1 Overestimation of the market

In most cases, traffic gains have been much lower than expected because road competition has been fiercer than anticipated. The KRC concession contract, for example, targeted four million tons of traffic between Mombasa and Nairobi, with financial sanctions if this was not achieved. In reality, traffic increased from 2.2 million to only 2.5 million tons until it became clear that the concession contract needed to be revised. Additional capital and investment debt was required to make the rail operations financially solvent.

Host governments often did not understand the need to equalize rail/road competition, or were deterred from doing so by the prevailing political economy supporting the trucking sector. In SSA, governments originally saddled concessionaires with the cost of rail maintenance and rehabilitation, while they proved unable to modify road user regulations and taxation, making truckers



Railway operated by state railway company

PSP projects planned or underway

Part of rail network now under private management

Railway now under private management

shoulder no more than a mere portion of the cost of road maintenance.

2 Underestimation of investment needs

Plans for infrastructure rehabilitation usually focused only on the first five years of the concession, ignoring long-term needs, which proved to be far greater than anticipated. This was often a result of a downplaying of the investment needs of existing rail infrastructure on the part of the governments and private operators during bidding.

3 Under-capitalization

The capital base of concession companies was often too limited, in part to lower the risk perceptions of potential private investors. This caused many concessions to rapidly become cash strapped, as projected positive cash flows did not materialize. The long-term debt burden inherited from the on-lending of donors' money became too burdensome.

4 Unrealistic expectations of passenger services

Since 1996, none of the privately operated passenger services have ever achieved financial solvency. They have all been either indirectly subsidized by freight operations or directly subsidized by government treasuries. Although subsidization is not intrinsically problematic, analysts underestimated the political cost and

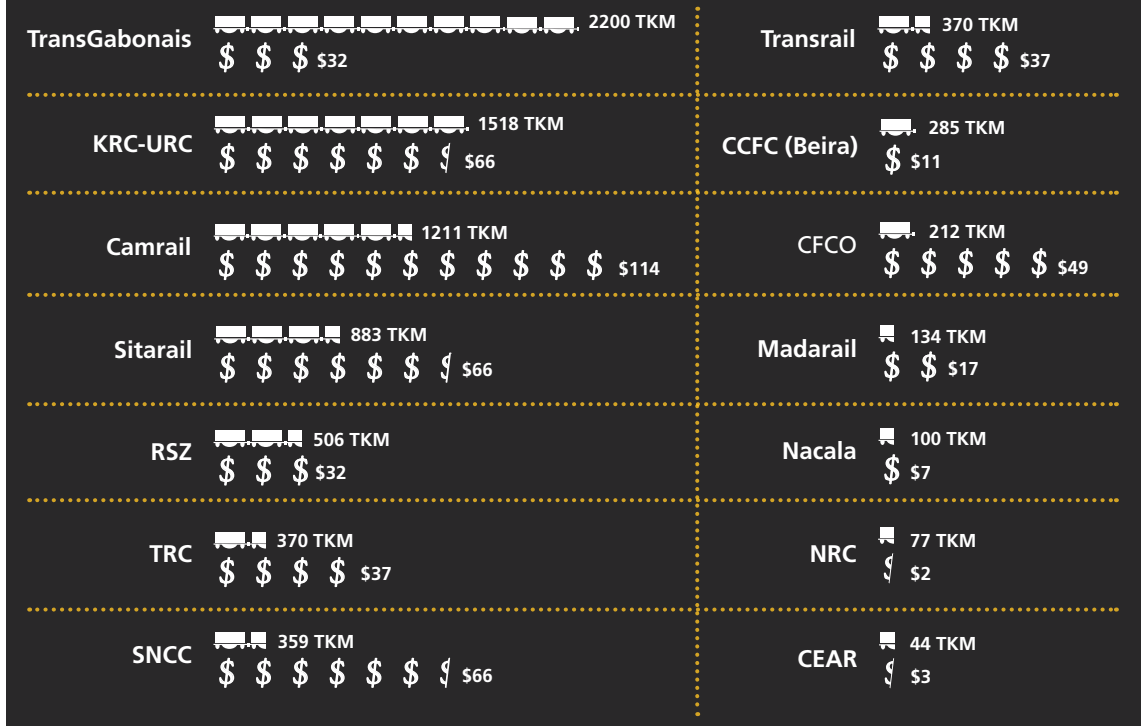
risk associated with badly crafted passenger subsidy schemes. For example, the financial impact of unpaid passenger subsidies from the Government of Cameroon to Camrail between 1999 and 2008 all but wiped out the cumulative profits generated by freight services, while representing less than 15 percent of the rail operators' revenues.

Markets served by rail concessions in SSA are usually too small to ensure the sustainability of rail businesses required to finance both rail infrastructure and rolling stock without heavy government subsidy. The average yearly revenue of most rail concessions in SSA is only \$35 million, whereas each network requires rehabilitation investment far in excess of that amount (more

Markets served by rail concessions in SSA are usually too small to ensure the sustainability of rail businesses required to finance both rail infrastructure and rolling stock without heavy government subsidy.

than \$200 million for Camrail and Transrail, according to their respective concessionaires) in the next 10 years (2010-2020).

Traffic volumes and revenues for a sample of SSA railways in 2008



All figures in millions

TKM=tonne-kilometer

Traffic Revenues

MODEL RAILROAD

Concession contracts in Cameroon and Madagascar have been successfully restructured to reflect the lessons learned since the beginning of privatization in 1996. The pillars of this restructuring include:

- Private operators taking responsibility for financing rolling stock maintenance and renewal, shouldering only the cost of track maintenance;
- Governments agreeing to finance track renewal subject to sharing profits;

- Governments committing to finance infrastructure, partially securitized by an “infrastructure renewal fee” paid by the concessionaire (which represents anywhere from 1 to 4 percent of annual revenues) into a secured account managed by it for the government;
- Concession contracts stating upfront the estimated infrastructure amounts payable for at least 15 years, so governments grasp their net commitments (after the infrastructure renewal fee, profit sharing, and other concession fees);
- Instituting intermodal competition policies to rebalance road-rail competition (for example, enforcing axle loading for trucks along competing corridors, and road tolls); and
- Separately accounting for passenger services, to reflect governments’ financial obligations to these.

While this approach is likely to ensure the success of railways in SSA, the success of concessions will ultimately be determined by governments offering private operators rail businesses with enticing financial returns. However, the financial fundamentals that have driven private investment towards the railway sector are not likely to change soon. 🚂

RAILING AGAINST THE COMPETITION

The main competitive advantages of rail over road transportation are:

- Higher transport capacity per dollar invested (50 percent lower cost per kilometer of rehabilitated rail track compared to a two-lane road).
- Higher durability (roads need complete rebuilding every seven to 10 years, versus every 15 to 20 years for rail tracks).
- Lower energy consumption and carbon footprint per ton transported (up to 75 percent and 85 percent less, respectively).
- Higher operational safety—the road accident rate per ton transported is much higher than that of rail. (For rail passengers, the worldwide accident rate is below one fatal accident per billion passenger km, versus a range of 6 to 700 for road users worldwide.)



Photo © Beyond Images/istockphoto

MINING NEW *transport* SOLUTIONS

The mining industry has witnessed many changes in the last decade, including recent soaring commodity prices fueled by high demand. The high commodity price environment has resulted in a consolidation of the sector with large private companies controlling some key commodities like iron ore. At the same time, there is an improved viability of resources that were previously considered non-viable, due to expensive transport infrastructure resulting from geographical remoteness. Developing these stranded mining resources has created a new set of logistical challenges centered on the financing, construction, and long term operations of expensive transport infrastructure.

Enabling multi-user & multi-modal systems

By Pierre Pozzo di Borgo

Many governments are trying to extract the highest possible value from their mining resources through *in situ* transformation requirements. This has resulted in a new approach to mining development from host countries, which now seek to negotiate comprehensive “mining development agreements” rather than simple “mining licenses.”

Two key issues arise around the financing, construction, and operation of this package infrastructure. First, we ask which party will be responsible for developing the mining-related infrastructure. Following this, how can the infrastructure be shared with other mining or freight users?

ME, YOU, OR THEM?

PROJECT MODELS FOR MINING TRANSPORT INFRASTRUCTURE

There are three primary models for financing and developing mining-related transport infrastructure:

Public entity: Rarely seen since the 1980s, unlikely to occur going forward.

Mining Company: The most popular model since the 1990s and the most pragmatic approach.

Third-party private sector company: Remains elusive.

PROS

- Government can choose to finance shared-use infrastructure and gain from its broader benefits.
- Project financing.
- Incentive to maintain good quality infrastructure.
- Efficiencies from an integrated value chain.
- Creates economic gains if government regulates assets as multi-modal and/or multi-user.
- Facilitates asset pooling.
- Allows the use of project financing and integrated construction management.
- Limits barriers to entry and fosters core-business competition.

CONS

- Too costly for most emerging market governments.
- Historically dependent on concessional financing. Little donor appetite now, especially for single-user projects which are commercially viable.
- Governments may lack expertise to design, build, and operate the assets.
- Creates barriers of entry for mid-tier and smaller mining companies.
- Creates unnecessary duplications in most cases if multi-modal and/or multi-user approach is not imposed by regulators.
- Can be more complex to structure and requires government PPP know-how.
- Difficult to attract strong private sector players due to market and geopolitical uncertainties.
- Requires the miner to give up some of its equity returns to the third party provider.

THE MULTI-USER APPROACH:

Can the same transport infrastructure be shared among several mining shippers?

BENEFITS

- 🚛 Creates additional revenues for the owner/operator (from other miners).
- 🚛 Fosters competition: lessens barriers of entry for other miners.
- 🚛 Creates more viable investment opportunities, which brings additional mining products to the global market.

CHALLENGES




- 🚛 Uncertainty around different stages of development of various mining projects, creating throughput uncertainty.
- 🚛 Agreement on access tariffs.
- 🚛 Agreement on transport capacity allocation.
- 🚛 This is rarely in the main mining sponsor's interest. They typically prefer to guard their destiny through dedicated transport infrastructure.
- 🚛 As more projects become viable, infrastructure needs to expand, which raises the issue of who should finance capacity expansion.

MITIGANTS




- 🚛 Infrastructure can start off as single-use and become multi-user when needed, providing upside to the initial investor based on clear and transparent access regulations and an impartial regulator.
- 🚛 Government may regulate/require multi-user access to the transportation infrastructure as part of the mining company's license/concession.
- 🚛 Adding capacity is less challenging/costly than the initial building of the infrastructure. Furthermore, traffic demand risk is no longer prominent.

THE MULTI-MODAL APPROACH: Can mining products share the same transport infrastructure with general freight products and passengers?

BENEFITS

-  Creates additional revenues for the owner/operator (from general freight users).
-  Creates incentive for the operator to ensure higher quality infrastructure due to higher usage.
-  Fosters numerous positive externalities for the host countries.

CHALLENGES

-  Difficult to project traffic from other industries/users and devise “fair” access tariffs.
Opens the door for requests from government to offer passenger services that are rarely operationally compatible with intense mining traffic.
-  Not automatically true—still need to attract strong operators.
-  Under the Third Party model, “chicken and egg” problem: an investor has to invest in customers that might only materialize if such infrastructure is in place.

MITIGANTS

-  Can only be done when infrastructure financing makes financial sense based on a few key mining customers.
Should be designed to avoid displacing mining traffic (uses extra and unused transport capacity only).
-  Mining sponsor has stronger incentive to maintain infrastructure to withstand additional traffic.
-  Programmatic approach based on trade-free zones and other economic incentives to attract third parties.



Ehoala Port, Madagascar (opened in 2009)

Construction of a multi-modal port in Ehoala.

- The port was 87 percent funded by QMM, a subsidiary of Rio Tinto, under a concession agreement.
- While the QMM ilmenite mine is the port's key initial customer, it is expected to gain other customers over time as economic activities develop. (Currently, agricultural, mining, and sea products are under-exploited due to the lack of such infrastructure.)

Aynak Copper Deposit, Afghanistan

Copper deposit with an estimated 240 million tons accessible through surface mining.

- The Aynak copper deposit was the first international, transparent, and competitive mineral bidding process to take place in Afghanistan.
- Project will provide direct employment of 5,000 and an estimated annual revenue stream of \$300 million to the government.
- It will put in place shared-use road, rail, power, and water systems.

Moatize Coal Project, Mozambique (commissioned in May 2011)

Coal mine with a production capacity of 11 million tons per year.

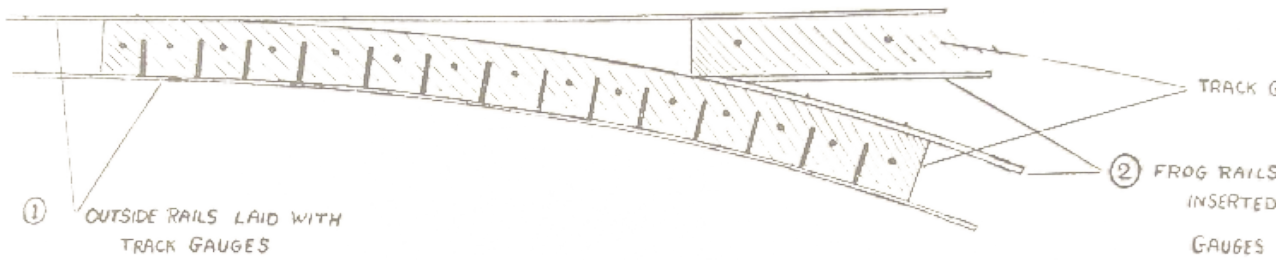
- Shipment of the coal to the port of Beira by rail. The line's rehabilitation was completed by a private sector majority consortium through a PPP with the government.
- Plans for the construction of a new rail line to Nacala port, which is expected to be shared-use and involve the governments of both Mozambique and Malawi.

Siandou Iron Ore, Guinea (under development)

Iron ore project under development in southeast Guinea.

- 600 km rail and associated port to be built to export the ore. Government will have a 51 percent stake.

Source: IFC, 2012; and Mineral Resource Tenders and Mining Infrastructure Projects Guiding Principles, World Bank 2011.



ON THE FAST TRACK

everything you've always wanted to know about railway gauges

Around the world, planners constructing new railway lines must determine what rail gauge to adopt. Historically, many different gauges have been used for a range of reasons. Although this variation has lessened over time, there remain many locations where passenger and freight rail traffic move from one gauge to another. Several methods have been developed to make these operations as efficient as possible.

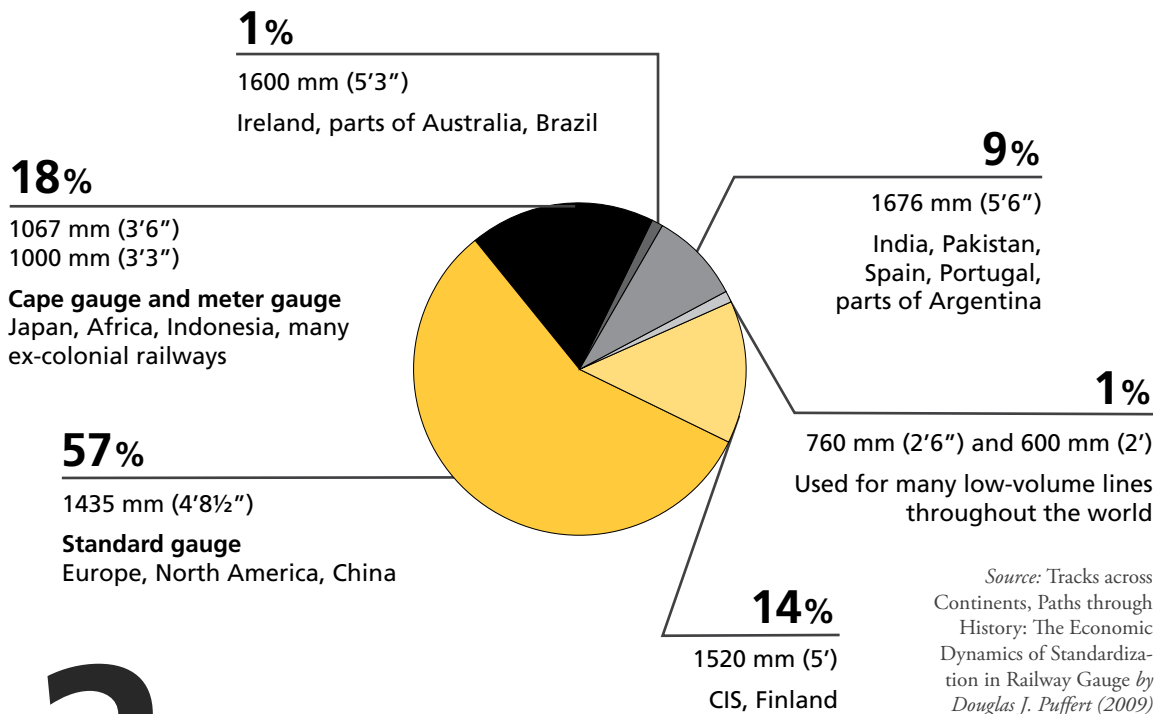
(but were
afraid to ask)

By Richard Bullock

1

What exactly is the rail gauge?

The term “rail gauge” traditionally refers to the track gauge, which is the distance between the insides of the two rails. But there are other gauges as well—principally the structure gauge, which defines the vertical and horizontal clearances around the track to allow clear passage of the rolling stock. There have been an astonishing number of track gauges used over the years, but today most fall into six groups.



2

Why are there so many rail gauges?

The first railways developed from horse-drawn wagonways, which had a variety of gauges but were typically between 1200mm and 1500mm. The “standard gauge” of 1435mm was more or less the gauge of a wagonway used by the engineers (principally George Stephenson) of the earliest U.K. railways in the 1820s. But other engineers had their own theories, generally wanting to build broader gauges to provide more stability and capacity. Many of these variations were eventually converted during the following decades. Narrower gauges, which typically permit sharper curves than the standard gauge and are cheaper to construct, were subsequently introduced as lines were constructed in hillier terrain and as networks expanded into low-volume regions.

In some cases, gauges have been considered an important element of commercial and national security. Variations in gauge between neighboring networks limited diversion of traffic and interchange of rolling stock with adjacent networks. Some countries still consider a break-of-gauge an important factor in strengthening their defenses against invasion.

3

Which gauge is the best for efficient freight operations?

The general engineering consensus has always been that the most technically efficient gauge in normal terrain is somewhere between 1500mm and 1800mm—but the gain compared to the standard gauge of 1435mm is not overwhelming. In addition, most modern rolling stock outside Russia and India is built as standard gauge, and the cost of modifying the design to a different gauge is often substantial. Finally, for those rail systems which use cape and meter gauges, change to standard gauge is more often than not hardly justifiable on economic grounds. It entails loss of interoperability with neighboring railways and complete change in rolling stock. This is usually not underpinned by significant gains in freight volume.

4

How do railways solve the problem of transshipment at interchange points?

Freight often has to be physically transhipped, either manually or through bulk transshipment facilities. Many interchange points also have facilities for changing the bogies of the vehicles while the contents remain untouched, and for short distances a wagon of one gauge can be piggybacked onto a transporter wagon. But these arrangements cost money, delay freight, and are unreliable. Another common solution has been to avoid the problem by including both gauges in the same track. Dual gauge exists over significant distances of some main lines, and triple gauge can also be found.

5

To what gauge should new railway lines be constructed?

Where new lines are connecting with a network, the cost and inconvenience of transshipment is often so steep that there is every incentive to construct the same gauge as the network it is connecting to. Where the new line is standalone (as with high-speed lines in Japan and Spain as well as the Gautrain suburban line in South Africa), however, there are strong arguments for constructing a standard-gauge line.



Speeding *toward tomorrow*

As the retrenchment continues in the public sector worldwide, private sector investors are likely to play an important role in paying for fast train systems. PPPs in France provide two potential models that could prove useful.

By Yonah Freemark

With a depressed economy and little government money available, there is increasing recognition of the potential value of engaging the private sector in infrastructure financing. France, which has recently signed two large deals to extend its high-speed rail network, provides useful examples of varying approaches to PPP contracts.

The first is the €3.4 billion Bretagne-Pays de la Loire (BPL) high-speed link, which will connect

western France to the existing northern branch of the Atlantique line with 182 km of new tracks between Le Mans and Rennes by 2016.

This PPP contract is being primarily funded by the public sector; Réseau Ferré de France (RFF), the public infrastructure owner, will contribute €1.4 billion, with state and local governments paying about €1 billion more. Thirty percent of the costs will be financed with loans by the

EMERGING MARKETS

In emerging markets, PPPs offer advantages that are not as apparent in developed nations. High growth rates mean that an investment in capital for certain projects may provide a very high return. Thus private funds assembled more quickly could result in more significant economic growth over the long term than expenditures generated from public revenues or loans from international organizations, which often require a longer development time.

Moreover, developing countries that lack public-sector expertise in rail construction can use PPPs to gain access to construction and management

tools not currently available to them. PPPs cost more than government-sponsored alternatives in many cases, but they provide an infusion of technical knowledge that may not be available without private sector involvement.

The significant growth in PPPs in emerging markets reflects this (more than \$80 billion was invested in emerging market PPPs in 2009). To ensure success, however, effective PPPs require strong legal systems, a lack of corruption, and strong enabling institutions. Emerging markets must pay close attention to these components to avoid even greater risks than developed countries if they bring in private investors without ensuring that an effective regulatory framework is in place first.

private construction group Eiffage. These will be paid back over twenty years with pre-determined fees from train operators.

Like Lyon's Rhônexpress airport rail link project, which connects the city center to the airport, this PPP arrangement essentially keeps the operations risks in the hands of the public sector; if ridership comes in under estimates, the government will have to scrounge up funds from elsewhere to pay Eiffage its due. If ridership is above estimates, RFF will profit from the PPP relationship.

ALL RAILS LEAD TO PARIS

The other French project soon to begin construction is the €7.8 billion Sud-Europe Atlantique line, which by 2017 will extend the southern branch of the existing Atlantique line 302 km from Tours to Bordeaux, bringing that city within two hours and five minutes of Paris—about an hour faster than today.

Because of the expected profitability of the line, RFF signed a concession contract earlier this year with a private consortium called LISEA, made up of Vinci construction company (33.3 percent), the Caisse des Dépôts (25.4 percent),

SOJAS investment company (22 percent), and AXA Bank (19.2 percent). The 50-year contract, which includes construction, operations, and maintenance, is the largest-ever PPP for a European rail project.

LISEA will contribute €3.8 billion to the project, with the remainder of costs being granted by public sector sources. Much of the private funding will come from low-interest, long-term loans that will be repaid through charges on trains using the line. These will eventually be passed on to ticket-paying passengers over fifty years.

Unlike with the BPL line—which limited risks of operational profitability and line ridership to the public sector—in this case, the private investors will be responsible if initial estimates fall short.

The business case for Sud-Europe Atlantique line assumes operational profitability. The international record shows that high-speed rail systems have little difficulty achieving self-support, so these are not unsound predictions. The advantage of acquiring private sector support is beginning construction more quickly by delaying public investment, and using future revenues to pay back construction costs.

The use of PPPs does not mean that the public at large will ultimately be responsible for a smaller percentage of overall costs.

It would be a mistake to conclude from these examples that private sector involvement will save any significant money over the long term for developed countries with streamlined governmental sectors. The use of PPPs does not mean that the public at large will ultimately be responsible for a smaller percentage of overall costs. PPPs typically require a higher cost of capital than public financing that may not be offset by potential efficiency gains from private sector involvement. This means that such projects may cost more to complete than those funded only by the government, and thus will eventually have to be paid off by users through higher fees.


While the taxpayer may appear to be getting a discount now by using PPPs (and indeed, some projects provide large upfront cash grants to sponsoring governments), infrastructure users will inevitably have to face the costs of future tolls. In the case of high-speed rail, replacing government investment with private financiers means higher ticket prices in the future to pay back a portion of the costs of construction. There is no free lunch.

WHO WINS?

But do the benefits of a transportation investment bring advantages to the entire public or are they reserved only to those people who use

it? Transportation economists argue for user fees such as the tolls charged to trains in the PPPs discussed here; for economists, it makes perfect sense to charge users the full cost of not only the operation but also the construction of the infrastructure they are using. (That said, many economists note that rail projects have significant positive externalities like pollution reduction and land use prioritization that demand direct grants from the government to cover some costs.)

Others, however, argue that the benefits of rail are economy-wide and that they should be paid for not only by users but by all members of the population through general taxes; therefore, charging the riders alone for the costs of capital investments would be inappropriate. Moreover, the unavoidable risks associated with PPPs suggest that any decision to incorporate private investors in public infrastructure should be approached with skepticism.

To diminish these risks, a 2011 report from the Public Interest Research Group suggested aligning “private sector incentives with public sector goals,” only pursuing PPPs “where ample competition exists,” ensuring “clear public accountability,” retaining public control over system decisions, limiting lengths of contracts, and guaranteeing transparency in the contracting process. 



Riding RUSSIAN RAILS

Public-private solutions solve rolling stock shortage

Deregulation and development of the Russian and Commonwealth of Independent States rail sector is a good example of the public sector partnering with private business in order to resolve a sector capacity issue and facilitate economic growth at the macro level.

In the 1980s, the Soviet railroad was the largest rail system in the world, accounting for half of the world's total railroad turnover. This is no surprise: given the size and the terrain of the country, rail was historically the main mode of transportation and the bloodstream of the

country's economy, accounting for the bulk of goods transport (without taking pipelines into account). But after the disintegration of the Soviet Union, the country's rail system was divided among 15 newly independent states, which included the infrastructure and rolling stock. In the end, Russia inherited approximately 1.1 million freight rail cars (1992 data), all held by the state.

During the Russian economic collapse of the 1990s, the declining cargo turnover and low earnings of the rail system led to very little investment in the replacement of the rolling stock. Just one decade after the record-breaking



statistics of the 1980s, rail traffic in Russia bottomed out in 1998. At 60 percent of the peak reached in 1988, a large proportion of the rail car fleet was now parked idle. Worse, because the cars were aging, thousands of them had to be scrapped and very few were replaced due to the lack of finance. As a result, only slightly over half of the initial number of rail cars survived through the 1990s (630,000 cars).


STARTING OVER

At the start of the twenty-first century, Russia's promising economy grew by some 7 percent per year on average between 1999 and 2008. This resulted in an increasing demand for the transportation of goods, especially commodities—which need to be moved by railcars. A lot of railcars. But the aging fleet could not meet the demand, as the state still lacked funding to quickly provide new rolling stock for the growing traffic.

To tackle the problem, Russia's government decided to turn to private finance. It embarked on a long-term rail sector liberalization program, a part of which addressed the issue of providing access to the state-owned rail track to private rail car owners and incentivizing them through the tariff system to invest in rolling stock. Spin-off and privatization of state-owned rail car operators followed suit.

The private sector responded quickly with a massive acquisition of rail cars. In 2003 the number of private rail cars in Russia reached 200,000; by contrast, at the end of 2011 this number shot up to 530,000, representing over half of Russia's 1 million strong rail car fleet. Another benefit accompanied this development: private fleets tend to be much younger and in better condition than those of the state-controlled entities. By 2010, there were a whopping 2,000 private rail car owners (leasing companies and logistics operators) in the country.

As these numbers demonstrate, the rail sectors liberalization and creation of a favorable investment environment for the private sector helped alleviate the rolling stock shortage in Russia and facilitate the economy's growth. Other countries of the former Soviet Union took similar steps to attract private sector investment in rolling stock.

But the crisis is not quite over. Having addressed the rail car availability constraints, Russia is now facing increasing track capacity shortages in certain parts of the rail network, especially in proximity to major sea ports. Cooperation between the public sector (which owns the infrastructure) and private business may offer a solution to the fixed infrastructure capacity issue, just as it helped solve the country's rail car deficit. 

Rail traffic in Russia bottomed out in 1998, just one decade after the record-breaking statistics of the 1980s.

Railroad TIES that BIND

Legal, regulatory, and policy issues that impact railways

By Victoria Delmon

Policy, planning, and regulation play critical roles in the railway sector. Following are some of the key issues that arise from the interface between the public and private sectors in railway concessions.

COMPETING ACCESS

In situations of vertical integration, where the railway operator owns the track, operates the track, and operates trains on the track, monopoly pricing can restrict access to private operators. This challenge can be managed through regulation, by requiring the incumbent to allow third party access at set rates. Not as easy as it sounds perhaps, but getting it right allows for significant growth of private sector participation, increased competition, and resulting efficiency gains.

Where a railway is being operated by a private operator, the terms for competing access will need to be specifically addressed in the conces-

sion or operating agreement. Clear requirements are critical—especially those that stipulate whether the operator is required to provide access to third parties, on what terms, and whether its own operations can take priority.

These challenges increase where there is cross-border potential (a particular issue for landlocked countries that need transit services to sea ports). Without appropriate arrangements between governments that determine the rules and costs of access for foreign operators, goods will need to be transferred from one country's train to the other's at drastically increased cost and reduced efficiency. This has been a challenge within the European Union, resulting in significant regulation that limits discrimination in cross-border access to railway track .

INTENDED USE

An obvious but critical point: government must define a railway's end-use during the concep-

tualization of new railways or the expansion of an existing one. This definition will affect specifications, which are often difficult to change once the railway has been built. For example, if government wants the railway to carry passengers, the track, route and station specifications will need to reflect this. In contrast, if the track is to be used for heavy minerals, it will need to be constructed to manage the load.

In determining capacity, governments need to predict future need and specify in the contract how to manage increases in demand.

Planning for future traffic loads is particularly important in the case of minerals transportation. Often, a dedicated track laid by a mining company is not designed to allow for increased loads from other mines or for passenger transport. If the government has envisaged shared use, then it will need to specify this before the track is laid.

If connectivity with neighboring countries is necessary, then compatible gauge must be used. Other technical standards, such as signaling and safety, should also be considered.


CHANGE IN GOVERNMENT POLICY RISK

Railways are highly sensitive to changes in government policy. Concession contracts must include robust change of law provisions and compensation mechanisms for the private investor who suffers as a result of government actions and policies that affect traffic. Examples of this could include construction of a parallel road, a new subsidy for bus routes, or a reduction in taxes for truck freight.

PUBLIC SECTOR OBLIGATIONS

Contracts must also assure investors that pre-agreed government obligations will be met on time. Timely provision of land, access roads, and connectivity to other transport modes will significantly impact the viability of railways. This is also achieved through a robust compensation mechanism and/or other remedies.

REGULATORY RISK

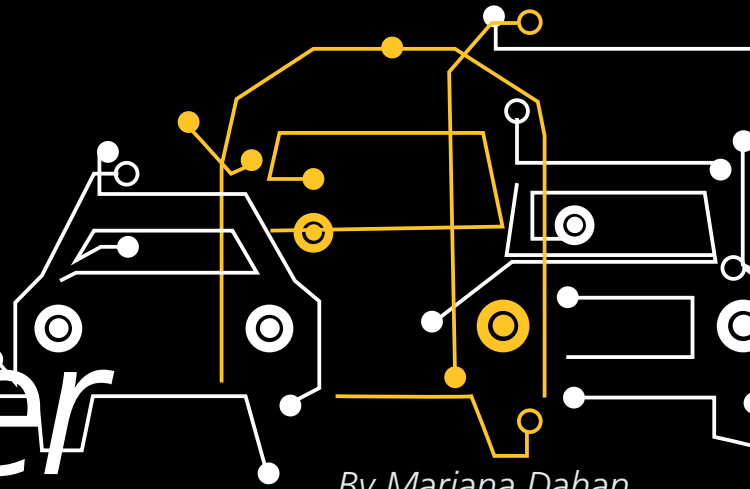
Given the monopolistic nature of public sector involvement in railways, and railways' important place in a nation's infrastructure, they tend to be heavily regulated. From an investor's perspective, it is important that such regulation is fair, transparent, and predictable. Investors will look for assurances that regulatory risk is mitigated. In particular, investors prefer to see an independent regulator—or at least one that is shielded from government interference. 

There is more discussion on railway reform and PPP in railways in the PPIAF and World Bank Railway Reform Toolkit for Improving Rail Sector Performance.

More information on legal and regulatory issues in railways, roads, and other transport and infrastructure sectors can be found at the PPP in Infrastructure Resource Center for Contracts, Laws, and Regulation:

www.ppiaf.org/railtoolkit

Moving smarter



By Mariana Dahan

Intelligent transportation systems have revolutionized all aspects of urban transportation. These systems contribute to more efficient urban transport by helping people plan trips, improving safety on high-volume traffic roads, and creating simple mechanisms for service and toll payments.

Intelligent transportation systems (ITS) debuted with in-vehicle navigation systems such as Navteq, Onstar, Navigation Disc programs, and iDrive systems, which aimed to provide safe, comfortable, and environmentally friendly driving guidance. Changes following rapid urbanization increased transport complexity and created the need for a more sophisticated tool.

The resulting ITS uses integrated systems, wireless communication, data clouds, and cloud computing to respond to the needs of individual drivers in urban settings. In addition to helping drivers, these new systems allow transportation agencies and companies to more efficiently manage their IT resources and to develop and host mobile and web-based applications.

One of ITS's most powerful tools is the ability to connect transportation devices to the cloud computing infrastructure, which allows for real-time analysis of data. To see how effective this can be, imagine these headlines: a major snowstorm hits New York City during rush hour, snaring city-wide public transportation. Not only do officials want to know where all of the buses are in the affected area, but also how many people are on each bus. Instead of relying solely on GPS data to locate each bus, the local transportation agency can obtain accurate data on the number of passengers on each bus and communicate this critical information to emergency rescue services. If the technology embedded in a standard bus—a camera, a fare collection terminal, a passenger counting device, a WiFi and GPS system—is ultimately connected to a cloud computing infrastructure, data can be analyzed in near real-time, providing realistic snapshots at any given moment.

Legislating change

The need for “smart” transport was recognized in 2010 by the European Council, European

Parliament, and European Commission, as they agreed on a pan-European Directive for ITS. The Directive means that travelers will benefit from seamless services across Europe. Also, authorities and administrations will reduce waste as network reliability and equilibrium are improved through the use of more integrated systems. Industry will also have a stable market to service, because of the new and sustained business opportunities created. Transaction systems, like integrated ticketing, road user charging, electronic fee collection, and improved traffic management and information systems will be the key to this major transition in transport.

To support better and more efficient transport decisions, more and better quality data is essential. In addition to traditional transport statistics, new ways of collecting and sharing data—for example, through crowd-sourcing mechanisms—should be combined with sound follow-up actions and enforcement policies.

Innovative approaches

Changes in the traditional landscape of the transportation industry have translated into another major shift in the development process, welcoming new actors and innovative solutions. To capture this innovation, the World Bank has initiated Transport Hackathons—a multi-month process designed to engage experts in the field of transport and urban development alongside experts from the volunteer technology community.

Hackathons represent a new approach to transportation problem-solving. In this context,

it refers to a series of events that source problem statements from citizens, civil society, and development experts; build sectoral and digital literacy for technologists and for development practitioners; develop community structures, networks and relationships; and use technology to visualize solutions. Together, these groups hack (i.e., create) rapid iterations of technical pilot solutions to conceptualize and build solutions to pressing development challenges.

The first stage of the Transport Hackathon, a Tech Camp, launched in Egypt in June 2012, and the full Transport Hackathon followed in October 2012. Overall, the event increased awareness of transport challenges facing Cairo and the impact on the city's sustainability. But personal interactions were also key. Participants acknowledged the importance of creating a network of partners that had never before collaborated—including Egyptian civil society, aid agencies, software developers, and relevant Egyptian government offices. In other words, it's a hack for the greater good—and if it results in smarter, greener growth for the transportation sector, it will be even better. ☸

Why Cairo?

Cairo's traffic costs the economy as much as \$8 billion in lost productivity, delays, and excess fuel consumption, according to the World Bank. That amounts to about 3 percent of gross domestic product, putting Cairo's rate several times higher than that of comparable cities.

LOGISTICS

Enhancing trade is the most effective way to reduce poverty at local, national, and regional levels as long as barriers to road transport are removed. After all, research has shown that road transport is a key driver of economic development, and 80 percent of world trade passes through about 30 major ports. To achieve this ultimate goal of economic development, the International Road Transport Union has focused on reopening the ancient Silk Road to trade by road transport, connecting businesses in the region to major world markets. The aim is to stimulate trade, investments, tourism, and employment in landlocked countries that are not yet benefitting from globalization.

Mapping a path **TO TRADE**



*Truck caravans transform
the Silk Road*
by Umberto de Pretto

The International Road Transport Union (IRU) has implemented several projects over the past 15 years to collect and analyze data on the impediments and non-physical barriers to trade by international road transport. Results are encouraging: in 2004, the IRU's Beijing-Brussels Truck Caravan highlighted road transport as an effective means of shipping cargo between Asia, Europe, and the Pacific. Notably, the study found that infrastructure is not a key impediment to trade. This finding laid the groundwork for more focused research.

ACCUMULATING ANSWERS

In 2007, the Black Sea Ring Highway Caravan collected further data on non-physical barriers to road transport in the Black Sea Economic Cooperation (BSEC) region—a concrete first step towards the development of an integrated road transport market.

In 2008, building on all of these initiatives, the IRU's New Eurasian Land Transport Initiative (NELTI) investigated the feasibility of Eurasian land transport for commercial goods. In June 2009, NELTI expanded possible routes to China and Afghanistan, and developed a road map to reduce the time and cost of road transport between China and Europe.

REVEALING RESULTS

IRU's NELTI results showed a high competitive potential for the development of alternative trade routes, but revealed that 40 percent of road

transport time along the Silk Road is lost due to inappropriate border crossing procedures—not to ineffective infrastructure (the common misconception). Additionally, some 25 percent of transport costs were due to payments and levies, both official and unofficial, paid by drivers at borders.

Confirming this, the Economic Cooperation Organisation (ECO)—IRU Silk Road Truck Caravan travelled from Islamabad to Istanbul in 2010 to collect data on border waiting times, customs procedures, and road charges. Research clearly demonstrated that most barriers stem from the inefficient implementation of key UN multilateral trade and road transport facilitation instruments. ECO followed up in 2011 with regular monitoring of trucks, which proved 30 percent of transport time is lost at ECO borders and “unofficial payments” account for 28 percent of transport costs.

IRU's efforts to revitalize the Silk Road point to the need to streamline border crossing procedures by ratifying and strictly implementing UN multilateral trade and road transport facilitation instruments. This action will significantly reduce transport times and costs, and greatly enhance road transport efficiency without further infrastructure spending. ☸

This article was made possible with the help of Virginia Tanase, Senior Transport Specialist in the Transport, Water, Information & Communication Technologies Department of the World Bank.

BROWN

is the new green

UPS's sustainability initiatives set new standards for logistics operations

Scott Wicker, UPS's Vice President of corporate plant engineering, was named the company's first Chief Sustainability Officer in 2011. Wicker has been deeply involved with the advancement of sustainability at UPS for several years, establishing a dedicated engineering group that manages global sustainability data for reporting. His team oversees a cross-functional Sustainability Working Committee and a Sustainability Directors Committee that establishes key performance indicators and goals for the company.

Interview by Alison Buckholtz

How did UPS come to focus so aggressively on sustainability?

UPS's activities to mitigate its environmental impact have been going on for many, many years—long before the term “sustainability” entered the mainstream. This is because we have always been a company focused on reducing the energy it takes to deliver packages and provide logistics services. When you begin to focus on being more energy-efficient, as well as using a sustainable source of energy, you really start to reduce carbon. Reducing carbon is directly related to burning fossil fuels, which we do a lot of—after all, we have about 100,000 ground vehicles on the road everyday in over 220 countries around the world. We have a sizable

environmental impact as a result of our high energy usage—we've always been focused on reducing that energy.

So becoming “green” isn't a recent decision?

No. One of the key things that makes sustainability work at UPS is that it is integrated into our business model. It cannot be something a company does “in addition to” its regular business. Since UPS was founded on very strong industrial engineering principles, we have always been focused on trying to make our network more efficient. Sustainability at UPS is about improving our environment and social impacts while keeping a keen eye on the economic side

of the business, and making sure the company remains prosperous. We are always balancing the three. This focus on the triple bottom line defines sustainability for us.

What is the connection between logistics and sustainability?

Our logistics service is about moving goods from point A to point B in a very efficient manner—and the amount of carbon we emit is reduced by having an efficient, optimized and integrated network. You might be shipping materials to another part of the world, moving goods to manufacturing facilities and back out to distribution centers, and on to ports around the world before these goods ultimately reach customers. The transportation piece is where the majority of the greenhouse gas emissions occur, so reducing the carbon associated with those moves is critical to sustainability.

How much of UPS's sustainability effort is in response to customer demand?

Our customers started to come to us five or six years ago wanting to know the carbon output associated with the goods that we moved for them, so we had to get better and better at calculating carbon footprints and understanding exactly how we were burning carbon throughout our distribution network. As the customer requests became more prevalent and detailed, we had to move away from spreadsheets and automate. We built our own carbon calculator with all the relevant information. For example, if you

ship a package from Atlanta to L.A., it tells us what type of vehicle was used for each segment of travel so we know how much fuel was used; it can account for which facility it went to, and the carbon footprint of the facility; and what mode of transport is used, whether train, plane, truck, or ship. All this information is critical to providing our customers with the data they demand.

What's your advice to companies or governments that want to increase their sustainability efforts in the transportation sector, but don't know where to begin?

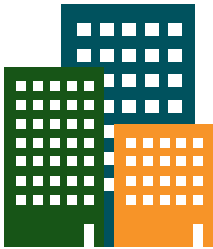
It is about knowing your data. If you are looking to become more sustainable, you have to understand your impact: your environmental impact, your carbon footprint, and other impacts such as water and air pollution. If you don't know it, then that is where you start to figure out where you stand. At UPS, our model is to measure, manage and mitigate. If you measure your impact, then you can manage and mitigate to improve the situation. If you have rock solid information you can build from there. Our whole sustainability program came from that sound understanding, and having accurate data.

Second, in the sustainability space, transparency is extremely important. In our sustainability report, for example, we are trying to meet the requirements of the global reporting initiative and we are trying to lay out the information that our stakeholders are looking for. We have to tell our story. Do not underestimate the importance of telling your sustainability story in a very transparent way. ☼

How UPS does it

Safety

Safety Telematics improved seatbelt adherence by 95 percent and ensured that bulkhead doors were closed, an 81 percent improvement.



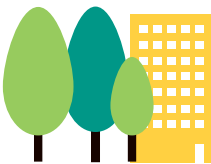
Improved Stops per Mile

Improved stops per mile saved 5.3 million miles of driving, which equate to approximately 528,000 gallons of fuel.



Alternative Fuel and Technology Fleet

A "rolling laboratory" of more than 2,500 alternative fuel/advanced technology vehicles, including electrics, electric hybrids, hydraulic hybrids, and natural gas (propane, LNG, CNG).



ORION

We've begun implementation on our On Road Integrated Optimization and Navigation ("ORION") system, which employs advanced algorithms to determine the optimal route for each delivery while meeting service commitments.

UPS Smart Pickup™

UPS Smart Pickup™ is a scheduled pickup option that automatically notifies a UPS driver when you have processed a shipment. By requiring UPS to come only when a package is ready to ship, customers help save fuel and reduce emissions.





Avoiding Left Turns

No left turns. Less engine idle time.
Safer crossings. Higher MPG.



Sensors & GPS

Sensors throughout our vehicles generate data that help us plan smarter routes—and help our people learn more fuel-efficient driving techniques. Each night we upload the day's driving data to look for the next opportunity to get more efficient, and for vehicles that need maintenance to keep running clean and safe.



Results

Greenhouse Gas Reduction

UPS uses proprietary IT and engineering technology extensively to reduce greenhouse gases.

Telematics Outputs

Telematics outputs combine maps of routes derived from GPS data and detailed reports on driver behavior. These and other outputs drive our planning, training, and maintenance activities.

Mileage Reduction

Telematics helped UPS avoid 5.3 million miles of driving in 2011. Routing technology provided an avoidance of more than 85 million miles of driving, which equates to almost 8.4 million gallons of fuel.

Fuel and Emissions Efficiency

UPS uses telematics extensively to increase miles per gallon and reduce greenhouse gas emissions. Reduce idling in 2011, drivers with telematics-equipped vehicles cut 98 million minutes of idling time—saving more than 653,000 gallons of fuel.

Operational Improvement

Even tiny operational improvements from telematics data can cut millions of miles from the total. Data is captured on 200 elements including speed, seatbelt use and engine idling. This information and driver coaching reduces fuel consumption, emissions and maintenance costs while improving safety. And, customers experience more consistent pick up times and more reliable deliveries.

Courtesy of UPS

LOGISTICS



Yossi Sheffi is Director of MIT's Center for Transportation and Logistics, Director and Founder of MIT's Master of Engineering in Logistics program, and Elisha Gray II Professor of Engineering Systems. He is an expert in systems optimization, risk analysis, and supply chain management, which are the subjects he teaches and researches at MIT. He is also an active entrepreneur and has founded or cofounded five companies since 1987. His new book, Logistics Clusters: Delivering Value and Driving Growth, was published by MIT Press this month.

Interview by Alison Buckholtz

fueling TRADE

Logistics clusters redraw the transportation map

In your new book, you write that governments can support logistics clusters through investment, regulation, and trade policy. Is this true in every case?

The role of government, most of all, is development of the infrastructure. Then there's a question of attracting businesses, and the theory is that to get this flywheel moving they provide tax and regulatory relief. Of course, there are all kinds of logistics clusters, and some of them just need government to get out of the way. But in general, governments that have a more accommodating trade policy, governments that don't raise all kinds of tariff and non tariff barriers, will promote and support trade. Everything governments do to support trade will in turn impact the flow of goods in and out of the country. And once the cluster starts growing, it feeds on itself. This is true of every kind of cluster, but

it's especially true for logistics clusters. It's an ecosystem based on a positive feedback loop: The more it grows, the more it's beneficial to all of its residents, and as a result it grows even more.

How important are public-private partnerships?

These partnerships are at the crux of a logistics cluster. The main difference between a cluster that's successful and a cluster that's not is this alignment of the public and private sectors. We're not talking about just one public sector: I'm referring to city, county, state, and regional governments, labor unions, chambers of commerce, etc. When interests are aligned, logistics clusters flourish. For example, in Memphis, the mayor and the governor will drop everything to help FedEx bring new business in. Zaragoza, Spain, is an even more striking example. It started as a brownfield and is now the largest logistics park in Europe. It was extremely suc-

successful because the government got everybody involved: national, state, and city government, opposition parties, labor unions, and all elements of civil society. This is a striking case of everybody working together and it's a huge success.

Are logistics clusters always, necessarily, transportation hubs?

Yes, because a lot of freight is coming in and out of the cluster. As the cluster grows, transportation companies have high utilization of the equipment, and they can use bigger trucks, or long trains that are very efficient. This is due to two phenomena in the economics of transportation. The cost of moving a conveyance, say, a truck, really depends on how much the truck is loaded, so of course if it's fully loaded and the utilization is high, it costs less per pound to move the freight. That's true in almost every mode of transportation. In addition, the cost of moving a conveyance does not grow linearly with the conveyance size. If the truck is twice as big, it doesn't cost twice as much to move it. So it is a lot more efficient to move larger conveyances. The result is that the more flow that comes in and out of a cluster, the lower the transportation costs.

How does this affect service?

Service improves tremendously with efficient transportation because you get more frequent departures and arrivals, and no one has to wait as long. Since the costs are lower, and the service is better, this attracts even more companies. Furthermore, as more freight is available in the

clusters, more destinations are serviced directly, improving the service even more. This is part of the positive feedback loop that's unique to the growth of logistics clusters.

What else makes logistics clusters different from industrial clusters?

In general, logistics clusters exist in mode-changing places: when you go from ship to airport, rail or ship to truck, airplane to truck. So intermodal yards are very important for logistics clusters. Intermodal yards exist in almost all the big logistics clusters. This has to do with the economics of transportation: when you move long distances, you want to move in very large conveyances like a mile-long train or a huge ship. But then you have to distribute the shipments. You can't bring a mile-long train into the heart of a city—you need trucks, sometimes small trucks. So you want to position your distribution centers as close to the urban areas and the retail stores as much as you can. Intermodal yards can get the full container from the ship to the heartland, close to urban centers. If your intermodal yard is located strategically like this, then within one day of trucking from some of the U.S. logistics clusters in the South and Midwest you can get to tens of millions of consumers. Within two days you can get to more than 100 million consumers from most of these clusters.

How are logistics clusters mitigating their environmental impact?

Some of the best logistics clusters, like Los Angeles, Singapore, and Rotterdam, have become

hubs of environmental sustainability and innovation. They use hybrid and electric trucks and all kinds of other means to reduce the impact of logistics activity on the environment around them. Singapore and Rotterdam are centers for alternative fuel. Precisely because these areas have a concentration of possible pollutants from noise and congestion, they have become hubs for environmental innovation. Now, some of the most promising trends in environmental sustainability are coming from the logistics clusters. After all, one of the challenges for a logistics cluster is to be a good neighbor, to do all it can to reduce the carbon footprint of the operation.

Which areas are on the cusp of becoming successful logistics clusters?

China is investing mightily in logistics clusters as well as lots of transportation infrastructure, and in Asia, Singapore has always invested in logistics clusters. In Europe, Holland, Belgium, and the Ruhr area of northern Germany near the Dutch border are all significant logistics clusters. In fact, the German government is now investing in logistics clusters alongside the usual high profile areas such as biotechnology and nanotechnology. Germany wants to be a center of logistics for all of Europe, so the German government put logistics at the same level of all these new, sexy industries. The important point here is that logistics clusters, by offering low transportation and distribution costs as well as a high level of service, are becoming crucial nodes in the global supply chain. ☼

THE *what & where* OF LOGISTICS CLUSTERS

what?

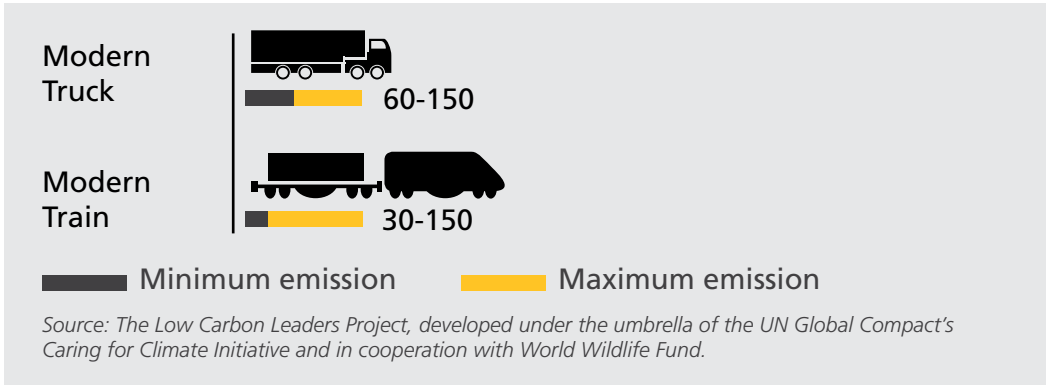
A logistics cluster is a geographical agglomeration of logistics-intensive operations. It includes mainly three types of companies: (i) logistics services providers, such as transportation carriers, warehousemen, and forwarders, (ii) the logistics operations of industrial firms, such as the distribution operations of retailers, and after-market parts suppliers, and (iii) manufacturing and headquarters activities of companies with logistics-intensive operations. In addition, such clusters include supply chain management facilitators such as customs brokers, and specialized consulting and IT providers, as well as academic and research institutions dedicated to logistics.

where?

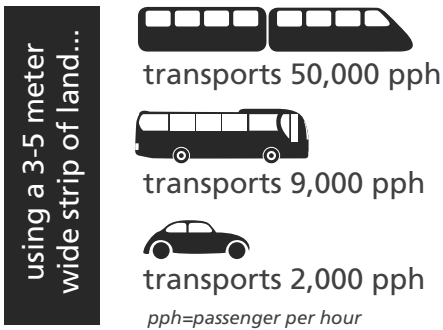
Logistics clusters are located strategically to enable efficient transportation and delivery services to large populations. Typically, they are positioned in mode-changing locations such as busy seaports (Rotterdam, Shanghai, Los Angeles), airport hubs (Hong Kong, Seoul, Memphis) and major intermodal yards where freight shipments transfer from railcars to trucks (Chicago, Dallas, and Kansas City). Some of the world's largest logistics hubs, including Singapore, São Paulo, and Memphis, bring together multiple elements at once: mode-changing services, distribution to nearby populations, and transshipment services.

FAST FACTS

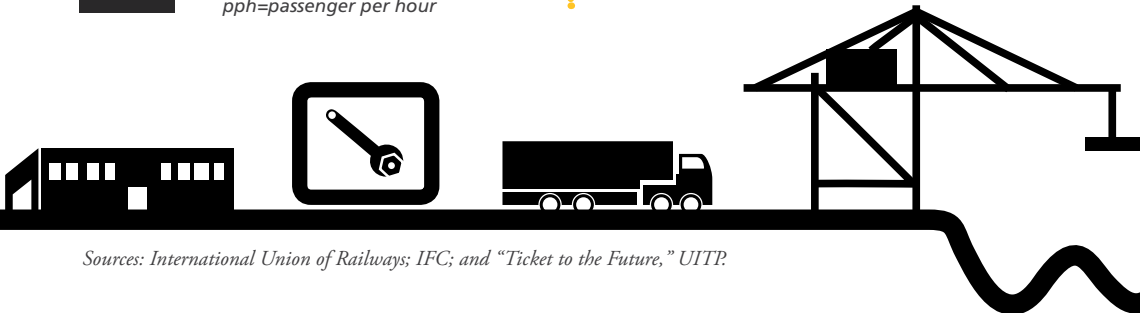
CO₂ (in grams) emitted per metric tonne of freight per km of transportation



Rail travel releases **3-10** times less carbon dioxide between than driving or flying.



1,000,000,000
number of people who do not have access to an all-weather road.

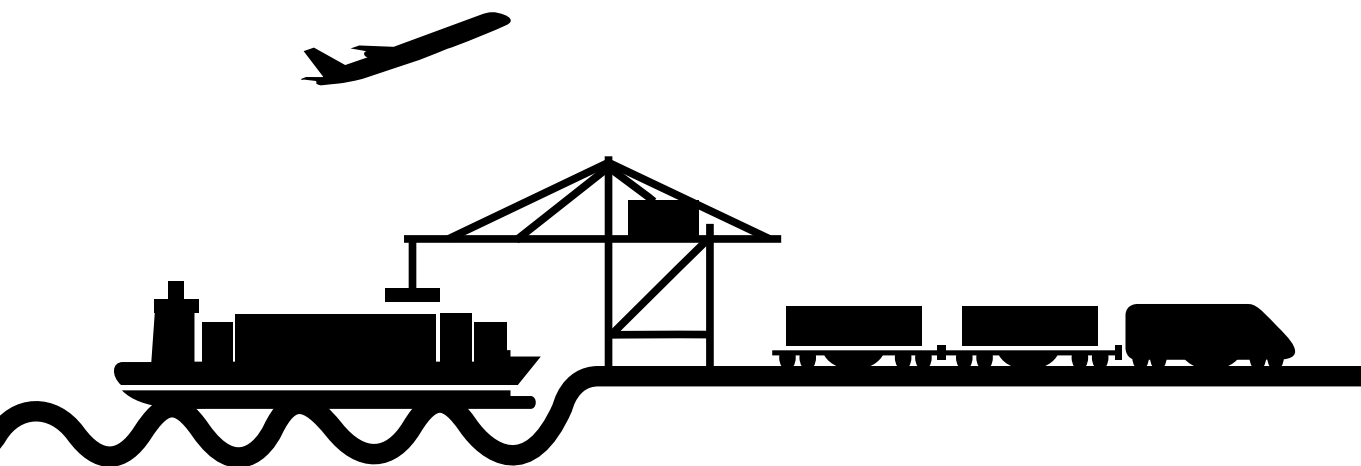


Sources: International Union of Railways; IFC; and "Ticket to the Future," UITP.

On traveling:

“ I think the only worthwhile way of doing it is the old laborious way of traveling over land, on the road. You really need to be insulted at the border and get in a ramshackle bus or train and travel on. Because that’s how people really live.”

—Paul Theroux on “Studio 360”
June 2012



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