Metro
of the METR

White Book
on the Future
of Mobility
in the METR
Region

Metro

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on the Future
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of the METR

Middle East
Europe
Turkey
Russia

MIR INITIATIVE

Коммерсантъ

Igor Ivanov

President, Russian
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Foreign Minister,
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1998–2004

Secretary, Security Council,
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2004–2007

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To the Reader

It would not be an exaggeration to say that all of humanity's history, stretching back to the distant past, has been shaped by the development of transport. The first cities arose, nations formed, and civilizations flourished along navigable rivers and on caravan routes, in mountain passes and sea straits. The bitter struggle for control of transport routes often led to bloody wars, and changes to the geography of main trade routes drastically shifted the balance of power in international relations.

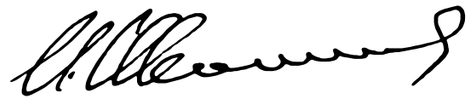
Now, in the 21st century, the importance of transportation-communication networks has increased even more. In today's global and interdependent world, the exclusion of a country or region from the international transport system almost inevitably leads to economic and social hindrances, preservation of archaic social and political practices, and ultimately to the rise of social and political instability. The unevenness and imbalance in individual regions' development are caused to a great extent by the unequal access of various countries to modern transport infrastructure. Unfortunately, "mobile inequality" continues to grow on our planet, creating new risks at regional and global levels.

The METR region — the Middle East, Europe, Turkey and Russia — offers a prime example of the importance of overcoming "mobile inequality" in the modern world as quickly as possible. This region is characterized by obvious disparities in the development of transportation-communication routes, clearly outdated and flawed geography for transport flows, and the absence of a unified system of standards and mechanisms that could regulate transportation-communication infrastructure. Without a doubt, the resolution of transport problems in the METR region would make an invaluable contribution not only to expanding trade and economic development in METR countries, but also to widening regional stability, overcoming mutual fears and suspicions, and preventing political radicalism and extremism.

That is why the projects and ideas developed by the MIR Initiative in the pages of its white book "Metro of the METR Region" provoke so much interest. The authors of the white papers — representatives of big business, experts, public figures and politicians — are united by their desire to take a fresh look at the problems of the Eurasian continent, to get away from stereotypes and ideological dogmas, and to offer their vision of how to achieve sustainable growth, social stability, and security in one of the most complex and "problematic" regions of our planet.

Probably, someone will think that the plans and projects in the white book are too radical or that they are even fantastical and too far from today's reality.

But we can assume that more than 2,000 years ago, the idea of the Silk Road also seemed an unrealizable fantasy to most of the contemporaries of the dreamers and adventurers who were laying the first transcontinental traffic artery between East and the West on the Eurasian continent. Nevertheless, the Silk Road became a reality, and its implications for trade, cross-cultural interaction, and the development of science and art in the ancient world cannot be overstated. So why should we, the people of the 21st century, set ourselves goals any less ambitious than our distant ancestors did?



Piero Fassino

Mayor of Turin

New forms of transportation are changing the world's geography

President, National Association of Italian Municipalities

National Secretary, Democrats of the Left
2001–2007

Justice Minister, Italy
2000–2001

Foreign Trade Minister, Italy
1998–2000

Metro of the METR

In the European Union, the nine priority corridors of the TEN-T network are creating for Europe's passengers a kind of Continental Metro, a "Euro Metro," with European cities as stations. This is allowing a new relationship system for trade, knowledge and circulation of people and ideas.

These connections also link seaports, airports and intermodal centers, building an inland logistics network from north to south and from east to west, that connects the seas by crossing them with major routes and overcomes mountain barriers by crossing them with tunnels.

Italy is playing a major role in this project, since four of the nine corridors will pass through its territory. This is not a mere technical modernization of existing routes aimed at conforming transport supply to the traffic demand in EU countries. It is a means of European integration through the construction of its most basic levers of functioning: the circulation of people and goods.

Being both Italian and Piedmontese, I feel obliged to recall the lessons of Cavour. In 1846, 15 years before Italian unification, Camillo Benso, Count of Cavour, published in the Revue Nouvelle in Paris a design for a national railway network at a time when Italy was still divided into several small states, mostly in conflict with each other, without any trade that could justify basic infrastructure investments according to a cost-benefit analysis as we would define it today.

As a matter of fact, Cavour did not intend to answer to the (non-existent) traffic demand, but he aimed to build, through transport, a new political-institutional reality, the unified Italy, and a new unified market, which could generate opportunities and trade unthinkable until that moment. While he was thinking about the national railway network, several decades before its realization, he had already planned the fundamental connections across the Alps of Moncenisio, Gotthard and Brenner.

The TEN-T, or Trans-European Transport Network, now is presenting on a continental scale a model similar to the one depicted by Cavour on a national scale nearly 170 years ago. It identifies material and immaterial communications and transports as drivers of integration and construction in the new Europe, and thus the construction of a large new market, internally unified and open to sea and inland connections with the rest of the world, close and distant, with particular attention to Eurasia.

Trade perspective is indeed growing in scale, and it is first of all influenced by the new role of eastern Europe and the Far East. The present and future realities are represented by relations between East and West, from the Atlantic Ocean to the Pacific Ocean, repeating in a modern interpretation the Silk Road, from Beijing to the Atlantic. The Mediterranean area plays a crucial role in this context, and in particular Italy is the pier of Europe, thus being the historical mediator for Europe with the East and North Africa.

The MIR white book — in which the term METR stands for the Middle East, Europe, Turkey and Russia — outlines this new perspective that is relevant not only from a commercial transport point of view, but mainly because of social, cultural and political reasons.

This new Silk Road running from China through Russia, the Caucasus, Turkey, the Middle East and the Balkans, will not stop in Venice. Passing through Turin, it will link all of the Mediterranean corridor cities up to the Iberian Peninsula, to Gibraltar, with a study of the underwater connection with African countries. In this way, there is a new relationship system with the Eurasian cities of both the new and ancient Silk Road.

In a globalized world, and during the short processes of our continuous evolution, cities are again a point of reference, a fundamental historical legacy that had dimmed during the period of triumphant national states. Today we are rediscovering the fundamental role of cities. They guarantee people a sense of belonging to a real community and at the same time are symbols of larger territories. Without the lighthouse of their capital city illuminating them in the collective imagination, these larger areas would have difficulty finding their place in the general competitive arena.

Cities not only have irrepressible needs and their own local values in a globalized world, but they also can be the main characters in major "glocal" processes, in which local and global regions coexist. Transportation and major transnational routes are like necklaces: They link together separate jewels, just as transport routes link cities distinct from each other in art, history, vocation, culture, and society.

Ultimately, European and Eurasian corridors need the active, conceptual and proactive involvement of the cities that define their routes. For this reason, the New Silk Road invites cities on its itinerary to become permanent forums for the promotion, direction and development of the interests of local communities, without localisms but aware of large contemporary challenges.

Azer Mursaliev

Editor in Chief, Kommersant
Publishing House

The Spirit of Mobility

Metro of the METR

The METR region — the Middle East, Europe, Turkey, Russia — is going through difficult times. The Arab Spring, which gripped much of the Middle East, has developed into a protracted war in most of those Middle Eastern countries, and in some places the conflict has taken on an ethno-religious nature. Relations between Europe and Russia, which have been developing successfully for the last quarter century, now have turned extremely complicated, reaching perhaps their lowest point in that timeframe. Reciprocal sanctions, fault-finding, mistrust and wariness are poisoning those relations.

Yet, no matter how events unfold, the countries of this vast region are fated to be neighbors, to have mutual interests and to collaborate with one another. Economic interests, a shared history of 3,000 years, and cultures and religious beliefs stemming from one set of roots: These factors make it unavoidable that the METR countries will gravitate toward one another.

The Roman Empire and the Byzantine Empire and its successors, the Ottoman and Russian empires, each integrated the METR region according to their own systems of values and laws. After a pause during the so-called Dark Ages, contacts among countries and peoples of the region then intensified in the later Middle Ages. By no means did these contacts always occur in the form of armed conflicts, military campaigns or conquests. European intellectuals, including future popes, studied in Moorish universities in Spain. Several centuries later, young people from Russian and Muslim regions hurried to Europe's universities, while professors and experts from France, Germany, the Netherlands and Italy went to Russia, Turkey and the Middle East to share their knowledge and skills.

Most of all, merchants and traders — long before soldiers, students, pilgrims, or scholars — have been paving new routes since ancient times. They were the first to bring new goods and knowledge, expand horizons, overcome xenophobia, and strike up initial contacts, thus starting dialogues between great cultures.

From the East to the West and the West to the East, and from the North to the South and the South to the North, caravans came and ships sailed. The fog of ignorance was clearing away. Blank spaces took on the contours of new lands where, instead of monsters and cannibals, Cyclops and the people of Gog and Magog, there were completely ordinary people, albeit speaking a different language, wearing unusual clothes, and having hair and skin of a different color. But they felt the same love and hate, duty and honor, generosity and greed, curiosity and ignorance. While getting to know these foreign peoples, the travelers learned about themselves as well.

Apparently, it is no coincidence that world religions appeared and developed in this very region, religions that refused to divide people into tribes and castes. It also is no coincidence that the universal ideas of modern times — socialism, democracy, liberalism — originated and developed here.

Regardless of ideology, religion, or even the ethnic groups populating the METR region, a sort of system of relations formed here and has remained, unwavering.

The Middle East, for example, has always gravitated toward the North, namely, toward southern Europe. Just look at Libya and Morocco: These African countries have much more in common with Spain and Italy than with Chad and Nigeria.

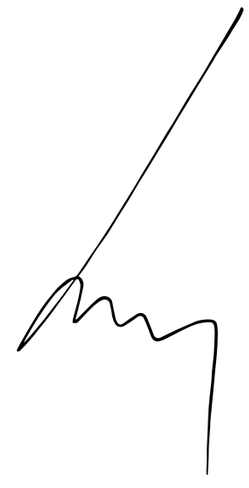
Russia and Turkey, the only countries located in both Europe and Asia, have maintained their traditions, but they have never been willing to give up their "European vector," not even during periods of prevailing anti-Western sentiment.

Relationships among the region's individual areas have experienced various periods. There have been periods of love and adoration, as well as those of hatred and anger. There have been periods of intensive construction of roads and supply connections, and those of defensive walls and "iron curtains." Common interests, however, remain the same, including economic interests.

The METR region is changing rapidly. It's difficult to say what the result of today's changes will be. Even the territorial future of the region is uncertain:

It is unclear whether existing states will remain within their present borders. Meanwhile the Arab world is on fire, with hundreds of thousands of people fleeing war and heading to the North. Northern countries are trying to reinforce their borders in order to stop the waves of refugees; they are discussing a tightening of immigration laws.

The possibility of building new dividing walls and "curtains" in the METR region is already under serious discussion. Yet, sooner or later, the walls collapse, the curtains fall. The roads are repaired, made more modern, and become faster to travel. And we get closer and closer to each other.



Ernest Sultanov

Coordinator, MIR Initiative

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Silk Road to the Future

The hallmark of any civilization is its creation of a fundamentally new system of mobility. The Romans built types of roads that no one had constructed before. The Venetians, the Portuguese, and the Spaniards opened and paved transoceanic highways. The Tatars created a transcontinental postal system. The Ottomans organized caravan routes and created an efficient infrastructure of ports and logistics. As a rule, the more effective a civilization's system of mobility is, the more maturity and stability the civilization has.

Mobility has many characteristics, but from my point of view, its transport and socioeconomic components are the most important in this palette. We can constantly see their interconnection in our daily lives. One person spends 10 minutes to get to work, while another needs a couple of hours. In this case, the person who spends a lot of time commuting is under constant stress due to lack of sleep, fatigue, the threat of showing up late to work and getting sacked. Often it is difficult to find a better-paid and promising job because of low transport mobility.

Without transport mobility and social mobility, conflicts within a society, unfortunately, often turn antagonistic, and it is impossible to resolve them within the framework of ordinary negotiation processes. Then revolutions and wars "suddenly" appear. Suffice to recall that the Arab Spring began with the self-immolation of a young man: He had no opportunity to move, and his small business had been taken away.

The risk of socially unacceptable behavior is usually in inverse proportion to the level of socioeconomic, transport and communication mobility — in other words, the more developed the mobility system of a region or a country, the less likely it is to see a crisis or conflict break out. Europe has overcome the risks of internal armed conflict to a large extent by creating and constantly developing its pan-European metro, the Trans-European Transport Network (TEN-T).

It's this image of an integrated transport network that unites, in one way or another, all the texts of this white book, which we have titled "Metro of the METR." A metro system, which is an integral part of all major cities and thus of modern civilization, is perhaps the best analogy for an integrated and interdependent system of all "stations and lines" in the METR region, or the Middle East, Europe, Turkey and Russia.

The METR acronym has a very important and mysterious component. Europe is only the western part of the Eurasian continent. Russia and Turkey, due to geographical and historical reasons, are the only two Eurasian powers in the world. And the Middle East is not only the region where the idea of a common Eurasian destiny was conceived, but also where Alexander the Great, along with Aristotle, made the first attempt to bring it into existence.

On the other hand, the existence of variations of the legendary Silk Road for hundreds or perhaps thousands of years has served as a symbol of the practical capability of maintaining — no matter what! — profitable pan-Eurasian cooperation in trade and economics.

The ultimate goal of "Metro of the METR" is to conceptualize the future of a single transport system for this key region based on the views and experiences of various national and international players. Naturally, this concept also includes a range of issues concerning the functioning of transport corridors, the future of logistics and related manufacturing, and the integration and competition in the sphere of passenger and freight transportation. Exchanging ideas about solutions to regional and national transportation problems is necessary if we are to obtain true sustainability, both from an environmental point of view and from the view of systemic development within the METR region.

Therefore, in this white book, we discuss the prospects for developing not only future infrastructure and industry, but also architecture, transportation corridors, and logistic services. To that end, executives at major international companies in the transport industry, along with lawyers, bankers, environmentalists, politicians and visionaries, all are taking part in this project.

Actively discussed in this white book are the many mosaic pieces of various transport corridors — corridors that will undoubtedly determine the geography of trade and manufacturing in the next decades. That new geography is taking shape not only in the METR region, but in other Eurasian capitals as well.

Elements that right now are shaping the success or failure, the competitiveness or non-competitiveness of specific routes include the physical condition of infrastructure, as well as the level of access to information and financial services, the existence of technical and legal tools, and the presence of educational and environmental standards. Many of these details are addressed and discussed in our white book.

At the same time, it becomes possible to find, via this project, optimal answers to the expanding variety of political, economic and social challenges faced by METR countries. This project combines a number of concrete and specific projects that are cost-effective and needed by countries, cities and people. For example, the integration of existing transportation and infrastructure solutions with the IT system can make the lives of tens of millions of people significantly easier.

Representatives of the People's Republic of China are involved in "Metro of the METR." This is an significant fact, given the long-term plans for a new Silk Road within the framework of the officially endorsed strategy "One Belt, One Road" put forward by the Chinese leadership. This strategy envisions the implementation of new corridors, including in Eurasia's north and south,

Ernest Sultanov

connecting China and the METR region.

Today's complex economic situation in the METR region and in the entire global economy is tied to a great extent to a permanent crisis of mobility.

Never before has the difference in the mobility system within the METR region been so tangible as it is today. That is why the entire region has gradually slipped into a state of socioeconomic and sociopolitical turbulence.

The speed of the exchange of information via modern telecommunications is much higher than the speed of the movement of money, goods and people. What makes the situation even more dramatic is the fact that the speed of movement of goods and people varies not only from one part of the region to other, but even within individual countries. The METR region's prospects largely depend on an increase of mobility, on the transport corridors and carriers of the future, all of which are discussed in our white papers.

The off-the-charts tensions in the METR region are caused, to a significant degree, by the fact that transportation-communication mobility and thus social advancement are distributed unevenly in the region. It is impossible to bring peace and stability to the Middle East when locals face "mobility inequality," just as it is impossible to stop the stream of poor immigrants moving to Europe in search of new opportunities.

A long-term solution for this issue cannot be based on military operations, air strikes or escalating sanction programs. The problem can be solved only by creating new conditions that can boost overall transport mobility rather than serve just a chosen few. Today, it is transportation-communication mobility that determines social mobility and, in the end, works as the most visible expression of freedom.

The forms of mobility in transportation, communication and society are becoming more and more interconnected and interdependent in today's global reality. A person living in an area with high-end infrastructure enjoys far brighter prospects for social advancement than those "on the outside" of the transport system.

A new level of mobility means a new standard of living, and it also is an optimal solution to many long-term social problems. The best illustrations of these concepts can be found in the high-speed railways that have significantly changed life in Europe and Asia in the last 30 years. In fact, high-speed rail will be one of the main elements of the future "metro" of the METR region.

Millions of people have been able to abandon their plans to move to a big city at all cost. The presence of high-speed railways renders it totally unnecessary to change where one lives because of a job. For instance, the residents of the Lombardy region of Italy can easily take high-speed trains to Milan or Turin, spending no more than an hour and a half on their commute. Moreover, small towns are getting an increasing competitive advantage from the high-speed rails: Earnings are rising because of the connectivity with the major centers, while the cost of living continues to be lower than that of metropolitan areas. Accordingly, it has become normal to live in more comfortable place but to work where pay is higher.

Moreover, thanks to high-speed rail, another trend has begun to take shape in some European countries, such as Spain and France. People have begun to move out to areas located an hour and a half's trip by high-speed train from major centers. Advantages of living in the regions or suburbs include a cleaner environment and lower prices, and in the case of real estate, the difference can be significant. Along those lines, people can buy or rent better housing for less money.

At the same time, as the European experience has shown, the increased mobility made possible by high-speed rail improves the quality of life in small towns. This is because people living or working in big cities need better services. Demand appears and in turn gives impetus to the development of services, education and medicine in these outlying areas.

An increase in transport mobility in the METR zone will naturally result in improved social dynamics and potentially more equitable distribution of socioeconomic resources, leading to less extremism and less risk of conflict. It will be easier for people to see their neighbors as partners in the exchange of values, ideas, information and goods, rather than potential enemies or competitors.

A long-term strategy for creating a Eurasian system enabling more-balanced development of the movement of people, goods, services and ideas is extremely important in our current state of global uncertainty. Such a system can be achieved by implementing innovative infrastructure projects, as well as by introducing modern technological solutions and business models. Just imagine an app that will bring you to your destination on time and on budget. People will no longer be dependent on single mobility solutions, whether for trains, buses or airplanes. Monopolies will be overcome, and carriers will be motivated to constantly improve their services and prices. Otherwise, the person using an integrated mobility system will choose a different modality or operator the next time.

In this respect, the MIR Initiative is already serving as a platform for practical discourse by decision makers, intellectuals and visionaries of the central issues that will define transportation and infrastructure integration in the METR region. Anything that can be done to create a new transport infrastructure that meets a need, increase communication across the system, and boost social mobility in the end will bring social justice to millions of people. This is more effective in preventing wars than any restrictions and sanctions. And it is, in fact, the Silk Road to the future.

Metro of the METR

to the **Future**

Contents

Mamuka Bakhtadze

General Director, AO Georgian Railway

Mamuka Bakhtadze was born in 1982 in Tbilisi. In 1999 he entered the microeconomics and management department at Ivane Javakhishvili Tbilisi State University, and in 2003 he received his bachelor's degree with honors in organization and management of foreign economic affairs. In 2003 he entered Moscow State University's MBA program, graduating with honors in 2005 with a master's degree in economics. He received an MBA degree from INSEAD in 2010.

From October 2010 until December 2012, Mr. Bakhtadze was executive director at Georgian International Energy Corporation Ltd. Since March 2013, Mr. Bakhtadze has been general director at AO Georgian Railway, which is Georgia's only rail operator and is the owner of national freight and passenger rail networks. As of 2014, it employed more than 12,500 people.

Transport Corridor Through the Caucasus Region

Mamuka Bakhtadze of Georgian Railway discusses company plans for creating continuous cargo transportation from China to Europe via Georgia.

As a result of rapid globalization, international trade, and environmental issues, efficient rail network expansion and unification are immensely important. Being part of the Central Asia-Black Sea corridor, where there are a number of railway counterparts, the real challenge not only lies in addressing technical issues related to different technological standards, but in understanding and aligning the geopolitical and economic interests of participating countries. That is why the importance of organizations through which various railway companies coordinate their activities, strategies and communications cannot be underestimated.

Georgia is located at the crossroads of Europe and Asia, providing strategic cargo transportation to countries such as Armenia, Azerbaijan, Kazakhstan, Turkmenistan, Uzbekistan, Tajikistan, Kyrgyzstan and Afghanistan. Therefore, the main objectives for the rail industry are coordinated operation of the transportation industry sectors, construction and modernization of transport infrastructure in accordance with international standards, and harmonization of local legislation with international laws.

Railway transportation plays an important role in economic development in Georgia and is an integral part of the Europe-Caucasus-Asia transport corridor.

Georgian Railway, along with its Kazakh and Azerbaijani counterparts, which also make up the Central Asia-Black Sea corridor, has recently established the Tariff Committee.

Its aim is to harmonize the tariff policy of participants in order to offer a fixed transportation rate to customers along the whole length of the corridor.

At the third Pan-European Transport Conference, Georgia was recognized as a priority corridor for Eurasia, and it joined the pan-European transport area.

Today, Georgian Railway is involved in a number of large-scale projects that aim to increase the efficiency and capacity of the rail transportation system in Georgia, expand the rail network by connecting to Turkey, and stimulate and enhance intermodal and passenger transportation. These projects are dedicated to strengthening and increasing the TRACECA and the idea of a Modern Silk Road corridor. They will also benefit the wider railway network beyond Georgian borders.

The Baku-Tbilisi-Kars (BTK) Railway is a project of world-class importance that will connect the Asian and European continents. After putting the main line in motion, China, Kazakhstan, India and Central Asia, as well as the South Caucasian nations, will become more accessible to Europe.

The initiators of the BTK project are Azerbaijan, Turkey and Georgia. For the Georgian section of the BTK railway construction, Azerbaijan has allocated a credit line totaling $775 million.

The project has huge geopolitical, economic and social significance. First of all, it is a guarantee of the development of international relations. It is a connecting road between Asia and Europe, which will significantly improve the country's international image. The recently completed Marmaray project, a railway tunnel under the Bosphorus Strait, ensures a railway connection to Europe through Turkey.

The project will contribute to the development of the entire region by simplifying export-import processes and establishing direct ties with the other regions. It also will attract investments to the country and encourage more local businesses to export their products to foreign markets.

The anticipated date for project completion is 2015. By the time the BTK railway is completed and the first train passes along the rails, the shortest route between Asia and Europe, forgotten a thousand years ago, will at last have been restored.

Georgian Railway engaged the leading European companies in early 2010 to prepare a full-scale feasibility study and an initial design study for a modernization project. Based on the results of these studies, the company began incurring costs for the project in September 2010. Main objectives of the modernization plan include optimizing freight and passenger traffic, reducing operational expenses and improving operational safety.

The modernization has an estimated capital expenditure of 389.7 million Swiss francs. It focuses primarily on the mainline that runs from Tbilisi to the Black Sea, in particular to the terminals at Poti and Batumi. As part of the project, Georgian Railway intends to modernize the railroad and electric supply infrastructure between Tbilisi and Batumi (315 kilometers), including the 40-kilometer mountainous gorge region in central Georgia, with the goal of achieving passenger train speeds of 80 kilometers per hour on the gorge section and 120 kilometers per hour on the rest of the mainline.

One of the key aims of the modernizing initiative is to decrease the track gradient in the gorge section. Company management believes that a flatter gradient will reduce wear-and-tear on wheels and tracks, decreasing the need for extra locomotives in that section, and reducing the extra stops needed to cool the brakes on the trains.

In addition, the company plans to make improvements to tunnels, bridges and level crossings and to procure new rolling stock. As a result of the modernization, the company expects to increase capacity threefold by having a double track along the largest part of the mainline, to reduce maintenance costs and to have an extended lifecycle for a number of its infrastructure assets.The company estimates that completion of the modernization may also result in savings in operating costs in certain areas of up to 40 percent compared with 2008-2010 total operating costs.

Trans Caucasus Terminals (TCT), a 100 percent subsidiary of Georgian Railway, was founded at the end of 2009. It aims to bring about continuous cargo transportation from China to Europe via Georgia in minimum time.

TCT has partner companies in China, Kazakhstan, Azerbaijan and Romania. It expects finalization of negotiations to start shipments from China through Georgia in the near future.

There were several reasons behind the foundation of TCT. First and foremost was railway freight diversification. Over half of Georgian Railway's traffic and revenue was provided by oil. The market niche of container transportation, which had dramatically increased throughout the last decade in cargo-carrying businesses, was essentially undeveloped in Georgia, particularly in rail.

TCT started operating in 2011. Since then it has begun to operate the only rail-connected container terminal in the Georgian capital. The latter is undergoing modernization and is equipped with three rail-mounted gantry cranes, as well as a new building with a customs agency. In spring 2012, TCT opened an off-dock terminal in Poti. The main function of the Poti terminal will be cargo trans-shipment from container to train car and vice versa.

With significant transit volumes from Turkey to Central Asia, Azerbaijan, and Armenia, Georgian Railway has recently opened an inland terminal in Batumi.

TCT is planning an additional inland terminal development project in Vale (another point close to the border with Turkey). With this terminal, TCT has revealed new opportunities for increasing cargo flow through Georgia by rail from Central Asia to Turkey and vice versa. With the incorporation of TCT, Georgian Railway underlined the increasing significance of container transportation in the region as well as the demand for a seamless door-to-door logistics concept.

TCT provides two types of service: terminal handling and freight forwarding. It aims to transport cargo from any place in the world to its final destination. Its main sphere of interest is in the transportation of Chinese cargo through the Transcaucasus route. At present, there are ongoing negotiations with Azerbaijan and Kazakhstan on appointing block-trains with terminals operated in Tbilisi and Poti, as well as a third scheduled project in Vale.

Georgian Railway is entering into a new project regarding a ferry transportation service to Black Sea basin countries. Georgia has a ferry transportation service agreement with Ukraine, Russia and Bulgaria, and there have been plans for signing a similar agreement with Turkey. At present, Georgian transport operators aren't able to utilize quotas that are dedicated for the country, because they don't have the appropriate vessels. The market is untapped from the Georgian side, while the Ukrainian and Russian ferries successfully use their allotted quotas, with Georgian ports serving about five foreign ferries per week.

In order to implement the project, the company plans to have a Special Purpose Vehicle (SPV) together with a chosen partner, with equity participation to be further agreed during the final stage of selection.

Considering growing demand for ferry transportation, Georgian Railway is interested in growing transit/import freight volume moved via the company's rails by about 80,000 tons per year and organizing ferry transportation service with Russia.

An important part of the corridor served by the Georgian rail system is marine transportation via the Black Sea. The development of infrastructure for a deepwater sea port is envisaged in order to overcome the existing limitations. The port is to be oriented on containers and bulk/general cargo, with the capacity to accommodate fifth-generation Panamax-type vessels.

The transportation of passengers, while a priority, is a minor business for the railway. Since it is loss-making, it is subsidized by the freight business. The management of Georgian Railway is working to break even in the passenger business through the introduction of modern technologies and new services.

During the past decade, the passenger business unit of Georgian Railway, as well as the whole company, have gone though a number of significant transformations. These changes have concerned the optimization and rehabilitation of rolling stock, the reduction of operating expenses and optimal resource utilization, the introduction of new services, and significant improvement in management systems.

Nowadays, the passenger unit is offering comfortable transportation services to its customers on modern electric trains, with a strong focus on service quality, continuous improvement, and services with the aim of increasing customer satisfaction and loyalty.

This passenger business unit was established in 2005 following recommendations provided by consulting company Booz Allen Hamilton. The key challenge facing the unit in that period was an obsolete rolling stock fleet left over from the Soviet period, plus inflated operating costs and low labor productivity.

The first steps that the unit took, in order to satisfy the increased demand for passenger transportation in line with the economic development of the country, was the modernization of 38 sleeping cars in Dnepropetrovsk and commissioning them for the popular Tbilisi-Batumi route. In order to increase rolling stock availability, the capital repair of train cars was begun in Georgian Railway's depot facility.

In 2009 the company commissioned three new electric trains constructed by a Georgian company together with Chinese partners. At that time, these trains were the most comfortable in the South Caucasus region. Then, in 2012-2013, Georgian Railway commissioned five new-generation electric trains procured by Chinese company CSR Nanjing Puzhen Rolling Stock. According to its existing strategy, the company plans to operate old sleeping cars until the end of their lifecycle, after which they will be replaced by electric trains. Travel on electric trains is much more comfortable and time-efficient: Travel time on such trains is two times shorter compared with sleeping cars.

Today, Georgian Railway is in negotiations with European producers to acquire modern EMUs.

In 2013 the company introduced new onboard services on their electric trains such as Internet access during travel and vending machines. As a result of the commissioning of such new trains, the improvement of service quality and the optimization of the tariff policy, revenues on the Tbilisi-Batumi and Tbilisi-Poti routes increased by 13.7 percent compared with the previous year.

CEO, Acciona Infrastructure

Luis Castilla

Luis Castilla is the chief executive officer of Acciona Infrastructure. Mr. Castilla holds an MSc/MEng in civil engineering and has nearly 30 years of experience in industrial construction, engineering, and operations and maintenance. He leads the development and implementation of strategy for Acciona Infrastructure (construction, water & services) and manages high-level stakeholder relationships, particularly those with clients and partners. He is responsible for a team of almost 30,000 employees in 30 countries.

Innovation for Sustainable Mobility Development in the METR Region

Luis Castilla of Acciona Infrastructure talks about next-generation materials, technologies and innovative approaches as vital considerations in any rail infrastructure project.

Transport is fundamental to the economy and society of every country, and it is usually closely connected to a country's level of development. It is commonly accepted that the degree of development in a transport infrastructure network is by itself an indicator of the country's advancement, and that a high-density transport infrastructure and highly connected networks are associated with high levels of advancement. Moreover, the development of the transport infrastructure network is usually one of the cornerstones of progress in emerging countries.

The projected investment figures for infrastructure development in the METR region are enormous. Just to name a few, Russia has projected investments until 2030 totaling nearly $1 trillion, with half of the investments planned to be completed by 2020. In the Middle East, figures are similar, with development projects in infrastructure accounting for $1 trillion by 2030.

The largest share of these investments is in road and rail infrastructure development. This is most likely a consequence of the fact that more than half of the world's population now lives in urban areas, and the expectation is that this figure will grow rapidly in the next decades — reaching 70 percent in 2050 — and that mobility is one of the most fundamental and important features of economic activity, creating economic growth and jobs.

Tackling the inefficiency and financial burden imposed by underperforming infrastructure is an important issue, as is addressing sustainable investment, since poor decisions or analyses in infrastructure development can have significant economic and social consequences.

Looking at the infrastructure development in western Europe during the past decades, and especially since the 2001 White Paper on Transport was released, the sector has advanced a lot: There has been development of trans-European networks and high-speed railway lines, improvement of transport's environmental performance, improved freight transportation, and a boost of intermodality as a means of enhanced and optimized mobility for citizens and goods transportation. Nevertheless, as reflected in the 2011 White Paper on Transport, the transportation system isn't yet sustainable.

Large infrastructure companies play a decisive role in the development of infrastructure transportation networks. The conjunction of factors such as the large investment needed in infrastructure and such as sustainability brings in a new paradigm for the infrastructure sector. Innovation will play a key role in our vision of the evolution of future infrastructure. We can achieve sustainable development and economic performance only through innovation.

Integrated services provide reliability to investors and give the best value for the money. Large infrastructure projects require a huge team to accomplish a project on time and on budget. Large infrastructure companies nowadays can provide integrated services capable of bringing together, under one parent company, a design team and a construction team, operation of the infrastructure through a concessions company, and operations and maintenance services.

What might not be so business-as-usual in the construction sector is that the infrastructure company also puts innovation at the core of its activity. Innovation teams must be integrated within the project team since, as we said before, we can achieve sustainable development and economic welfare only by innovating. It is the way to ensure that projects are cost-effective to build and efficient during their operational lifetime.

The infrastructure sector is considered one of the most traditional industrial sectors. A radical change in the consideration of innovation in the sector must be internalized by all the stakeholders involved, if the objectives of sustainable investment are going to be met. Thus, the government and investors procuring a project should evaluate the innovation capacity that the company will bring to the project, along with the usual evaluations of experience in past projects, engineering capacity and so on.

Innovation must be promoted and sought in projects from the earliest stage of development. In a highly standardized sector like construction, and with the appropriate risk-mitigation measures borne in mind, the proposal and use of innovative technologies should be rewarded, instead of being met with barriers that can't be overcome during the project completion lifetime.

There is no direct relationship between innovation and cost overruns, as is generally thought. Investment in innovation actually has a positive impact over the project lifetime, and projects are built to last for years. The direct cost of construction must be considered, but the project lifecycle costs must also be taken into consideration, as operations and maintenance costs might negatively affect the expected return of investment.

Innovations in projects can be found in multiple forms: methodologies for integrated development and effective cooperation of all stakeholders involved, new materials that reduce maintenance costs over the project lifetime, and so on. Several examples of innovative aspects in projects are given below as an example of what can be achieved with the goodwill and joint cooperation of a large infrastructure company and the administration.

Acciona is one of Spain's leading business groups, spearheading the development and management of infrastructures, renewable energy, water and services. Acciona's strategy revolves around the principles of sustainability and social well-being as the building blocks of economic growth, environmental balance and social progress. Acciona has consolidated its commitment to innovation by stepping up spending ($650 million in 2010-2015), developing more projects and programs, and expanding its workforce, a sign of its intention to maintain its leadership position in the development of more sustainable solutions and alternatives.

Providing value-added innovative solutions during the design, construction and operations phases is a feature that has characterized company projects around the world and that should become the standard in infrastructure development projects in the future, regardless of what company is in charge of the project development. The use of technology as a differentiation tool — boosting innovation and continuous improvement of operational processes through the development and business integration of innovative technologies, products, processes and services — contributes to Acciona's mission to develop, construct and manage infrastructure and to operate under the principles of social contribution, sustainable development and value creation for its stakeholders.

One of the most important new technologies is the Building Information Modeling (BIM) system, adopted by Acciona, which is capable of detecting construction problems and optimizing time and money by applying virtual reality to construction. This maximizes customer satisfaction by enabling clients to make changes and see the finished results of the project. The use of BIM actually creates a collaborative environment among all the stakeholders involved in the project, which in turn results in a reduction of the project's cost and a drastic reduction of errors made during construction (which, again, are one of the most frequent causes of cost overruns). These benefits have been proven by the experience of numerous projects.

Roads are some of the most important recipients of infrastructure investment. Innovation in the development of materials for road surfaces must be aimed at reducing both construction and maintenance costs. Improved existing materials, modified with nanotechnology capable of optimizing and improving the materials' mechanical characteristics and resistance to various environmental and chemical weathering agents, will prolong the life of road surfaces and meet the current and future demands of the transport industry. In addition, protection of the environment is also possible by working on the development of new kinds of asphalt, ones that include recycled materials that would otherwise need to be transferred to dumping sites or used as fuel. The use of these groundbreaking materials on road surfaces has many advantages: They improve the resistance of the asphalt, reducing both energy consumption and maintenance costs.

Another example of waste valorization in road construction is the use of shredded end-of-life tires (ELTs) as lightweight fill in embankments, as a partial substitute for the conventional use of soil. The use of this waste material allows a reduction in the weight of the embankment and a reduction of physical stresses, which in turn presents a powerful tool to limit deformations under poor conditions in the foundations. Acciona constructed the first ELT embankment in Europe in 2008 with 2,200 tons of shredded tires used as lightweight fill. These 2,200 tons were located in the core of an embankment that was 200 meters long and eight meters high. Acciona has since built three more embankments using ELTs in Tenerife (Canary Islands), Granada (Spain) and Poland.

Bridges constitute an essential element in the development of a road and railway transport network. Acciona is a pioneer in the design and construction of bridges made of fiber reinforced polymers (FRP), also known as composite materials. FRP materials have been used for more than 30 years in bridge and footbridge construction. So far, more than 300 bridges around the world have had their decks and/or their beams manufactured using FRP materials. Acciona has a proven record in the use of FRP materials in bridge construction and provides its clients an integrated project delivery through the design, manufacturing and construction of the bridge. FRP materials have unique properties such as being lightweight for easy and quick assembly on site and high strength to ensure structural integrity or corrosion resistance.

To date, Acciona has built two road bridges (34 meters and 46 meters long) and three footbridges (with total lengths of 44-216 meters and spans of 44-72 meters). The lightness of the footbridges permits rapid assembly processes on site to mitigate disruption to traffic: The assembly on top of the abutments of the 44-meter footbridge was achieved in half a day. Our company's work in the field of composite materials has been recognized by the JEC International Conference, having been granted the award for best project in construction using FRP two years in a row, in 2010 and 2011.

With railways accounting for nearly half of the planned investments in infrastructures, the design, construction, operation and maintenance of rail network infrastructure need to be safe, reliable, supportive of customer needs, cost-effective and sustainable. The European Commission has just launched an initiative, Shift2Rail, to invest almost $1.3 billion until 2020 in technology developments in rail, aiming to deliver a reduc-

tion of 50 percent in the lifecycle cost of railway transport, an increase in the capacity up to 100 percent and an overall increase in reliability. Rail infrastructure technology is one of the issues contemplated by the initiative with the objective of providing reliable, high-quality infrastructure with reduced lifecycle costs and track noise and increased intelligent maintenance.

Acciona Infrastructure and ADIF, the Spanish railway infrastructure company, signed an agreement to open a new office within the Railway Technologies Center in the Andalucia Technology Park in Malaga, with the goal of encouraging new railway developments to be applied in the various projects that Acciona designs and constructs around the world. Also expected is the construction of the world's largest trial rail ring in a nearby location, as a test field for operators, developers and all the other relevant stakeholders.

Some proprietary technologies developed by Acciona have already been implemented or are at an early-adoption stage. Such is the case with a proprietary design of an optimized slab track railway platform intended to reduce construction and maintenance costs, as well as create an increased bearing capacity. Improved environmental-friendly products — such as elastomeric elements based on the waste valorization and enhancement of recycled used tires and polyurethane resin mixed for vibro-acoustic attenuation — will improve comfort conditions for railway infrastructure. In high-speed rail ballast tracks, where the flying ballast phenomenon is a major concern during the operation and maintenance phase, a ballast binder is designed as a bonding system to avoid ballast projection.

In sum, major investments will be carried out in the METR region in the coming years. Megaprojects are intended to stimulate domestic production and demand, and advanced technological solutions are often used in megaprojects, as has been noted by Kirill Androsov, board chairman of both Aeroflot and Russian Railways. The role of large infrastructure companies that can provide integrated services in engineering, construction, operation and maintenance and that have a proven dedicated innovation capacity will be key in supporting the development of these megaprojects. Innovation will be a major factor in ensuring the completion of these megaprojects on time and on budget and in making the METR region a world-class leader in infrastructure development.

CEO - Rail Systems, Siemens AG

Jochen Eickholt

Jochen Eickholt is chief executive officer of the rail systems division of Siemens AG. He has held this position since October 2012. Mr. Eickholt started his professional career in 1989 at Fraunhofer Institute for Production Technology. In 1999 he joined Siemens, starting as CEO of Siemens Elektropristroje s.r.o. in the Czech Republic.

Mr. Eickholt held several executive positions within the sales and supply chain management of the Siemens Communications Business and was board member of BenQ Mobile International. He then was appointed CEO of Siemens Home and Office Communications GmbH in 2006. In 2009, he joined the Siemens rail business management, heading up the rail automation business unit in Brunswick and Berlin. Mr. Eickholt studied electrical engineering at Rhine-Westphalia University of Technology in Aachen, Germany, and at the Imperial College of Science, Technology and Medicine in London.

Integrated Mobility for the METR Region

In worldwide efforts to optimize the use of our planet's finite resources and to protect the environment and climate, sustainability has become a key goal. One of the primary targets is to reduce harmful greenhouse gases, particularly in the large urban centers that now are home to more than half of the global population. Today, cities account for about 80 percent of the world's economic output and drive an even higher share of global growth. Rail transport should be given priority, since it substantially helps cut transport-related carbon emissions.

However, in a globalized economy, with businesses and workforces increasingly able to relocate internationally, cities must compete to offer the most attractive environment for economic activities. Efficient transport can attract business and industry to cities, boost productivity by improving connectivity, reduce time lost to travel, and improve the quality of urban life. Ultimately, making a city more attractive to live in helps provide business with the labor force to create its products and buyers to consume them, thereby fueling economic growth.

A recent study commissioned by Siemens shows that cities that invest in transport will reduce economic costs and drive growth. Further, the potential impact from such investments is clear: the cost of transport falls and growth accelerates. Extrapolating this fact to all relevant cities globally suggests an economic opportunity of about $800 billion per year by 2030 — equivalent to nearly 1 percent of global GDP — together with further social and environmental benefits.

Given such perspectives, it is obvious that current mobility development strategies in Russia, Turkey and the Middle East focusing on urban transport and railway development programs will not only further stimulate economic growth in these regions, but also ensure that this growth is more environmentally compatible. Growth and environmental responsibility can go hand-in-hand.

In order to leverage the potential offered by integrated and efficient transport modes, Siemens develops solutions based on energy-saving, sustainable technologies. In each type of transport mode, Siemens combines stylish and comfortable mobility with optimized energy efficiency and maximum environmental compatibility.

In a project for Riyadh, Saudi Arabia, Siemens is using lightweight construction methods and modern traction technology to achieve a marked decrease in energy consumption. Both the car body and its interior were designed for optimal reusability and have a recycling rate of more than 95 percent.

Jochen Eickholt, head of the rail systems division at Siemens AG, lays out technical solutions that can enable urban transport to become more efficient and environmentally friendly.

Fully integrated Siemens concepts are custom-designed to help cities reduce their environmental burdens and make urban life more attractive as well as more competitive. In London, for example, Siemens delivered more than 1,200 cars for regional trains and the Heathrow Airport Express in order to optimize rail connections with the city. The company also provided a city-road congestion toll system that encourages commuters to shift to the improved and cleaner rail system. In addition, Siemens supplied a satellite-based bus-tracking system with real-time passenger info. This package of solutions has reduced street traffic in London City by around 20 percent and cut carbon emissions by 150,000 tons a year. Since their implementation, inner-city traffic flows have been accelerated by 37 percent and commute times have been shortened by 17 percent on average.

Beyond all innovations in rolling stock and rail automation, in the long run, efficient transport and sustainability can only be balanced by the intelligent networking of all transportation services. It is possible only in rare cases to meet the growing demand for transportation capacity by building new roads or railroad lines. Instead, it is preferable to use innovative traffic concepts that tilt the modal split toward environmentally friendly rail transport and simultaneously offer an intelligent interface with road transport. An essential component for achieving the modal shift is an Automated Fare Collection (AFC) system, which is based on electronic ticketing (eTicketing).

Electronic tickets can be used across all modes of transport and offer additional functionality. Passengers can flexibly change between different modes of transport without losing time in purchasing individual tickets and selecting the correct fare. Siemens therefore offers modular eTicketing solutions for multimodal trips. One approach is the Siemens-developed smartcard, designed in credit-card format with one active and one passive RFID (radio-frequency identification) chip. This makes it basically possible to use one card for different means of transport, with interoperability between different transit companies and tariff consortiums, as well as connected service providers. It will be possible, for example, to use it also for chargeable parking spaces or for hiring cars.

The Siemens smartcard offers dual functionality, which enables the usage of both CiCo and BiBo access control systems. Following the Check-in/Check-out (CiCo) principle, the passenger actively taps in and out with the smartcard (or smartphone) at the beginning and end of each journey, by holding the card to a terminal reader for the access control system when entering and leaving. With the Be-in/Be-out (BiBo) principle, the smartcard (or smartphone) is automatical-

Jochen Eickholt

ly logged at intervals during the journey, without actively having to use the reader.

Because of the contactless automatic registration, the smartcard doesn't even need to be visible, so it can be carried in a pocket, purse or jacket. The actual journey of a BiBo passenger is determined afterwards, with a best-tariff guarantee. This innovation was honored at the Transport Ticketing Conference in London, with the MasterCard Transport Ticketing Award 2013 in the category "Ticketing technology of the year." Siemens ticketing solutions based on mobile phones and smartphones complement the card-based approach.

In order to further leverage networked mobility, Siemens currently is developing an Integrated Mobility Platform (IMP) that enriches ticketing with additional functionalities for information, route planning, reservation and navigation. The Integrated Mobility Platform is built to achieve the most comprehensive possible networking of transportation users, mobility providers and urban traffic management centers.

Designed as a B2B platform, it enables operators to integrate complementary mobility services into their own portfolio. A car-sharing company could, for example, bundle its mobility services with those of a rail operator via the IT platform. From this approach, bundled mobility offerings will emerge, which will simplify the planning, booking and billing of multimodal travel from door to door. In a trial called "Open Mobility Berlin," Siemens has already implemented interfaces to many providers across transportation modes.

Beyond technical implementation, there are challenges facing integrated mobility, mostly legal and commercial: Terms of use need to be harmonized, tariff models aligned, contracts ideally standardized. As such the business model between the platform operator and the providers of mobility services is a critical success factor.

Meanwhile, the platform offers additional benefits, which increase with more service providers integrated. The IMP may evolve as a true marketplace, enabling various multimodal packages. With the set-up as a scalable B2B platform with flexible interfaces, the IMP is a base that enables not only easy integration of new providers, but also a streamlined management of partners and interfaces along operations. Although travelers would experience the most value-add with a multinational platform being accessed from one single user interface, it is expected that platforms will first be built on regional and national levels, establishing the basis for an international integration later on. This is also related to regional standards, established cooperations and time to market. Ongoing European Union initiatives and projects also elaborate on this development.

All parties may benefit from integrated solutions. Through provision of access to an IMP, mobility providers like rail operators can make their transportation services more appealing, helping to break down access barriers to the use of public transport, increase ridership with existing and new customers, and thus boost sales revenue.

The IMP may also serve as a valuable source of information about passenger figures, preferred travel times and routes. This detailed information can be used to optimize fleet deployment and may provide new options in fare pricing. For passengers, an IMP enables easy and multimodal travel, transparent travel information in real time, and, thanks to the cooperation between providers, a wider range of mobility services and customized packages. Cities also benefit from this platform. The promotion of intermodal travel with state-of-the art technologies supports the innovative image of urban areas in the competition between cities, as well as provides a basis for more sustainable transport management related to real traveler needs and optimal use of rail and road infrastructure.

All in all, there are many opportunities to fuel economic growth in the METR region by improving mobility systems, particularly rail transport. At the same time, energy-efficient rail systems are ideally suited for moving passengers around and between cities comfortably and quickly while reducing emissions. Innovative mobility solutions not only create opportunities for growth, but also make growth more sustainable.

Jan Christoph Harder

Sales Director/Senior Consultant,
Molinari Rail AG

Jan Christoph Harder is steering committee chairman of the MIR Initiative and sales director/senior consultant with Molinari Rail AG in Switzerland. Previously he was vice president for business development in the CIS region for Alstom Transport, responsible for systems, infrastructure and signaling. Before Alstom he worked in management positions within Siemens AG in Germany and Siemens LLC Russia in postal automation, airport infrastructure and rail systems. He has extensive experience in sales, strategy, supply-chain management and legal. He has been a customer director for Russian Railways, with a special focus on high-speed rail development in Russia.

Mr. Harder participates in expert panels, forums and conferences in the 1520-gauge rail market as a key speaker and expert, and he initiated cooperation with Moscow Railway Engineering University (MIIT) in order to improve the education of future railway talent. He has been a member of the strategic issues committee of the Union of Railway Equipment Industries, a Russian non-profit partnership, as well as a member of the Wirtschaftsclub Russland and remains a member of Rotary Club Moscow International. Mr. Harder publishes articles and gives interviews on rail technologies and markets.

He holds an MBA from Edinburgh Business School of Heriot-Watt University. He is a registered lawyer with specialization in international and European law in Germany and studied law at the University of Constance, Germany.

Visions for Transportation Systems in 2050

Jan Christoph Harder of Molinari Rail AG discusses barriers in the railway transport market and railway industry and how to overcome them.

One of the key obstacles to rail development in the METR region is the existence of traditionally developed national railway systems with different political, operational, regulatory, industrial and technical attributes. Such challenges to harmonization are the result of distinct characteristics appearing in various countries over decades of nationally driven railway development — characteristics such as rail gauges, signaling systems, different electrical supply networks based on either AC or DC voltages, and nationally defined safety procedures. The harmonization necessary for simplifying rail traffic in the METR region will need to deal with all of these issues in order to secure seamless transportation of freight and passengers and to prevent intermodal changes along the route.

It must be said that the endeavors of the European Union and its relevant body, the European Railway Agency (ERA), which was established only in 2004, are the most advanced to date. Rail has been recognized as a vital part of EU transport, with a key role in addressing congestion, traffic demand, energy efficiency, reduction of carbon dioxide emissions, and sustainable development.

Alongside this approach, strategic programs such as the EU's Europe 2020 and the EU's long-term Transport 2050 are defining corridors for passenger and freight operations to be created and already improving the process of bringing them to fruition. Huge investment projects are being realized to make this happen, such as the Brenner Base Tunnel and the high-speed rail line between Turin and Lyon. In addition, the advantages of interoperability, cross-acceptance, harmonization of safety and regulatory standards such as the TSI, promotion of a European-wide signaling standard, and creation of the Trans-European Transport Network (TEN-T) are all spearheading development beyond the boundaries of the EU.

In November 2013, the ERA presented its Multi-Annual Work Programme 2014-2017 to outline harmonized conditions for an integrated Single European Railway Area. The ERA also will be tasked with issuing Europe-wide safety certificates for railway ventures and vehicles, as well as authorizations related to the European Rail Traffic Management System (ERTMS) project. This "one-stop shop" for authorization and certification will be groundbreaking and improve the competitiveness of EU-wide rail transport in a substantial way. On average, the authorization procedures for new rail vehicles cost about 6 million euros during a process that takes up to two years, and currently the certificates are issued by bodies of the EU member state based on their national regulations. The risk of using these national rules as market-entry barriers cannot be denied.

Harmonization of norms and standards are particularly important in the process of infrastructure integration, not only within the EU, but across the whole METR region.

In 2013, Turkey opened the Marmaray tunnel under the Bosphorus Strait, while Turkish State Railways (TCDD) has introduced high-speed operations, changing the transportation landscape of Turkey and improving mobility between those regions connected by the tunnel. The first high-speed line between Ankara and Eskisehir was commissioned on March 13, 2009, and already has carried more than 5 million passengers. Between 2003 and 2011, more than 6,400 kilometers were renewed, and a rail industry was created.

At present, Sofia and Bucharest are the only large destinations in Europe reached by the Bosphorus Express operated by TCDD. With its Vision 2023, TCDD is developing not only high-speed lines, but also creating new corridors. Those include the Marmaray project connecting Europe and Asia, the Kavkaz-Samsun rail and ferry service, the Baku–Tbilisi–Kars project, and others with great potential for increasing market share in passenger and freight operations, for raising the appeal of the Turkish network as a European-Asian hub and for becoming an international player in regional transport.

In Saudi Arabia and the Persian Gulf states, transportation investments have been enormous, despite the region's climatic challenges. Unprecedented projects are in the realization phase, primarily for optimizing national transportation and secondly for creating the GCC rail network connecting Jordan, Bahrain, Qatar, Saudi Arabia, United Arab Emirates and Oman. The creation of the Etihad rail network should be highlighted: It will form a 1,200-kilometer network stretching from the border of Saudi Arabia to the border of Oman. The creation of this Persian Gulf network definitely will increase the attractiveness of rail transport in the coming decades and serve as a connection between the various areas of the METR region.

With the biggest rail network in the METR region, Russian Railways and the Russian government have identified rail transport as the top priority for Transport Strategy 2030. One high-speed pilot project currently under development is Moscow-Kazan, which will be the first section of the high-speed Moscow–Kazan–Yekaterinburg corridor, followed by projects on the Moscow–St. Petersburg corridor and the Moscow-Adler corridor. With regard to freight operations, two major projects have been identified for increasing the attractiveness and competitiveness of transit corridors from Asia to Europe through the Russian Federation: the modernizations of the Trans-Siberian line and the Baikal-Amur

line. Furthermore, one of the visionary projects of Russian Railways, in conjunction with other state rail infrastructure owners and operators, is the creation of a 1520-gauge rail line, the so-called Moscow-Vienna wide-gauge project, enabling freight and passenger transport from Russia via Bratislava to Vienna. As a result of this project, freight delivery times from Europe will be halved relative to sea routes, from 30 to 14 days.

Even with these projects in the works, the EU's role is extending beyond EU member states to places such as Turkey and transportation corridors leading to Asia and the Middle East. Here we also need to note the cooperation with eastern neighbors, including the Russian Federation, to make the rail corridors to Asia competitive with sea and air transport. The EU has decided to increase its competitiveness based on sustainable strategies and, in the long term, widen the access of European markets to other markets. Hence it can be stated that this intensity will continue to increase, while the globalization of transport will bring the METR region much closer and ease the exchange of goods and people.

Customs and border control have posed some challenges, but new approaches to checking freight and passenger operations have appeared in recent decades, improving the speed of land transportation. Examples such as the Allegro train between Helsinki and St. Petersburg with on-board customs and border-control units at the Russian-EU border are showing how rail transit's passenger appeal can be increased by coming up with new border control processes.

Intermodal transport systems will be vital to the successful development of an effective transport landscape that serves customers door-to-door. This overall development must be supported by all of the other actions taken to connect sea, rail, road and air traffic, as well as to connect mainline and urban transportation systems. The EU's transport strategy through 2050 aims to connect all high-speed lines with airports in order to create intermodal hubs for easing passenger and freight flow. In Moscow, the creation of intermodal transport hubs is one of the main strategies for fighting congestion over the next 10 years. Nowadays, increasing the efficiency of intermodal transportation is viewed as important, and it is expected to grow in the 21st century, making public transit more attractive in comparison to individual transportation.

Regarding the impact of further integration of the METR region with the EU, the effects on industry will be numerous and will change the industrial footprint. All the players in the market are traditionally created companies serving a home market in a particular country or region. They maintain high market share in those areas and a special status of sorts because of existing delivery fleets and long-term partnerships with rail operators or infrastructure owners. Further harmonization of the target rail market in the METR region will lead to further consolidation in the industry, as in the telecommunications or energy markets.

That said, more than just the railway-supply industry will be affected by increased harmonization of the METR region. In fact, the size of the impact on national railway operators will change the rules of the game in the METR rail market. Different consequences for infrastructure owners and operators, in either passenger or freight transport, can be expected: While infrastructure owners will stay within national boundaries, the operating companies will be challenged to operate in a more-international target market and optimize their services accordingly. The new business will be more globally driven, and national, regional and urban operations will be farmed out more and more to private operators. In this case, we can expect a significant increase in competition, accompanied by an increase in quality of service. Future operators in the METR region will need to rely on the core competencies of the rail operator to market their services and differentiate them from the competition.

Therefore, national operators will transition to international operations in the METR region, and cooperation beyond national borders will result. Major national carriers as SNCF, Trenitalia and Deutsche Bahn AG will intensify their activities in other countries in order to stay competitive and secure market share in a more-competitive environment. Concentrating on core competencies, namely operations, and using a business model with a tariff policy will result in more outsourcing of support activities — such as outsourcing lifecycle maintenance services for rolling stock to producers in a move to strengthen availability, reliability and asset management of that rolling stock.

The formation of international corridors from Europe to Asia and the Middle East will generate opportunities for developing new economic zones along new or modernized corridors. The challenge of harmonizing the 1520-millimeter gauge of the Russian and CIS rail network and the 1435-millimeter gauge systems in the European Union will continue to be an impediment, but technical solutions in conjunction with logistics centers could ease the movement of goods and passengers. The spearhead role of EU rail activities will be used as a model, and new developments will be guided by the recommendations of the future EU rail network. The prospects of the METR region for a more-unified transport system are good, but they depend on the existence of political will and long-term strategies to use the most sustainable and environmentally friendly means of transportation.

Boris Levin

President, MIIT

Boris Levin is the president of Moscow Railway Engineering University (MIIT). He is a professor and doctor of engineering science. Mr. Levin began working with MIIT as an engineer in its automated control systems department, and he became the head of the graduate studies program in 1977. He has been president of the university since 1997.

MIIT was established by an order of Tsar Nicholas II in 1896. Today, it is one of largest universities in Russia and offers bachelor's, master's and doctoral studies, as well as advanced training.

Transport Education: Main Challenges

Boris Levin, the head of Russia's largest transportation education institution, describes how future rail engineers and other specialists can become well-trained and well-prepared when universities use modern approaches and technologies.

Modern economic and social challenges brought about by both issues specific to Russia and by integration processes in the METR region are giving rise to increasingly complex requirements for accelerated development of the transport sector. Yet the response to changes in the transport arena has been less than the response in banking or other sectors.

As head of one of METR's leading transport universities, I believe that transportation systems should be developed with a view to the future, anticipating the emerging challenges. Human capital is the main component of transportation systems. This concerns not only highly qualified specialists who maintain existing infrastructure and vehicles, but also designers and builders, scientists and researchers whose intellectual endeavors are shaping the future of industry. Consequently, the most important condition for the development of scientific and human resources for transport is the accelerated development of transport education.

Two issues must be addressed to improve the efficiency of transport education: the training of a new type of transport specialist and the development of a practical orientation in university research. Powerful educational and research centers focused on solving the industry's problems will enable the training of this next generation of specialists. Only the efforts of a new generation of specialists, scientists and teachers can make such centers more innovative, practical and business-oriented.

Orienting toward the needs of employers, anticipating the nature of educational infrastructure formation, providing continuing education at all levels, promoting an interest in applied scientific research: These concepts, plus the impact of transportation's evolution, have always distinguished industrial transport education in Russia. The fundamental tasks of transport universities are the following: maximizing staff performance in the transport sector to support the country's development; creating the means for continuing education in the field; and efficiently integrating transport science achievements and professional education in collaboration with leading universities and transport structures around the world.

We believe that the farthest-reaching attribute of the next-generation transport university is its ability to ensure effective development of the ever-growing area of communications. We would like to see the transport university become the uniting force of an effective partnership between different branches of transport, between the transport business and the academic community, science and education, science and industry, pure science and applied science in the innovation cycle, national transport systems, and educational and scientific organizations in various countries.

In addition, a transport university should integrate new educational and information technologies into the educational process, as well as connect university classroom spaces and the modern youth information environment. All of this involves a combination of principles: the principles of continuing and advanced education, classical and technical education, and university models for applied sciences, innovation and entrepreneurial education.

The specific industrial system of vocational education can be considered an achievement of Russia's transport sector. At the start of this decade, technical schools and colleges for transport education became part of vertically integrated university systems. Also, transport businesses have maintained integrated systems for teaching staff in their own internal training departments. In turn, that has allowed the Russian transportation industry to avoid staff shortages.

Vertical connections between organizations and institutes, as well as continuing education within pre-agreed and pre-defined programs, have been significantly improving the process of training specialists of various skill levels. Those two steps have produced other results as well, including helping future transport employees learn and adapt to system-wide, standardized technological processes and safety requirements. A particular note can be made of targeted training systems, which are based on contractual relationships with employers and provide guaranteed employment. This creates additional opportunities for developing students' skills by means of learning components pegged to a future workplace.

Another priority of Russian transport education is the development of a unified, multilevel system of continuing education, which includes continuing professional education and advanced training.

Matters such as forming professional standards, equipping educational institutions with working models and facilities in collaboration with businesses, and developing networks of institutes and centers are all essential for success.

In general, the goal of the transport university is to create specialists across a wide range of fields who are able to adapt to new technologies and who then improve themselves on their own initiative. This adaptable, self-directed approach is necessitated by the type of evolution that

occurs in the transport sector, which is demanding a transition from mere improvements to breakthrough innovations.

In some ways, there has been a return to the practices seen during the birth of modern transportation, when engineers become designers and creators of technology and infrastructure and then operators of their own inventions. This is the optimum goal of transport education.

The minimum goal is the creation of self-sufficiency based on university knowledge, which would allow graduates to adapt to modern technologies faster and more effectively.

In all circumstances, the mission of transport universities cannot be implemented without first finding out what the actual eligibility criteria are in the actual business environment. A practical assessment of the employability of the institute's graduates and their knowledge, capacities, and potential for professional growth are essential.

The needs of staff development for the transport sector coincide with the overall objectives of education. They include:

- improving ways of implementing educational programs, such as by developing new majors, creating modular and supplementary courses, networking different types of education and introducing interactive learning;
- increasing student commitment to practical activities, such as by having the university jointly develop professional standards with future employers, by updating training programs and developing branch laboratories, research and educational centers;
- optimizing the formal and legal organization of universities and improving management, such as by creating a board of regents and an endowment;
- developing the promotion system in the industry, including by forming employment centers at universities, offering professional testing and certification, and improving forms of employment monitoring.

Key requirements for specialist training are brought about by the conditions of transportation process implementation as a set of systematically interrelated technologies. Those requirements are the combination of basic engineering training with practical skills; the systemic coherence of the curricula of vocational and higher education programs; the presence of highly skilled academic staff; and the availability of laboratory equipment and working models.

Another issue is how to give students a new, wider range of capacities, driven by industry dynamics and environment.

They include capacities in digital and information technology, communication and legal areas, and foreign languages. Demand for economic knowledge and for skills in business, customer orientation, safety and other areas is appearing mainly because companies are placing a higher value on such abilities.

One important trend is the development of intermodal transport and general transportation competencies. In modern conditions, the majority of transport workers — and not just managers — need to interact not only with subcontractors for their company and their particular mode of transportation, but with a wide range of organizations involved in transport activities, multimodal transportation, logistics, regional transport networks and transport corridors.

Special attention is being paid to the development of competences in the field of international standards, information exchange and electronic workflow, satellite monitoring of freight transportation, and route scheduling of goods traffic, among other areas.

New technologies have been applied to specific areas of training. This is especially the focus of specialized departments at MIIT, which are carrying out simulations and modeling in collaboration with leading companies. A range of projects — parallel computations, enormous dataset processing, uses of the emerging technologies known as NBIC (nanotechnology, biotechnology and information and cognitive technologies), multidimensional simulations in five or six dimensions — are all actively taking root.

Computer-based simulation is the means for carrying out projects — for example, calculation of freight flows — for most of the technical branches. Regarding the introduction of new materials and devices, student competencies are developed by synthesizing fundamental knowledge with an analysis of how modern technologies came to be. Areas that might be explored include nano-materials in transport engineering, polymer coatings in transport construction, space navigation, laser technologies and superconductors for magnetic levitation on railways. Prototype technologies are also used in the learning process.

We can hardly expect the overnight appearance of new specializations in the transport industry. At the same time, new specializations will appear due to new transportation modes such as high-speed transport and transport-logistics technologies. We can expect the same expansion in multimodal transportation, complex transportation systems, public transport systems and transport safety, primarily at the infrastructure level. The big trends will appear as gradual changes in professional capacities, the expansion of job descriptions, and the efforts that graduates make to acclimate themselves to new technologies and technical facilities.

Boris Levin

Introduction of modern information technologies into the education system is one of the trends that will have increasing impact in the long-term. It is affected by the speed of information evolution and the appearance of “Internet generations” — Generation Z born between 1995 and 2009 and Generation Alpha born in 2010 and later — for whom a digital environment is perfectly natural.

Transport technologies have changed as well. We already have seen several generations of technologies in communications, signaling, dispatching, navigation. This process of innovation and change is continuing. Here we are talking about the synergy of four factors: technological demand in the industry; innovations by teachers and students, who are the bearers of digital culture; fast transmission of knowledge and ideas; and skill training and competency oversight.

Meanwhile, learning spaces have diverged into two modes: a cloud or remote mode (cloud technologies, video communications) and an interactive mode in classrooms (interactive boards, touch screens). Both modes use interactive game-like approaches drawn from business and other areas. The number of traditional lectures delivered in lecture halls goes down every year. Today’s lessons are uploaded onto a web server or distributed via electronic media for self-study. Many web applications have been created in MIIT, particularly for students, and these services are developing constantly.

Some long-term, futuristic forecasts even predict that technology will allow a teacher’s hologram to educate and test students remotely. Technologically, we can already create completely virtual interactive education with complete control.

But classes in lecture halls can’t be fully replaced by homework via the Internet. Besides acquiring knowledge, it is very important for students to be trained in specific skills, which requires direct interpersonal communication. A balance should be found, including in education for basic transport professions, primarily in traffic safety. It’s too early to speak about substituting classical education in engineering disciplines.

Currently, a business incubator with Internet resources is being created in MIIT. It will take a completely new approach to communication between mentors, teachers and students. All of MIIT’s partners will be represented in this incubator resource, and the system will allow students to participate in the process of solving business challenges at various companies. Such technologies are a step toward education integration in the METR region. Without such integration, it’s impossible to speak about increasing transport mobility, because those who create it should speak “with one language.”

Director General, UIC

An International Platform for Railway Transport Integration

Jean-Pierre Loubinoux

Jean-Pierre Loubinoux is the director general of the International Union of Railways (UIC), a global association of rail companies. Mr. Loubinoux graduated from Ecole Centrale of Paris and worked at the Economic Expansion Observatory in Hong Kong in 1977-1978 before joining French railway company SNCF in 1978.

Within SNCF he has held various executive positions, including chief executive of French Railways Ltd UK and chief executive of SNCF Freight International. In 2001, he was named chairman and chief executive of SNCF International and director of international development at SNCF.

Mr. Loubinoux was appointed director general of UIC in March 2009. UIC members include integrated railway companies, infrastructure managers, railway or combined transport operators, rolling stock and traction leasing companies, and service providers.

Jean-Pierre Loubinoux

An International Platform for Railway Transport Integration

Jean-Pierre Loubinoux of global rail company association UIC writes about the reemergence of rail as a powerhouse for cross-border transport and the role UIC is playing in that growth.

Railways went through a decline during the second half of the 20th century, but their strengths have brought them a new lease on life in the 21st century. This is true across the globe.

These strengths include capacity, safety, sustainable development, and technological performance, which have been put in the limelight, particularly with the arrival of high-speed rail, first in Japan, then in France and now the rest of the world. Propelled by ongoing research into even greater capacity and better lifecycle performance — coupled with breakthroughs in information technology that have opened the door to new forms of communication and other innovations — railways have become the technology of choice and the transport mode of choice for policymakers and investors.

Furthermore, infrastructure renovation projects and blueprints for new high-speed rail links no longer stand alone, but rather are increasingly drafted to fit into the greater plan of land-use management programs around major cities and are drawn up with the requirement to offer efficient intercity transport systems.

On a larger scale, railway development at the intercity, regional, interregional and intercontinental levels must bear in mind the need to remain compatible with the interface to neighboring systems. For this reason, there are projects geared toward bridging these gaps, enabling regional networks to extend their operational scope and leading to the emergence of work on major corridors.

As opposed to the 20th century, there is also a focus on optimizing business models and making the most of technological advantages available from various transport modes, which can complement each other and help establish links to transport chains not just for freight, but also for passengers.

Examples of this type of project are appearing in the four corners of the world and are at differing stages of progress, depending on whether the region is still developing or already has the necessary infrastructure base. Taking a closer look at two key geographical areas in the field of railway development, there is Europe, which has a history in this arena, and the Middle East, which forms a channel for major economic flows between Europe and Asia. Many initiatives aimed at connecting these two regions exist in order to forge missing links and increase running speeds and capacity with a view to giving a central role for carrying goods and passengers to the railways.

Among these projects, there are high-speed initiatives that have weathered the economic downturn and financial straits. Indeed, one of the drawbacks with major railway projects is the distant return on investment and profitability due to the cost of infrastructure.

At this juncture it is important to note the existence of the Eurasian corridors. These key thoroughfares shouldn't be constrained to existing within European borders. In the long term, these corridors should form an interface with other networks to create a broad web of links from Europe to Asia, encompassing the Middle East. An example is the TEN-T East-Eastern Mediterranean Corridor linking part of the UNECE TER backbone, forming a passage across Turkey and the Caucasus, and thus uniting Europe to the Middle East via central and southern Europe.

These projects include those in the Middle East, the most emblematic of which is the passage under the Bosphorus that has become the passage linking Europe and Asia by rail, forming not only a bridge between both continents but also a door for trade between European and Far East markets. They also include new axes that have reopened paths formerly used by ancient silk and spice merchants. Step-by-step railway extensions, together with those being added from the south and north, are gradually forming a vast network of routes between Europe and Asia and building links from China to Kazakhstan, Turkmenistan, Iran and Turkey via the Caucasus or Siberia.

Some economic figures can demonstrate the huge potential and importance of exchange between Europe and Asia. The railways today are only capturing a meager 1 percent of trade worth $600 billion between Asia and Europe, of which a larger share is concentrated in eastern rather than western Europe, for freight in particular.

"A larger small piece of a larger cake" can be developed, so to speak. That is because, especially in the field of freight, reducing average journey times between southeast Asia and western Europe from a month and a half to two weeks helps reduce stocks and optimize mobility on the maritime legs of the journeys.

However, we must remain realistic, even if the projects being developed in this area are following the LHF (Longer, Heavier, Further) principle. In Europe we have trains that can transport up to 1,800 tons, or in Russia 5,000 tons, compared with container ships that can carry up to 200,000 tons. This forces us to keep a sense of proportion about the technical capacity of rail to be a dominant force, but it can still remain an alternative and interesting mode that can improve its share compared with other transportation modes.

Jean-Pierre Loubinoux

It seems quite clear that all of the ties linking European corridors to the major Middle East and Russian axes are crucial.

This is the reason why our organization, UIC, is forging ahead with work on a broad spectrum of international standards. Given the different standards currently used on a number of these corridors, there are still many hurdles to be overcome, in particular operational issues such as differing axle loads, speeds, braking rules, headway times, gauges, axle spacing and signaling systems. Various efforts need to be made to improve interoperability, which is the linchpin for securing the future of freight corridors. These efforts need to be not only technical, but also administrative and legal, with harmonization of tax regimes and work conditions and adoption of a “common language” for data exchange. Failure to achieve these things would put a brake on the carriage of interregional railway consignments.

These challenges underscore the importance of working toward broader interfaces, equivalent methods, and unification — in sum, moving toward the final prize of harmonization, which should be achieved by deploying efforts from the bottom up rather than the top down.

Our aim is to facilitate exchange and type approval, not only by working hand-in-glove with our members in the form of common projects, but also by putting our shoulder to the wheel alongside international bodies that have made these goals a core part of their business.

Our cooperation extends to work with a whole series of United Nations bodies and programs covering a wide geographical scope and range of technical subjects, where the UIC acts as a consultative reference, and this work includes other regional or professional organizations such as the OSJD, CIT, CCTT and OTIF.

To conclude, even though the railways have been on a long path to development, it is a familiar path. The path chosen was sketched out by the UIC at its origin, when it was already working toward the vision of global exchanges by rail. As research, globalization and trade now gather pace, the UIC has a rallying role to play at the heart of a newly vibrant railway sector. The UIC is the only railway organization to have a truly global outlook on the sector, thanks to its vast and diverse network of members and their involvement in its work.

Thomas Maier

Managing Director — Infrastructure Sector, EBRD

Transport Infrastructure Investments

Thomas Maier is the managing director of the infrastructure sector operations at the European Bank for Reconstruction and Development (EBRD). He joined the EBRD as senior project manager in August 1993 from NatWest Markets, where he had worked on acquisitions, buyouts and highly leveraged transactions in the UK and western Europe. At the EBRD, he has worked as a senior banker in the Romania/Moldova/Croatia/Ukraine country team. In 1999 he moved to the municipal and environmental infrastructure team as deputy director and became team director in October 2001.

The EBRD, an international financial institution created in 1991, supports projects from central Europe to Central Asia and from the southern to eastern Mediterranean. It finances projects in 34 countries. Through its investments, it promotes economic growth in its countries of operation, infrastructure development, adoption of strong corporate governance, and structural and sectoral reforms.

Thomas Maier

Transport Infrastructure Investments

Thomas Maier of the European Bank for Reconstruction and Development (EBRD) outlines priorities for METR region investment and explains how to secure them via public-private partnership mechanisms.

Infrastructure is one of the key factors as far as an economy's competitiveness and thus growth are concerned. While rail transport is quite developed in Russia, both in terms of overall track length and coverage and in terms of the reforms this sector has seen during the last 15 years, other transport industry sectors appear to be more of a bottleneck for the Russian economy. It is especially important to point out that one of the main obstacles to an increase in the country's development and competitiveness is its roads, which lacked investment both under and after the USSR.

Speaking about the region on a wider scale, the structural reform agenda in the infrastructure sector remains unfinished. While central European and Baltic countries are well-advanced in introducing market-oriented structures in line with European Union policies, other countries leave much room for improvement. In Central Asia, SEMED and eastern Europe, infrastructure reforms are at a much earlier stage, and the remaining transition challenges are large. A second observation relates to the progress of infrastructure reform compared with overall structural reform. In more advanced regions, infrastructure reform is on par with or slightly more advanced than overall economic reform, but in less advanced regions, it often lags.

The average infrastructure quality across non-EU EBRD countries is significantly weaker than both the G20 and world averages. The quality of infrastructure services has been improving since 2006 in almost all countries where the EBRD operates, with substantial score improvements in some places, such as Russia, Turkey and Kazakhstan. In fact, Russia, Turkey and central European EU member states all perform above the world average and indeed close to the G20 average. Nevertheless, in some countries, such as Egypt, the quality of infrastructure services is deteriorating.

According to the Logistics Performance Index developed by the World Bank, the EBRD region lags behind the world and the G20 countries in terms of logistics performance. With the exception of Poland and Turkey, and to a smaller extent the SEMED countries and central European states, the large emerging markets in the EBRD region are substantially behind large emerging economies in Asia and the Americas. It is important to note, however, that Poland and Turkey rank on par with China and better than all developing countries in the G20, with the exception of South Africa. Although the score has improved substantially in EBRD countries since 2007, there is a long way to go to catch up with the advanced economies in the G7. The aggregate LPI score hides significant heterogeneity in the scores across sub-components, with customs performance typically the lowest.

For the last 20 years, the EBRD has built up an infrastructure portfolio of more than 15 billion euros across 220 projects. On an annual basis, the bank finances about 1.8 billion euros through more than 50 projects in infrastructure, complementing roughly 3.5 billion euros in co-financing from other IFIs, donors and commercial finance raised from banks and capital markets.

Based on its mandate, the EBRD's infrastructure projects are designed to promote a reform agenda, typically promoted by a local leader or project sponsor. Increasing private-sector participation in the provision of infrastructure and services is one of the key objectives of the transition process, and our bank promotes this objective in its infrastructure operations.

The benefits of private-sector participation in infrastructure are generally recognized across the region, and over the last decade the private sector has played an increasingly important role in the provision of infrastructure. The EBRD has been successful in encouraging and supporting this transition, through its policy dialogue and investments, tackling some of the most complex transition challenges, such as port privatization and pioneering the use of public-private partnerships (PPPs) in new markets.

Two notable examples are the Pulkovo Airport and Mersin Port projects. In 2010, our bank financed the first PPP in Russia: Pulkovo Airport, a 30-year BOT concession. The EBRD provided $100 million for the project in parallel with other IFIs (IFC, NIB, VEB, BSTDB and EDB) and commercial banks. The project has received a number of prestigious awards, including ones from Infrastructure Journal, Euromoney Project Finance and EMEAFinance.

In the second example, in 2013, the EBRD supported Turkey's first-ever infrastructure bond with a $79.5 million participation in a $450 million Eurobond, launched by Mersin International Port (MIP), the private operator of the port of Mersin on the Mediterranean coast in southern Turkey. Successful placement of the bond on a foreign stock exchange, which attracted a broad global investor base, demonstrated new ways of financing infrastructure investments in Turkey and will encourage other infrastructure companies to diversify their sources of funding.

To date, the EBRD has financed nearly 40 infrastructure PPP projects for a total of 2.1 billion euros in direct private-sector financing across the transport and urban infrastructure sectors, including projects in water and wastewater (15 projects), roads (nine), airports (five), district heating (four), urban transport (three), ports (three), and national rail (one). These leveraged an additional 3.2 billion euros in other private financing from commercial lenders or other co-financiers.

However, significant transition challenges remain, including among the bank's countries of operation that are now EU member states, to

establish PPPs as a mechanism for delivering key infrastructure. This demonstrates the persistent and complex issues in improving the efficiency of infrastructure management. The bank's strategy is to support projects that enhance the level of private-sector participation in infrastructure, tailoring its approach to each country based on the stage of transition and the specific circumstances. Other important areas where work is still needed include the legal and regulatory framework and a review of operational activities such as performance-based road maintenance through the reform aspects of the projects it finances.

An important part of infrastructure project preparation is the environmental assessment. If project documentation fails to comply with lenders' environmental requirements, it could cause issues and delays with project implementation. To ensure timely financial closing and implementation of infrastructure PPPs, the government authorities/PPP grantors should undertake substantial preparatory work on the environmental and social project assessment prior to the PPP tender launch. This should include proper public consultations and development of an environmental and social action plan for implementation by the concessionaire.

The EBRD pays careful attention to the analysis of the environmental and social aspects of infrastructure projects and only finances projects compliant with the EBRD Environmental and Social Policy.

Improving and extending infrastructure ranks as a top priority for the region, given the widespread acknowledgement that adequate infrastructure is a key driver for growth and increased competitiveness in a globalized economy. Moreover, at the level of sector organization, properly structured infrastructure supports regional integration and promotes social inclusion.

At this sector organization level, there is a general need to increase competition in infrastructure through sector liberalization, reducing the remaining price subsidies and removing distortions in tariff-setting. To attract more funds to infrastructure, the role of the private sector in infrastructure needs to be increased. This can be done by strengthening existing private operators and increasing further private-sector participation, including through PPPs or joint ventures.

That said, while working in the infrastructure sector for the past 20 years, the EBRD has seen that all successful infrastructure projects have three things in common:

- They all have a strong underlying business case. A good project generates both an economic and a financial return through sufficient lasting demand for the new or refurbished infrastructure in areas in which that infrastructure has a significant positive impact on the well-being of economic actors.

- They are all supported by a strong financing and contractual structure. All are built on robust project finance structures that achieve bankability, legal enforceability, and environmental compliance while helping to expand the capacity of institutions to regulate, monitor, and evaluate projects.

- They all can depend on sustainable funding sources. The diversity of experiences shows that creativity and adaptability are often essential. Funding may come either from user charges alone or in combination with predictable, stable, and credit-worthy public-sector support.

Obviously, funding an infrastructure project is a vexing issue in developed countries and emerging markets alike; it can be a tough political challenge. Yet the search for funding must be a top priority for both the public and private sectors if infrastructure investment is to accelerate and economies are to continue to grow. The bankability of infrastructure projects — enhanced by new revenue sources and supported by enforceable contracts designed to match local institutional capacity — is what will accelerate their delivery.

A special focus should be on the quality of project preparation. Preparing and implementing infrastructure projects efficiently, however, remains a challenge given their complexity, the need to involve many stakeholders, and the weak capacity and limited experience of many EBRD counterparts in preparing bankable projects. In fact, one of the main problems in infrastructure isn't a lack of private-sector financing, but a lack of properly structured PPP projects by the public sector. What is needed most in order to make infrastructure project financing possible is enhanced project preparation by the (public) sponsors.

We see a number of infrastructure PPPs in preparation by national authorities, such as for roads in Russia and hospital infrastructure in Turkey. A good pipeline of PPPs is starting to emerge in certain sectors. However, there is still a lack of properly prepared PPPs at the regional level. It is important for regional authorities to allocate necessary budgets for preparation of bankable PPPs, with strong business cases (including rigorous economic internal rate of return analysis), a focus on "the user pays" principle and other underlying funding sources from the public sector, as needed. The support given by national authorities to the regions plays a key role. It is also important that regional authorities choose an open and competitive tender route for the selection of private investors. We often see directly negotiated deals or weak tenders lacking in transparency and competition.

The EBRD is willing to work closely with national and regional authorities and assist them with preparing bankable PPP projects and developing methodology for selecting projects, including on a case-by-case basis through provision of technical cooperation grants.

Jorge Miarnau

Integration of Transport Systems in the METR Region

President, COMSA EMTE

Jorge Miarnau is president of construction company COMSA EMTE. He was appointed president of Miarnau COMSA Group in 2005 and became head of the company after COMSA merged with EMTE. Mr. Miarnau is also head of the European Federation of Railway Trackworks Contractors (EFRTC).

COMSA EMTE is a Spanish infrastructure engineering company that also takes part in infrastructure concessions and works on renewable energy. It is represented in 25 countries and employs over 8,500 people. Its 2013 turnover was about 1.5 billion euros.

Jorge Miarnau

Systems Region •

Integration of Transport in the METR

Jorge Miarnau of the COMSA EMTE construction company discusses Spanish rail and European efforts to integrate rail networks.

All measures taken by the European Union to unify and standardize various national railroad systems are aimed at increasing the efficiency of the joint European railroad network. They will enable the creation of a common railroad space, thus making both passenger and freight rail transport much more profitable.

Yet, these measures aren't being implemented as quickly as it would seem desirable to do so. Many, if not all, future reforms depend on national governments, which aren't always ready to take their domestic railroad networks out onto the global market. It should also be noted that funding can be impaired because of limited budgets.

In some cases the delays can be explained by the fact that the government is unwilling to risk its privileged position as far as railroad management and equipment are concerned. Besides that, railroad operators wish to keep control over transport operations, which in some countries remain monopolized even today. It will thus be quite difficult for many state-owned companies that are often quite passive in their attitude to enter a competitive, result-oriented market.

Although reforms are introduced slowly and sometimes cost a lot, it will become obvious in the future that internationalization can increase a railroad network's competitiveness, allowing it to co-exist harmoniously with freight and passenger road transport systems. It can be illustrated by such successful projects as the Luxembourg-Les Boulous transport corridor on Spain's border with France served by VIIA, as well as the Trans-Alpine corridor between Eaton (France) and Orbassano (Italy) that is served by AFA (Autoroute Ferroviaire Alpine). The former is operated by Lorry Rail along with SNCF Geodis and will be extended to reach Barcelona in the future, while the latter has been operated since 2003 by SNCF Geodis and Trenitalia.

The Eurotunnel connecting London with Paris and Brussels is yet another example of such synergy. It allows the transit of trucks through the English Channel by rail at 140 kilometers per hour. The 745-meter trains operated on this track consist of two engines, 32 truck coaches, three freight coaches and a club coach for up to 50 drivers. Today there are 15 trains serving the tunnel, with their departure interval reaching 10 minutes during peak hours.

Funds allocated for internationalizing the railroad network must be aimed at providing competitive prices for operators. This is the basis for passenger and freight traffic growth and development. The times when rare investments into railroads were used solely to close loopholes should be left in the past.

Moreover, technical decisions required for railroad integration could turn out to be too expensive. But these investments should be approached practically: the more you invest, the cheaper both introduction and operation get.

Gauges of widths different from European widths are used in Spain. Railroad powering and signal systems are also different. This makes Spain a good example of such pragmatic investments, as recent years have included projects that allowed shifting from one gauge to the other and reducing operation costs.

This is best illustrated by such developments as the introduction of double-gauge three-rail freight and passenger tracks with a maximum speed of 160 kilometer per hour and triple-gauge four-rail track for gauge-width adjustment. These innovations allowed Barcelona's seaport to be integrated into the European railroad network.

Another example is the introduction of variable gauge wheelsets that eliminate the necessity of shifting to a different train on a different track, as well as any other discomfort for the passengers. The gauge adjustment sequence is conducted at a low speed, allowing the wheels and the axes to adapt to the new track automatically.

The question of the railroad signaling systems remains unresolved. The development of the European Rail Traffic Management System, or ERTMS, is unfortunately taking too long, and its introduction is facing financial and technical difficulties. This problem is best illustrated by the Barcelona-Paris route, in which trains must have three types of signaling systems in order to follow the Spanish, trans-border and French tracks.

All new measures, whether they involve the introduction of traditional systems, new systems or small-scale technological compatibility improvements, are intended to establish a common European railroad network that must be multifunctional, easy to manage and designed for further development in free market competition.

There are three types of railroad transport corridors in the METR region: high-speed passenger, freight and combined.

European practice shows that a high-speed corridor can satisfy the demand for passenger traffic for distances up to 600 kilometers. If the destination is farther, the travel time becomes long enough for planes to start looking like a better option. The key advantage of this kind of transport is that it allows major cities to be integrated with developed infrastructure and far-flung airports into one system. High-speed trains can fit perfectly into this picture due to advantages such as lack of traffic jams and delays.

A good example is the 600-kilometer Barcelona-Madrid route. Planes used to account for the major part of passenger traffic on this route, with unprecedented flight density. But after a high-speed railway connection was opened between the two cities, this new corridor started to take over the market and today, five years after the opening, the corridor accounts for 60 percent of the passenger traffic.

Freight transport corridors must be designed with a particular use in mind. Long, heavy trains need a track with a gentle gradient (from 12.5 percent to 20 percent) capable of mitigating and tolerating loads of up to 25 tons per axis to keep their speed steady. Since one of the ways to increase the efficiency of freight transportation is the use of long rolling stocks (more than 1 kilometer), the network should also incorporate sorting stations and side-tracks.

Besides that, such corridors require access to ports and industrial zones where all necessary infrastructure and logistical facilities working with freights must be provided for. Long trains with high carrying capacity will allow transportation expenses to be cut significantly.

And, finally, there are mixed-type corridors that can be used by both passenger and freight trains complementing the other two. These lines feature less traffic, either passenger or freight, and have to be adapted for combined use.

One of the options is to use this corridor for daily passenger traffic at a speed up to 300 kilometers per hour and overnight freight transportation at 100 or 200 kilometers per hour. The problem is that, when these two kinds of traffic are combined in daytime, it can lead to various delays that must be minimized by taking corresponding measures. These can incorporate the construction of sidetracks all along the corridor or of a second track that high-speed trains will use for overtaking.

It should, however, be taken into account that combined use of lightweight and heavyweight trains can have a negative impact on the quality of a track that is designed for neither. This will lead to increased maintenance expenses.

A common railroad system will allow the both the METR region and the EU to create a larger market and boost passenger and freight traffic.

Railroad integration benefits the industry as well: With lower transportation expenses, it will be possible to decrease the price of the end product. This will allow competition to be stimulated, increase output quality and cut prices, which benefits consumers as well.

On the macroeconomic level, transport integration and industrial expansion enable the diversification of trade and secure economy growth in various countries.

Increased integration would make railroad a more competitive transport means, especially in those countries that have historically had gauge width different from that of their neighbors.

Integrating EU and METR region railroad networks would allow the expansion of the necessary freight corridors stipulated by European Commission's TEN-T (Trans-European Transport Network) plan. The Finnish corridor connecting Helsinki with St. Petersburg is already provided for in the project, while Warsaw could be linked with Minsk and Moscow, Prague with Kiev and Budapest with Moscow. A Sofia-Istanbul connection is also planned in the southeastern part of the area. These corridors will cross the continent west to east and north to south.

Regarding high-speed passenger corridors, establishing a system of such corridors would allow travelers to cross the whole continent in a single 10-hour overnight ride on a train running 250 kilometers per hour. People will be able to get to Moscow from Paris as quickly as in one night.

Railroad operators will be competitive only on larger markets that will bring large volumes into play, which is impossible in most cases within the limits of a national market.

A large-scale, all-European transport system could be "the end of the line" for some national railroad operators, which used to hold monopolies (and some of them still do) on rail transport in their countries due to their outdated operational means. In particular, some of them are part of the country's infrastructure managing body. It will be difficult for these obsolete companies to make a quality breakthrough in order to be able to compete with private multinational operators in the future common transport system. Private operators show more efficiency in the use of their assets; they understand the way international markets work and have more investment opportunities.

For example, in Spain, freight traffic is served by Renfe Mercancias, the descendant of the state-owned Renfe company, which used to be the only railroad manager and operator and then split its activities between various enterprises. Renfe Mercancias works on a market that is very limited due to the width of the Spanish gauge, which essentially makes this traffic strictly local. This is the reason why Spain is one of the countries with the smallest freight railroad shipments volume.

As far as passenger traffic is concerned, it is likely to remain up to state-owned operators. This service is far from being cost-efficient but is still necessary to secure mobility for people living in low-populated areas. That also concerns commuter trains in major cities where national operators demonstrate quality and efficiency; it will be difficult for private operators to find their niche on this market.

Alexander Misharin

First Vice President, Russian Railways JSC

Alexander Misharin was born in 1959 in the city of Sverdlovsk. He made his career as a railroad man and later as a transport officer. He launched the project for restructuring the Railways Ministry, which resulted in the incorporation of Russian Railways JSC (RZD JSC). He took part in the startup of the first toll-road projects and in the approval of the action plan for improving Sochi's transportation system in preparation for the 2014 Olympic Games.

From 2009 to 2012, Misharin was governor of the Sverdlovsk Region. He supervised the launch of a joint venture by Siemens and Sinara-Transport Vehicles, where Lastochka electric trains are manufactured.

Since December 2012, he has been first vice president of Russian Railways JSC. He supervises the project for establishing high-speed railway lines in the Russian Federation.

RZD JSC is one of the largest state-owned railway operators in Russia. It holds 99 percent of the main railway lines in Russia, totaling over 86,000 kilometers, as well as stations, terminals, depots and dispatch systems. The company also owns about 20,000 locomotives (roughly 90 percent of the total locomotive stock), more than half of the country's freight cars and a major percentage of passenger cars.

Alexander Misharin

A Russian Train into the Future

Alexander Misharin, first vice president of Russian Railways JSC, shares the details of large-scale projects taking shape in Russia, home of the METR region's biggest rail network.

It is interesting to note that the countries with the most progressive approach to rail, namely Japan, France and Germany, gambled on new technologies in the 1960s. Railroads were a vestige of the past, and the top commercial speed of 210 kilometers per hour by train was considered the ultimate dream.

During this period, the Japanese and the Germans started designing magnetic-cushion trains, while the French worked on air-cushion designs. However, "air trains" never got off the ground, except for a short section of magnetic-cushion rail in Shanghai. Instead, high-speed trains took off, figuratively and literally, reaching speeds of 260 kilometers per hour in 1981 and 300 kilometers per hour in 1989. They set a record of 574 kilometers per hour in 2007.

The high-speed rail revolution is changing the social life of the entire METR region. Above all, these changes have to do with freedom of movement: Fast trains and high-speed trains have increased people's mobility many times over.

In Russia, the rail situation in our country can be viewed from a historical viewpoint. The first railroads in Russia were built during the reign of Alexander II to truly liberate the peasants from their yoke to the land by giving them the opportunity to move to Russia's newly formed industrial centers. As a result, however, one law on serfdom was replaced with another. Today, people resettle in large cities where there are more opportunities for self-fulfillment. New high-speed rail lines will allow a new "liberation of the people," while at the same time revitalizing a large number of small and medium-sized cities.

Specifically, the project to construct the Moscow-Kazan high-speed line (HSL) initiated by President Vladimir Putin will become the basis for social changes in Russia. We are speaking about the Moscow-Kazan HSL serving as a potential subway or suburban electric train for future urban areas. This is because, at speeds of 300-350 kilometers per hour, communities within an hour's travel will become stops in the future Greater Moscow, Greater Kazan and Greater Nizhny Novgorod. Communities up to 400 kilometers from each other and reachable in less than 1.5 hours will be regarded as "suburbs." Thus, urban areas will extend 400 kilometers, and cities like Kazan and Nizhny Novgorod, for example, will become suburbs of one another.

At the same time, the importance of stopover communities will sharply increase, rather than decrease. This is because, under current circumstances in Russian rail, the distances between these stopovers — ranging from 50 kilometers to 400 kilometers — are the most difficult to cover. Traveling these distances each day is long and difficult, whether by car or train. Since people's incomes and social status decrease sharply at these distances, the most ambitious citizens try to move closer to the center. Thus, when the HSL passes through these stations, they will get a second wind, and migration of citizens to large cities will stop. When high-speed rail travel is available, moving for work is no longer necessary.

Like residents of Lyon or Turin arriving in Paris or Milan, residents of Vladimir or Petushki will be able to travel to Moscow or Nizhny Novgorod via the HSL in less than an hour. Currently, it takes an average of 2.5 hours to 3 hours. In essence, the new rail service will be a high-speed subway with travel intervals of four to six minutes.

Furthermore, a "centrifugal" trend has been observed in a number of European countries, especially Spain and France, due to their high-speed trains. People have started moving to small communities as far as 1.5 hours by high-speed train from large population centers. The advantages of life in the provinces include a good environment and lower prices.

In the case of real estate, the difference can be substantial. In Russia, middle-income families who purchase an apartment 20 minutes by high-speed train from the center of Moscow, or 80 kilometers to 100 kilometers from the center, will pay off their mortgage in two to five years. A mortgage for an apartment located inside Moscow city limits, but at the same distance from the center, will take 30 years to pay off. Thus, people will be able to buy or rent better-quality housing for less money. It also will become typical to live where it is more comfortable and work where there is more money.

The new wave of social changes also will affect the more-affluent demographics. This is because the cost of land in the Vladimir and Nizhny Novgorod regions isn't comparable to the cost in areas surrounding Moscow. However, after the HSL project is implemented, those two places will have about the same travel time from the center of Moscow.

Thanks to the HSL, offices of large companies, universities and exhibition centers will be able to move within 1 hour to 1.5 hours of travel from what will essentially be central high-speed subway stations. It is clear that the HSL will become an excellent tool for decentralizing business and thus for reducing burdens on the infrastructure of large cities. It is precisely because of transportation problems that the idea of relocating some government offices outside of Moscow hasn't gotten off the ground.

Alexander Misharin

At the same time, as the European experience has shown, quality of life improves in small cities due to these “high-speed subway stops,” because people living or working in large cities need better-quality services. Consumer demand will appear, which in turn will stimulate the expansion of education, medicine and services in these communities. Ultimately, many opportunities for growing small and medium-size businesses will appear.

The Internet already has enabled large corporations to move their service centers to the regions. In addition, some consultants will relocate to the regions with the appearance of the HSL. They will have the means to reach their clients in the same amount of time that currently is spent sitting in urban traffic jams.

This Moscow-Kazan “high-speed subway” will give people the opportunity to earn more and make better use of their free time for traveling. A resident of Nizhny Novgorod will be able to take a trip to see Kazan’s kremlin and return within the day, spending only three hours in transit. This Moscow-Kazan high-speed line will make the beautiful places located between Moscow and Kazan more accessible — for example, the cities on the Golden Ring.

In many ways, high-speed railways have revitalized former industrial cities in Europe. For instance, the government of the French city of Lille lobbied for construction of an HSL through the city. Their HSL has brought in half a million tourists annually, 15 times more than before.

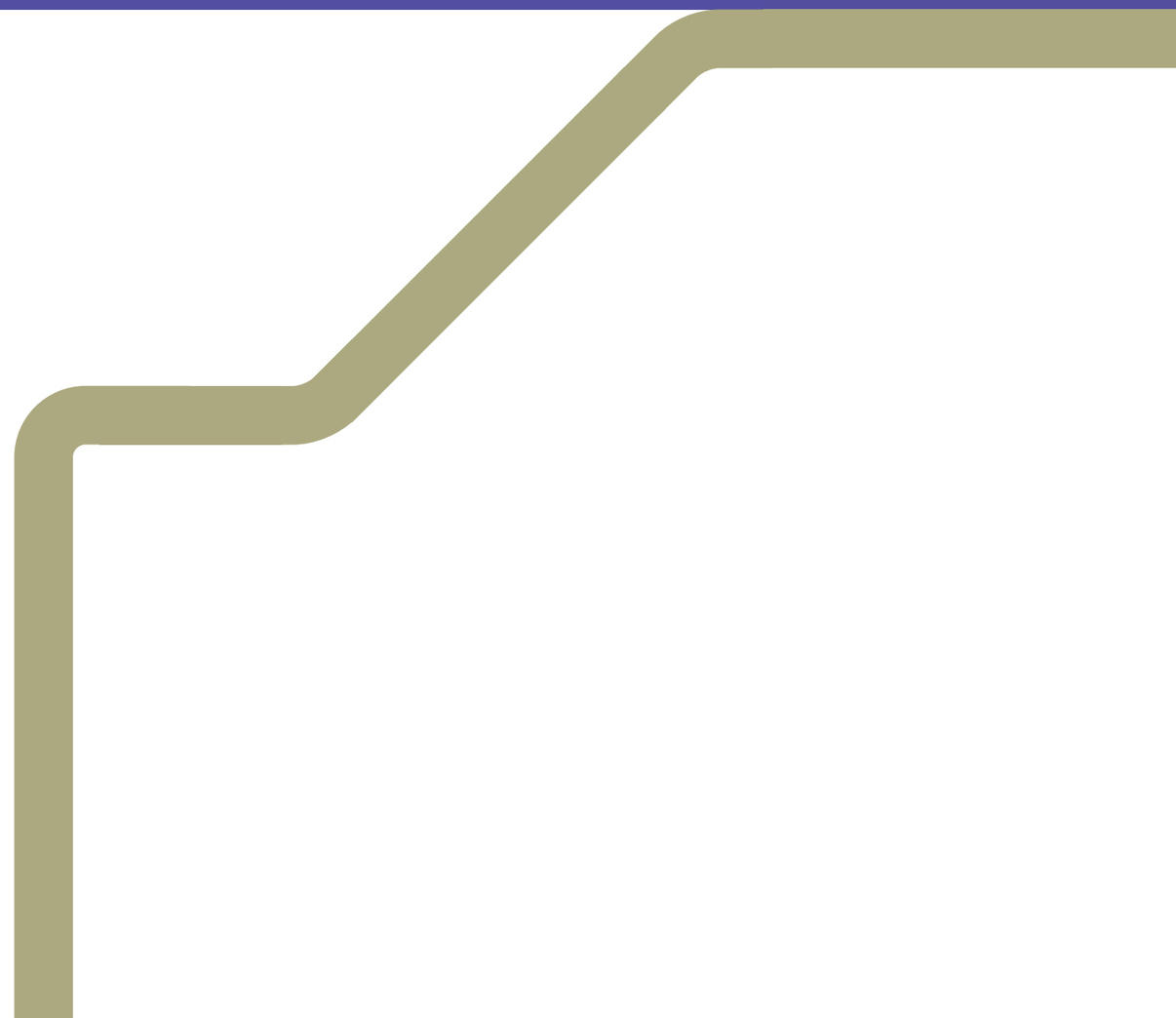
The reason for the success of high-speed lines in the METR region is associated with socioeconomic and other factors, including environmental ones. A train traveling at up to 320 kilometers per hour consumes less than one liter of fuel per passenger, or four times less energy than a car and seven times less than an airplane traveling the same distance. Moreover, atmospheric emissions from HSL are many times less than those from aircraft. If clean energy is used, this figure may even be 100 times lower. Finally, a railroad line is four times more efficient than a highway in terms of carrying capacity.

Russian Railways has the longest rail network in the METR region. Of course, this gives us an advantage in terms of our ability to transport freight within the country and for international trade. However, if we want to get a big piece of the pie, including traffic between Europe and Asia, we will need to increase the speed and reliability of freight delivery by many times. To this end, a project to upgrade the Trans-Siberian and Baikal-Amur lines has started at the initiative of President Putin.

Of course, the HSL project is expected to increase the competitiveness of Russia’s transportation system. In this context, we should note that it will significantly reduce the load and risks on existing lines, since it will be used for trains with varying speeds. As a result, Russia’s

Transport Strategy 2030 calls for the construction of more than 7,000 kilometers of fast rail lines and more than 4,000 kilometers of high-speed rail lines.

Implementation of the pilot Moscow-Kazan HSL project is currently under way. In addition, there are plans to extend this line to Yekaterinburg and build lines from Moscow to St. Petersburg and from Moscow to Adler.



Mauro Moretti

● METR Region Transport Systems

● **Chief Executive Officer, Finmeccanica S.p.A.**

Mauro Moretti is chief executive officer and general director of Finmeccanica S.p.A., the high-technology company in aerospace, defense, transportation and other sectors. Mr. Moretti was born in Rimini in 1953 and worked his way up the career ladder to become a union leader and railroad executive. From 2006 to 2014, he was CEO of Ferrovie dello Stato Italiane S.p.A., the government-owned railroad operator in Italy.

Mauro Moretti

METR Region — Transport Systems

The METR region — consisting of the Middle East, Europe, Turkey and Russia and soon to be joined by more Mediterranean countries — includes areas that are among the top development priorities of Italian state rail operator Gruppo Ferrovie dello Stato Italiane. This super-region is becoming more and more important for Italy's and Europe's economic progress, in terms of promoting direct trade with neighboring countries and enabling potential transit flow from the Far East.

It goes without saying that Europe's extensive experience in promoting and maintaining the integrity of its member states by introducing international transport policy should be taken into account. The European Union is supporting the Trans-European Transport Network (TEN-T), contributing to a policy aimed at facilitating ground-traffic organization, eliminating bottlenecks and optimizing the infrastructure through member states' coordinated investment programs. European transport policy has bolstered the rail transport sector by introducing interplay standards, by increasing rail's capacity and maximum speed, and by promoting the European Rail Traffic Management System (ERTMS), which meets the highest capacity and safety standards. Italy has actively backed this policy.

Though infrastructure network design is well-developed today, certain limits to the TEN-T project have been discovered in the last few years. And although TEN-T is fundamental for Europe's "general development plan," the funds allocated for this project aren't enough to create the large-scale infrastructure that Europe needs to eliminate physical and technical hindrances to cross-border freight traffic.

From 2007 to 2013, the EU allocated only 8 billion euros from its budget, with the chronically insufficient interstate financing taken into account. That is why the European Commission suggested revising the 2014-2020 plans and introducing new TEN-T standards and a CEF financing tool, all aimed at reconsidering maps and routes for top-priority corridors. The new plan that I backed as CEO of Gruppo FS Italiane and as chairman of the Community of European Railway and Infrastructure Companies was approved in November 2013.

Through the CEF, Europe was able to determine a core network of nine cross-border corridors that need to be considered top funding priorities and completed in the near future, then complemented with a large additional network to be finished by 2050. However, transport sector allo-

Mauro Moretti, who headed Ferrovie dello Stato Italiane from 2006 to 2014, outlines the creation of a common European transport market and describes how this experience could be used in other countries.

cations — especially in regards to the CEF, which also deals with energy and communications — were cut. Only 23.2 billion euros were allocated for transport development in 2014-2020 from the EU's meager budget, as opposed to the 50 billion euros suggested by the European Commission. We hope that CEF bond projects will allow private capital to be sought and obtained, even though state funding will be the main source of railroad financing.

Despite such a limited increase in funding, CEF has established the minimum goals — in particular, for rail interplay — that must be accomplished by 2030. For example, the whole core network must be equipped with ERTMS. The mechanism includes goals worked out under joint transport integration methods that cover train, airports and especially seaports, which pose a serious issue for Italy and the rest of Europe. Throughout Europe, 100 ports must be chosen from roughly 440 priority ports, but even 100 is too many to be integrated into the core network.

I hope the CEF will allow for the creation of a true common European railroad service market free of physical and technological barriers and open to competition among operators from various countries. The results to which member states commit themselves remain the key criteria in choosing infrastructure investment priorities.

This is why I support the decision to consider the Turin–Lyon rail line an object of strategic importance. Italy's priorities are maintaining and expanding its connections with Europe, breaching the Alpine barrier and thus solving the issue of its geographical isolation from Central Europe. A great achievement and a model at the international level, the Italian high-speed rail network will stay remote and subordinate (compared with the basic European network) if it isn't integrated into the railroad systems of Italy's neighbors.

However, Europe's top priority as stipulated by the 2011 Transport White Book is to eliminate the bottlenecks hindering the operation of TEN-T corridors from France, Switzerland, Austria and Slovenia crossing into Italy and restricting freight and high-speed traffic. Europe's commitment to establishing freight rail corridors is more proof of this point. But despite the efforts of Italian railroad management, the country is still facing technological and geographical challenges that cannot be tackled without creating long and expensive Alpine tunnels such as the Turin-Lyon high-speed line, the Brenner Base Tunnel, or similar projects.

We cannot give up on high-speed rail lines, and I think much effort is required from Europe to regulate the market. Here the European Commission could learn from the Italian experience, because Italy was the first in the world to see a market open for two high-speed rail operators to compete. Brussels is currently working on standards and regulations, and I hope that we will be able to transition to a common European mar-

ket where railroad operators can compete without administrative barriers or monopolies while working on state and private investments. Unfortunately, there is still a long way to go if we want the rail service market to be as dynamic and competitive as the air transport sector. However, Italy could post Europe's highest rates as far as high-speed rail business, economics, funding, quality, traffic density and service are concerned.

Certain METR region countries, namely Russia and Turkey, have already established intersection points with TEN-T corridors. North African and Middle Eastern countries should take the EU's experience into account and view renewed cooperation with the European Mediterranean region as a positive development.

In November 2013, transportation ministers gathered in Brussels to meet with Siim Kallas, then vice president of the European Commission and the commissioner on transport. Putting a new focus on the Mediterranean region and on the development of a trans-Mediterranean transport network is an important goal — one that must be achieved in order to connect Central Europe with the countries on the northern Mediterranean shore through so-called sea highways and to boost EU-backed infrastructure projects aimed at improving the quality of cross-border freight transit in Northern Africa.

We also should pay attention to the green corridors for fresh and perishable products connecting the Mediterranean region with the EU.

I hope that the countries of METR region will look to European policy and market regulation standards, in particular, as far as technical interoperability requirements are concerned.

The FS project in Egypt, which is bilaterally acknowledged as the core of the cooperation between the two countries even after the 2011 revolution, incorporates a range of measures aimed at introducing European-level service and management standards in Egypt's rail transport sector. The fact that Egypt is a key player on the Mediterranean geopolitical scene makes this an important project.

Another important integration and standardization initiative to which Gruppo FS Italiane has contributed is the Arab railroad network research. Initiated in 2010 by the Kuwait-based Arab Fund, this research covered 21 Arab League member states and had the goal of estimating the volume of work required for integrating their national railroads into a pan-Arabic regional system. Due to its scale and nature, the project is of special strategic, political and economic importance. The railroad concession featured a complex control plan, with the Arab State League participating through a special agency created to establish a State Arabic network that would take a special position in this sphere if the project is implemented successfully.

Now let's talk about the East. The Turkish-European networks integration plan cannot but take into account Balkan regional policy, especially as far as the X and VIII bottlenecks in the pan-European corridors are concerned.

The West Balkan network is connected with EU border states (Slovenia, Hungary, Romania, Bulgaria and Greece), represented at the Adriatic sea through six ports (Fiume, Spalato, Ploče, Bar, Durrës and Vlorë), and crossed by three pan-European corridors (V, VIII and X) and six regional routes. Serbia controls the largest part of the network, roughly a third. Its best infrastructure conditions can be seen in the north-south direction (corridor X and its branches), which is intended to connect Germany and Austria with Turkey and Greece. Gruppo FS Italiane has participated in various modernization works funded by the EU, the European Bank for Reconstruction and Development, and the European Investment Bank.

As a country with a large railroad network, Turkey has launched modernization programs for organization/management and for infrastructure. The latter includes high-speed line construction projects. As the country's relations with Europe developed, the Turkish railroad system saw European standards introduced and promoted by newly established agencies, which means the country is ready for future integration. This network will be easy to connect with the Marmaray rail tunnel under the Bosphorus Strait, which began operation in 2013.

There is also a range of noteworthy modernization and development projects in Russia, from the Moscow-Kazan high-speed line, to various Europe-oriented freight and passenger transport programs. Russia will see real benefits from high-speed lines, just as Italy and other European states did, especially as far as civilian mobility is concerned.

Another project that should be noted is the Vienna-Košice wide-gauge line, between Austria and Slovakia, that will require about 450 kilometers of new infrastructure and a new logistical center to support new businesses. The line should lead to an increase in freight traffic, a shorter logistical cycle and less travel time for freight transit from Asia to Europe. This project will be complemented by another one, the Trans-Eurasian Container Lines, which will enable the transport of goods from China to Europe by land instead of a 45-day sea voyage.

Eugenio Muzio

Eugenio Muzio is the owner of Combitec, a Milan-based consulting firm for the combined transport sector. He has been working with Combitec since 2007. From 1979 to 2007, he worked for Cemat S.p.A., an Italian company specializing in combined transport. During his time at Cemat, he served as both general manager and managing director.

From 2003 to 2009 Mr. Muzio also was president of the UIRR (International Union for Road-Rail Combined Transport), and from 1994 to 2009 he was president of the Technical Commission Interunit, an association of rail companies and intermodal operators that defines the technical rules for intermodal train cars.

Eugenio Muzio

Intermobility Strategy for the METR Region

Eugenio Muzio, a former Cemat executive now working with the Combitec transport consulting firm, details the various types of intermodal transportation and what they involve.

The countries forming the METR region represent a reality of great importance all around the world in terms of economic issues, political and social matters, and culture and science.

The key components for a better merging of economies of the involved countries are their commercial interconnections and, therefore, an efficient and functional transport network for the subsequent transfer of goods.

Considering their geographic location and the extent of the territories concerned, every transport mode is involved in interchange processes. Road, train, ship, airplane: Each of them with its specific characteristics and roles can improve the system and lead to an intense and profitable interconnection among countries and economies seemingly defined by different features.

In this presentation, the topic of intermodal transport of goods will be outlined by its specific areas: road-rail; road-sea; and road-rail-sea, especially for container sea traffic.

The goal is to draw a picture of the current realities and consequently to elaborate some suggestions for a larger development of intermodality in interchanges, with the aim of a fluent, simple and easier interconnection among the economies of the METR countries.

A close examination of the current situation of transport of goods in the METR region allows us to detect the currently predominant methodologies and to consider where and how intermodality can, along with infrastructural interventions, help evolve their economies in a positive way.

A

A 1

Intermodal transport techniques

Combined road-rail transport (CRRT)

It is the most modern and efficient inland transport solution in alternative to the full road one. This technique uses Intermodal Loading Units (ILU), designed to be loaded on rail cars as semi-trailers with grappler pockets and swap bodies. (To note, swap bodies are equivalent to a loading body of an articulated truck or semi-trailer and are placed on a train car in rail journeys and on a trailer or articulated truck in road transportation).

Transport is basically formed by three routes: a first short route from the loading point to the local intermodal terminal; a long-distance rail route usually with complete trains from terminal to terminal; and a final short road route to the downloading point.

This technique was born in the United States in the mid-1950s and is still the main type of transport there. A decade later, Europe also developed its first combined transport techniques. During the course of 50 years, CRRT experienced important changes, especially in certain European countries like Germany, Switzerland, Belgium, Austria and Italy.

An important relationship network connecting European countries is currently in place. This is particularly important for Italy because about 70 percent of exports are directed toward northern European countries across the Alps, and in some cases they also cross third countries. In this context this system has advantages compared with traditional rail or road transport. As a matter of fact, railway brings the best of its functionality with CRRT.

Below are European reference data from the UIRR (International Union for Road-Rail), an organization composed of 14 companies that together manage up to 50 percent of traffic. These data are for 2013:

Traffic type	ILU	TEU
National	924.294	1.848.588
International	1.701.999	3.403.998

These numbers prove the efficiency and penetration of the system even in time of economic crisis for many European countries, which obviously affects the volume of goods being transported.

A 2

Combined road-sea transport (CRST)

A CRST, also called a sea motorway, represents an important modal alternative, especially for business across the Mediterranean Sea. Thanks to modern ferry boats, it allows the massive transportation of semi-trailers (RoRo technique) and, once the hold is full, of containers as well. This is for international traffic — links among the Italian peninsula and the islands of Sicily and Sardinia are typical — and for connections between the northern and southern coasts of the Mediterranean Sea, as well as for East-West connections.

In the case of Italy, for instance, national routes between northern ports and the islands, as well as international routes between northern ports and Spanish ports, are clear examples of cost savings and time savings thanks to a substantial reduction of the covered distance and easiest connections.

Nowadays, the majority of RoRo ferries are big and efficient ships suitable for the transportation of passengers and cargo vehicles. They have proven an essential means of transportation that has made easier much of the business between Europe and the so-called Maghreb countries on the Mediterranean coast of northern Africa.

A 3 Intermodal transport of maritime containers

Maritime containers represent the biggest invention of the last 60 years in the transport of goods worldwide. With their evolution and gradual global expansion, they basically replaced all other means of maritime transport of various goods and allowed for market globalization.

Container ships have now increased their dimensions, reaching the load capacity of 22.000 Teu. With the increased load capacity, the opportunity to decrease the number of port of calls arose, concentrating the handling of containers directed to other ports of final destination called “regional” ports (this is “transhipment” handling). Transport — including transport by sea — between the port of call of the biggest ship (“mother ship”) and the regional port of final destination of the container is carried out by limited capacity ships (“feeder ships”).

Important issues in the intermodal chain of maritime containers — once the ship arrives at the destination port — are the time of leaving the port and the ease with which goods can reach the final delivery destination.

This last inland leg can be made both by road and through an intermodality system similar to the CRRT, with a first rail leg from the port to an inland terminal and from there by road to final destination. The use of railway becomes more and more fundamental and necessary with port traffic growth, thanks to the use of complete point-to-point trains. In major ports, such as Rotterdam, container traffic handled by rail can reach up to 50 percent. Obviously, in order to reach those levels, the whole port rail system must be adjusted to the traffic system as well as to the connecting railway network. (In Rotterdam a dedicated railway line was built, the Betuweroute, only for container traffic that links the port to the German railway networkk.)

Naval gigantism is a parallelism of port gigantism. In the worldwide chart of the major container ports (more than 7 million Teu per year), there are only three European ports, all of them from the Northern Range (Rotterdam, Hamburg and Antwerp). Eastern ports lead the chart, with peaks beyond 32 million Teu per year.

B Intermodality in METR countries

What has been described above about intermodal techniques shows that these transport systems can significantly contribute to the development of interchanges among the METR countries, expanding their interconnections and increasing their presence in the globalized economy.

At the moment intermodality is experiencing deep differences among various METR countries. For this reason, we will make a closer examination of each different reality with the aim of understanding the situation and make some suggestions for future evolutions.

B 1 The EU countries

The EU countries, especially northern ones, have already developed intermodality considerably. It is not by chance that European ports with the highest container traffic are in Holland, Germany, and Belgium. CRRT is also experiencing a remarkable application in Germany, Belgium, Holland, Austria and in northern Italy. In Italy, freight terminals began to be designed in the 1960s, and their construction started in the 1980s.

Freight terminals are multifunctional logistic structures of great value, and their functional concept could be useful in the METR region to develop and ease the traffic of goods. A freight terminal is designed mainly for logistics, with an annexed intermodal terminal. Besides traffic concentration, in the case of intermodality, freight terminals allow considerable cost and time reduction in road traffic.

Germany, for instance, already has adopted the freight terminal and in some cases has realized very big logistics intermodality in its cities. An outstanding example is Duisburg, where there are three means of transport: road, rail and internal navigation connected with ports.

The EU countries have defined nine strategic corridors, together forming the TEN-T, which by 2020 will update and improve the big European routes for passengers and goods. They are a remarkable opportunity for connection not only for interchanges among EU countries, but also with Russia, Ukraine, Belarus and Mediterranean countries.

B 2 Russia

Given its dimensions and economic reality, Russia is without any doubt a priority partner for the other METR countries, as well as for the southern Mediterranean coast countries. Russia has a wide and well-equipped railway network, its most impressive characteristic being the line from Moscow to Vladivostok. Russian Railways is one of the most important railway systems in the world.

The two significant limitations of the Russian railway network related to integration with other networks are the gauge difference and, specific to intermodality, the current transport limit of 20’ and 40’ containers, excluding the other ILU — swap bodies and semi-trailers — due to the lack of suitable train cars and terminal structures.

These limitations have a strong influence on the development of intermodal relationships between Europe and Russia. Problems arising from

different railway gauges could be overcome by developing CRRT with the option of transporting swap bodies and semi-trailers that could be transferred at the border between train cars with different gauges. The use of swap bodies and semi-trailers with EC measures allows the use of EUR-pallet, which in the ISO measures of maritime containers doesn't allow the complete use of the ILU loading surface.

Interesting experiments in railway connections between Europe, China and Korea via the Trans-Siberian rail line are currently being studied as an alternative to the classic maritime transport between Chinese and European ports. The advantage of rail could lead to a remarkable reduction in transit time, which is particularly useful for Chinese and Korean production centers far from the sea. These initiatives are very likely to become more and more widespread and will considerably foster certain types of traffic particularly suitable to intermodal railway transport. In this context the possible role of Russian railway seems clear.

Given the breadth of Russia's territory, a specific study could be conducted to evaluate the benefits of structures similar to Italian freight terminals located near major cities and major industrial centers, in order to promote interchange systems with a greater use of railway.

B 3 Turkey

Turkey is one the most dynamic and advanced Mediterranean countries. Its interchanges with European countries, especially Germany, have considerably increased in the last decade. Until the 1980s, the interchange of goods was made completely by road through the former Yugoslavia. Given the wars in that area in the 1990s, Turkey was forced to change its transport routes. It initially passed through the Greek port of Igoumenitsa that is connected by ferry with Italian Adriatic ports, and, more recently, it studied more extreme systems for the transport of goods.

This was the genesis of the first maritime interconnections organized and supported by Turkish road transport unions with ferries on the routes from Turkish ports to Trieste and vice versa. At the beginning, in the vast majority of cases Turkish sponsors used this service in order to continue to travel by road from Trieste to the final destination.

Later, the first variation of rail connection was implemented by Austria with a Trieste-Salzburg rolling motorway capable of transporting the entire vehicle and its driver inside the train. Afterward, with remarkable skill, Turkish enterprises successfully created a large fleet of vehicles and, therefore, changed the organization design. At the moment in Trieste, ferries of different companies arrive and leave with many voyages daily and semi-trailers are mainly moved on special trains having as departure/destination Bettembourg in Luxembourg; Cologne, Duisburg, Frankfurt, Ludwigshafen and Munich in Germany; and Ostrava in the Czech Republic.

Turkish operator initiatives show how intermodality can help develop interconnections between countries far from each other. However, inside Turkey the vast majority of transport is carried out by road, even though the country's size would justify the study of intermodal alternatives. It is likely that in the future the dynamism of Turkish management could seriously take into account this option.

B 4 The Middle Eastern countries

Particular attention should be paid to the Middle Eastern countries. Unfortunately this region is characterized by wars and conflicts that deeply damage normal economic activities and, consequently, interchanges with the rest of the world. For example, the situation is dramatic in Syria, with consequences in Lebanon and Jordan. The only exception is Israel, which in spite of the tragic conflict in the Gaza Strip in Palestine has considerable interchanges with Europe.

Logically, the vast majority of potential interchanges toward northern Mediterranean coast countries can be made by sea with containers, as well as rolling stocks loaded on RoRo vessels. It is therefore necessary that these countries, particularly the ones devastated by war, are equipped as soon as possible with highly effective structures and organizations suitable for loading and unloading vessels.

C Some considerations for actions and interventions

C 1 Creation of a master plan for METR traffic relations network

Taking into account arrangements made in the European Union with the creation of the nine TEN-T corridors with the aim of improving the flow of interchanges using intermodal techniques at the utmost, it could be interesting to carry out a study to identify the major traffic flows between METR countries.

The study could do the following: check the current situation of road, rail and port infrastructures; verify whether the existing system is able to meet medium-term traffic needs; identify adjustments in organization, rules, customs, etc. in order to improve the traffic of goods; and highlight the need of infrastructure interventions — for example, an interest in building a network of freight terminals — in relation to possible development of medium-term traffic flows.

This study could be divided into multiple phases, involving interested countries, as well as the cluster of transport and logistics involved. On one hand, it could identify the needs and resources to be allocated to these projects in order to evaluate their feasibility. On the other hand, it

could analyze the returns expected in the short, medium and long term from a policy mainly based on the development of interchanges, in order to better balance reference conditions among METR counties.

C2 Activation of a policy of higher intermodal integration among METR countries

Coordination and balance are the conditions necessary for developing intermodality among METR countries. Until now, different countries have developed useful initiatives and connections for the transport of goods among themselves. However, in order to expand intermodality to areas where it is still absent, an agreement among countries is needed, and the abovementioned master plan could be considered as its basic document.

An organization could be created in partnership with business representatives and with the ministries of commerce and transport of the countries involved. Its aim would be to identify near- and medium-term needs and define intervention guidelines, as well as to create an implementation plan, perhaps even involving the European Commission, in order to reach the expected results in the long term.

C3 Infrastructural and operational aspects of intermodality in METR countries

Intermodality development should include suitable lines and nodal infrastructures, that is, ports and inland terminals. For example, for railway lines and terminals, the EU has said that for the purpose of intermodality, EU railways should adapt their infrastructure to the standard train performance, meaning a length of 750 meters, a weight on hook of 2,000 tons and a maximum shape of P400.

If length and weight influence management, then an unadapted shape can obstruct CRRT with semi-trailers, while it is a less substantial problem for swap bodies (using car trains with low loading platforms) and containers according to heights.

Inland transport over time has improved in road transport (roads and tunnels), as well as in rail transport (base tunnels, underwater tunnels, shape and gauge adjustments). For a country like Italy, the new Gotthard line and the Brenner Base Tunnel are important strategic factors for smooth traffic of goods. In the same way, the Channel Tunnel and the fixed link between Denmark and Sweden are important for other European areas. Examples of important strategic factors for ports are the UIC gauge in the line between Barcelona and the French network, the Betuweroute line for Rotterdam, and the Third Passage for Genoa.

C4 Interchange between METR countries and Maghreb countries

The Maghreb countries — the Mediterranean coast of Northern Africa — deserve particular attention, since after the Arab Spring, the most important countries in this area have shown great interest in re-launching their economies and increasing interchanges with European countries. Egypt, Tunisia, Algeria and Morocco are the most visible examples of this change. Of course, this interest has to be supported by transport and logistics organizations capable of meeting the needs existing on the other Mediterranean coasts.

As Maghreb countries become more frequent sub-suppliers in European industry, the maritime connection system with RoRo ferries used for rolling stock and container transport already existing in some of those countries should increase accordingly. Inland transport in Maghreb is made at the moment by road, since there are no requirements to organize an intermodal railway system that could meet the market's needs. Therefore, it is essential to have a road network that could reach industrial centers and major urban areas where there are more consumers.

In this context it also could be interesting to consider the possibility of realizing ad hoc logistic infrastructures that allow the reduction of the costs of collecting and distributing goods.

Joaquin Jimenez Otero

Senior Vice President, ADIF

Development of International Rail Freight Corridors

Joaquin Jimenez Otero is senior vice president at ADIF and president of the European Green Ways Association. He is also supervising the Mecca-Medina high-speed railway connection.

ADIF (Administrador de Infraestructuras Ferroviarias) is the government administration for railway infrastructure in Spain and provides comprehensive management of all systems and subsystems of the country's rail network.

ADIF is Spain's largest investor. The company invested more than 37.9 billion euros into various national railroad projects in 2005-2012, with 32.1 billion euros allocated for high-speed rail lines and 5.8 billion euros for traditional railways. The company employs 14,000 people. It manages a railway network of 15,000 kilometers, with high-speed lines accounting for more than 2,000 kilometers. The company's total asset value is more than 40 billion euros.

Joaquin Jimenez Otero

Development of International Rail Freight Corridors

Since the dawn of time, our culture has been influenced by the major historical routes across countries and continents. We increasingly find evidence of unimaginable relations between prehistoric tribes located miles and miles from each other. Their needs were surely completely different from the ones we have now and undoubtedly had more to do with survival as opposed to business and trade. That said, even our early eras had flows of people, animals and goods.

Throughout history, great itineraries have shaped deep cultural exchanges, the development of civilizations and the boom of commerce — and, we should highlight, they promoted well-being, new living standards, and exchange of knowledge. As a Spaniard, I would like to mention a great historical route: our incredible Way of Saint James (Camino de Santiago), a medieval destination of pilgrims that is still intact.

Today, new great routes have emerged, reminding us of those once followed by our bigger-than-life explorers and merchants. Until recently, these new routes mirrored the ocean routes, the flows of major seaports, and the large civil engineering works aimed at overcoming land obstacles. However, during the last two decades, significant land itineraries have appeared and, as we can see, railways have proved themselves as the most efficient and competitive means of transport to cover vast distances by land.

At the same time, we are aware that in the past the fragmentation of territories was understood and established as the means of maintaining political balance (and as a consequence of local conflicts and tensions). Nowadays, however, we are aware that the fragmentation caused by technical differences limits the possibilities of competitive and efficient transport, particularly in regards to railways, which are notably sensitive to these differences between neighboring countries. Being a relatively medium-sized country, located in southwestern Europe together with our Portuguese neighbors, Spain is no stranger to these problems, as it has networks with a gauge width (1668 mm) different from the standard European gauge (1435 mm).

In 1986, Spain embraced a vision of “the railway of the future” and decided to invest in new high-speed lines with interoperable parameters, aiming to achieve higher integration into the European railway network. Today, three decades later, we have invested more than 35 billion euros and constructed 2,321 kilometers of next-generation high-speed lines with standard European gauge designed mostly for trains operated at 350 kilometers per hour, as well as constructed 759 kilometers of conventional lines with speeds of up to 200-220 kilometers per hour. This has resulted in commercial speeds of up to 160 kilometers per hour on long distances. On the whole, more than 25 million passengers enjoy the high-speed rail advantages of lower travel time and increased mobility.

Joaquin Jimenez Otero, senior vice president at ADIF, Spain’s rail infrastructure company, makes the case that eliminating infrastructure restrictions in Europe will increase rail transport’s competitiveness and shift the intercontinental freight traffic balance in favor of southern countries.

We are sure that no one in Spain could have imagined this success and this breakthrough in territory coverage 30 years ago. Nowadays, our view goes beyond our national borders, and since February 2013, the fully interoperable Spanish high-speed network has been a model of how to overcome technical differences, as it is integrated into the European network with standard UIC gauge. This eliminates one of the bottlenecks with the aforementioned great European railway routes of today. It also means that international freight trains can reach the French border from Barcelona’s terminal and port on this gauge.

What objectives can be set for the coming years? What can be accomplished before 2025?

Due to a number of circumstances, including a very competitive road freight transport sector and railway traffic limited mostly to national and therefore short distances, the Spanish railway’s share of the freight transport market has been reduced to a mere 4 percent. However, with the new vision of “great maps” adopted, the prospects for this matter are starting to look brighter. Promoted by the European Union, this vision supports the strategy of transport corridor construction advocated by Spain in hopes of making its railways more competitive on the global market.

According to EU officials, practice shows that the key obstacles to establishing an efficient trans-European transportation network are the restrictions resulting from cross-border infrastructures, the problems of technical interoperability, and the integration of various transport means with competitive advantages in corresponding sectors.

In 2013, the EU revised previous guidelines on the Trans-European Transport Network (TEN-T) project in order to define a core network of transport infrastructure that incorporates all modes of transport, but pays special attention to railways. The strategy of the European Commission was finally approved on December 11, 2013, and was included in the Communication from the Commission “Building the Transport Core Network: Core Network Corridors and Connecting Europe Facility” of January 7, 2014. Furthermore, the ambitious TEN-T project will be backed by an ambitiously large budget of 26.25 billion euros, allocated by the CEF within the short-term period of 2014-2020. This sum includes 11.305 billion euros for those EU member states eligible for the Cohesion Fund, that is to say, located to the East.

Development of International Rail Freight Corridors

Joaquin Jimenez Otero

The EU infrastructure policy will transform the current patchwork of European roads, railways, airports, ports and waterborne transport routes into a unified TEN-T transport network, aimed at creating more opportunities for efficient freight traffic. The “great map” of the TEN-T Core Network includes a network of nine top priority corridors, or core network corridors, that are designed to ensure homogenous development and national commitments for every member country. From eastern Europe to western Europe, from the north to the south, this system will work to define investments, remove bottlenecks, and implement interoperable solutions to eliminate current technical constraints. For example, the implementation of the European Rail Traffic Management System (ERTMS) as the unified signaling system will enable railways to overcome one of the major challenges to competitive international rail service.

This network of priority intermodal corridors includes nine rail freight corridors (RFCs), which will allow EU member states to cooperate with infrastructure managers such as ADIF in the spheres of traffic and infrastructure management and in the coordination of investments to improve the quality and reliability of international freight railway services.

Two of these RFCs cross the Iberian Peninsula and are designed to secure a significant increase in the Spanish railway’s share of international freight traffic. According to European Commission’s Regulation 913/2010 defining the efficient network of European freight railway corridors that was endorsed in 2010, RFC 4 mirrors the Atlantic TEN-T Corridor to a great extent. The RFC 4 connects the Portuguese Atlantic coast (Lisbon, Porto and Sines) with Madrid and the French border in the Western Pyrenees through the Basque region, towards Paris and the German border in Metz. RFC 6 will link six countries on the Mediterranean arch and Eastern Europe, reaching from Spain to the Hungarian-Ukrainian border. (Through an amendment to Regulation 913/2010, there is a plan to extend it to Algeciras to the west and to Croatia to the east, in accordance with the new TEN-T.)

RFC 6, which mostly follows the Mediterranean Core Network Corridor, is aimed at forming a competitive and efficient 6,641-kilometer rail link between the following cities: Almeria-Valencia/Madrid-Zaragoza/Barcelona-Marseille-Lyon-Turin-Milan-Verona-Padua/Venice-Trieste/Koper-Ljubljana-Budapest-Z hony. This would connect 96 terminals located on the Corridor and cross six other European freight corridors.

In accordance with the abovementioned regulation, Corridor 6 has been operational since November 11, 2013. On Dec. 11, the corresponding European Economic Interest Grouping (EEIG) was established for its management. What makes the corridor so competitive is the establishment of the new pre-arranged slots for international rail freight traffic (the slots available for 2015 were published in January 2014, and in Spain they totaled 42 slots, on a weekly basis, in each direction available for freight operators both with Iberian gauge and international gauge), together with a “one-stop shop” that allocates this capacity.

Eight partners make up the new EEIG RFC 6 established as the corridor’s governing body: Spanish ADIF, French RFF, Italian RFI, Slovenian ASZ, Hungarian MAV infrastructure managers and the private TP Ferro over the binational section connecting Spain and France, together with those in charge of capacity allocation in Slovenia SZ and Hungary VPE. The corridor is chaired by Spain, through ADIF.

Furthermore, an executive committee has been established with representatives of the five member states that are currently members of the corridor. More importantly, two advisory groups have been constituted, one on terminals and another on rail operators, in order to assure that all decisions fulfill the expectations of the users and to allow the main agents of the rail industry to express their opinions on the development of the corridor.

The Implementation Plan for the Corridor spells out both the bottlenecks and the measures and investments planned to eliminate them, as well as market analysis and management activities, together with the expected outcomes in rail traffic boom that, according to our forecasts, will result within a short period in a six-fold increase of pre-existing traffic.

The most relevant element of this Corridor is the new UIC gauge high-speed line between Barcelona and Perpignan that has been operating since December 2010. Historically, the cross-border link on the Mediterranean axis has been severely constrained by the Pyrenees, which rise as a natural barrier, and by the Iberian gauge in such a way that trains had to change axles in Cervere in France or transfer freight between Spanish and French trains in Portbou in Spain.

This new line, which has been running direct high-speed trains between Spain and France since December 2013, connecting Barcelona with Paris and Toulouse, and Madrid with Marseille, is operated by a joint company established by Spain’s RENFE and France’s SNCF and is a major step in the (yet) short history of Spanish railways.

This line is equipped with the European Rail Traffic Management System (ERTMS). It is interoperable — it fully complies with the TSIs, or Technical Specifications of Interoperability of the European Union — and is available both for standard European 750-meter-long trains and Spanish 550-meter-long trains. This gives a fair idea of the benefits of competitiveness that it offers: With this measure, the cost of each ton that is transported is reduced by more than 20 percent. The bypass with double gauge enables trains to circle Barcelona on the inland, linking Barcelona with its port, which is one of the most important ports of the Mediterranean Sea, and connecting with Europe, through standard gauge. This means the beginning of the effective incorporation of the whole of

the Spanish Mediterranean Corridor — one of the areas of major economic activity of the Peninsula — within the central core of Europe.

Indeed, we are aware that there is still much to be done, both on Spain's side and (probably particularly) on the rest of the Corridor, so that it becomes fully interoperable, integrated into the whole new TEN-T. This would bring the vision of "great maps" to life, with an efficient and competitive railway that makes the new reality true — a railway that is based on the major Trans-European Corridors that will contribute to our current expectations of economic and social growth and sustainability, and that is connected in an equally integrated way with the major transcontinental corridors that are starting to become a reality.

We are aware, however, that we are all working in the same direction in order to achieve these supra-continental objectives that each country contributes to with its own effort. Some countries contribute with milestone achievements that we can surely consider historic (such as the connection in Turkey between Europe and Asia under the Bosphorus) and that can be added to those that already have a long history (such as the Trans-Siberian Railway). In just a short period of time, a sustained joint effort can, as has already happened in Spain with our new high-speed network, offer us the best results for freight traffic as well.

Guillaume Pepy

Chairman, SNCF

Guillaume Pepy's career has spanned both rail management and public service. He is a graduate of Institut d'etudes politiques de Paris and Ecole nationale d'administration. In February 2008, France's Council of Ministers appointed Mr. Pepy chairman (president) of SNCF.

He holds the National Order of the Legion of Honor and is a member of the board of directors of the Suez Environnement, the management board of the Montaigne Institute, the Siecle Club management and the Mobiliz Invest supervisory board.

Transportation Development: Key Challenges

Guillaume Pepy, chairman of French rail transport company SNCF, explains how high-speed rails such as France's TGV are making transport more interconnected, as well as how an analysis of costs and traffic volume can strengthen rail projects.

The efficient projection of traffic volumes is the cornerstone of any transport infrastructure project. As experience shows, it is especially important to use projection models optimal for each type of transportation. Projections are based on external parameters, such as electricity price dynamics and changing security regulations, and transportation industry parameters, such as changing tariffs.

Naturally, every scenario requires a thorough analysis. It is also necessary to keep in mind the impact of every interested party: competitors, government authorities, local population and so on. Economic cost modeling quantifies the main parameters of possible scenarios.

Travel time seems to be the major factor determining potential traffic volume. The current traffic volume in other modes of transportation and a possibility of faster traffic have to be taken into consideration in travel time estimates.

Models of traffic volumes according to the mode of transportation have been devised. It is also possible to evaluate the volume of services. In the case of railroad traffic, it includes train stopovers, coordinated schedules of trains arriving in transfer stations, and other aspects. The issue of stopovers and coordinated schedules highlights the implications of transport infrastructure projects for territorial planning.

A classic economic cost model displays a correlation between revenue and losses of all of the players: railroad companies; competitors; car, rolling stock and aircraft builders; and companies implementing transportation and communication projects. Yet decisions regarding transport infrastructure projects are increasingly difficult to make. For example, it is necessary to be mindful of external factors, including the amount of carbon dioxide emissions and economic costs of traffic jams or accidents, insurance costs, environmental impacts and many other sensitive aspects. Many of these factors, among them socioeconomic, are fully attributed to state competencies and responsibilities.

Importantly, the market share of air transport is reduced depending on transportation time. For example, air transport loses its attraction if a distance can be covered by rail in two hours. Flights between Paris and Lyon, a 500-kilometer distance, are now gone.

In each country, international airports have become a gate to global mobility. Therefore, high-speed rail service that supports airports, such as Paris Roissy Airport (Charles de Gaulle Airport), is a mandatory element of rapid and convenient access to the country's regions. The Roissy TGV terminal linked to the airport had passenger traffic of 4 million in 2011, and 70 percent of the passengers boarded the train upon their arrival by plane.

There is a systemic advantage: Aviation is broadening business services and getting rid of unprofitable short-distance travels thanks to high-speed trains.

Meanwhile, the range of passenger services will continue to expand. Air France and SNCF have agreed that passengers may register and drop off their baggage at a railroad terminal. Passengers may even book combined airline/high-speed rail tickets if there are relevant agreements between transport companies.

A major source of high-speed rail's efficiency is that trains stop at existing stations, which are usually surrounded by densely populated city districts. The location of terminals away from city centers deprives high-speed rail service of its advantage over air travel. The so-called duplicating terminals, which are sometimes located 10-20 kilometers away from city centers, are efficient in long-distance travels.

High-speed trains make the rail service more attractive to the suburban population. Shorter travel time between the city and the district periphery boosts traffic volume.

As to the number of transfer stations on regular lines and the rivalry between transfer lines and direct routes, they derive from local economic factors. The quality of local transfer stations has considerably improved with the appearance and development of transfer hubs, which optimize connections between various means of transportation. At the same time, they are important centers of city infrastructure providing passenger services such as general information and ticket offices.

In fact, this is a natural consequence of the appearance worldwide of megapolises, which further the public's demand for higher mobility. Potential traffic between two populated areas is determined by the cost of transportation. This means that the potential market is proportional to the population and inversely proportional to the cost of transportation. Terminals offering new transportation services and attracting a new passenger flow actually regain the historical role of socioeconomic development catalyst.

The emergence of high-speed transport and the widening swap of passenger flows between various modes of transportation have an effect on the real estate sector and city transportation networks, and they stimulate profound social transformations.

Guillaume Pepy

What does the future have in store for us? Operational compatibility will develop into intermodality, and a global railroad network will create a “universal mobility” system. This trend has manifested itself in concrete examples, such as in TGV stations at airports, or in the construction of large and systemic transport hubs at numerous railroad stations in Europe. Such hubs comprise high-speed and regional lines, metro lines, street cars and buses.

New terms of passenger service require the supply of universal options, whether we are speaking about target information, unified travel cards for various means of transportation, or travel information and services. Widespread technologies and digital gadgets make such target services effective and rapid. Their quality may immeasurably improve in the near future.

Technological progress has a tangible role in the expansion of rail services, especially high-speed rail. On the other hand, one has to be very thorough and cautious about technological progress.

A train is different from a car, which constantly needs to incorporate new technologies for market considerations and thereby win new customers. Trains don’t need to win customers by following every new trend in technology, which could have negative effects in the long run.

The means of public transportation must be safe and reliable, first and foremost. Safety is achieved through the vast experience in running the system and through testing component parts in the process of operation. Reliability also derives from experience, and it is a vital long-term factor. Suspended operation of a high-speed train for maintenance or, even worse, repairs, is extremely expensive. An important optimization parameter is the annual mileage of 500,000 kilometers, which is a regular indicator for TGV trains.

Progress should be evolutionary rather than revolutionary. One has to be cautious and patient in the introduction of new engineering solutions, especially in the case of railroad infrastructure. At the same time, rolling stock must constantly adjusted to customer needs. Accessibility and spatial comfort are major parameters subject to optimization.

Railroads came into existence about 200 years ago in the course of the first industrial revolution, a revolution of coal and steel. The ongoing digital revolution will give a fresh start to high-speed rail.

We have been witnessing new waves in the development of rail transportation and high-speed lines. High-speed rail may be improved in two aspects thanks to the considerable advantages of new information technologies and new telecommunications technologies.

Modern instruments can monitor the technical condition of vital high-speed rail elements — such as the train, electric power systems, contact wires and infrastructure — and can improve the quality and safety of operations. The shift from routine maintenance to preventive maintenance and repairs may significantly improve the preparedness and cost-effectiveness of the railroad network.

A noteworthy technical advantage of the digital revolution is the sizable increase of the traffic capacity of high-speed lines linked to crucial transformations in the operation of signal systems. Information technologies introduced in that sector made possible and safe the calculation and transfer of data regarding the factual speed of each train. The distance between two high-speed trains may be reduced greatly if there is an awareness of the minimal distance the trains use in emergency brake application.

Having higher operational and booked speed will be a more important change from the point of view of the connection between a passenger and a transport operator. Digital innovations allow the railroad sector to solve the central task of high-speed transportation: mass transportation with an individual approach to every passenger. Next-generation high-speed trains are already accomplishing this mission.

An operator can offer an individual approach to each passenger: During their journey, people may receive required information in real-time by using a smartphone, as well as enjoy higher levels of comfort and a calm atmosphere thanks to the positioning of their seats on the train and notifications about arrivals at stations. Connection between operators’ information systems in an intermodal environment will give passengers access to the Internet and the joy of individual service benefits throughout the trip.

Marco Piuri

Mobility Solutions for ‘Glocal Cities’

Marco Piuri joined Arriva in 2008 as managing director of Arriva Italy and went on to lead the Italian businesses alongside Arriva’s operations in Spain and Portugal. He oversaw the continued development of Arriva’s businesses on the Iberian Peninsula. In April 2014 Mr. Piuri was appointed director of Arriva’s business in southern, central and eastern Europe. He joined the Arriva Group Executive Committee in September 2014.

Arriva is one of the largest providers of passenger transport in Europe, employing more than 55,000 people. It operates services such as local buses; inter-urban commuter coaches; local, regional and national train services; trams and light rail; and airport-related transport services. Arriva was acquired by Deutsche Bahn (DB) in August 2010 and is responsible for DB’s regional passenger transport services outside Germany.

Director for Southern, Central & Eastern Europe, Arriva

Marco Piuri

Mobility Solutions for 'Glocal Cities'

Marco Piuri, a regional division head for local transport services provider Arriva, details the specific trends that will come into play and will need to be considered as the 'new mobility' arrives.

The METR project offers a vision consisting of many suggestions and a lot of different working hypotheses. This vast geographical area played a decisive role in the history of humankind: It was the cradle of most ancient civilizations and is the physical and historical space where the three major monotheistic religions originated and developed. It is the bridge of communications and exchange between East and West.

Today, this area is affected by conflicts and tensions that generate instability and imbalances at a global level. But this is also an area with huge potential for economic and social development. What is crucial is this region's capacity for regaining its role in exchange and connection between the diverse groups who live there.

From this perspective, the issue of mobility and the process of infrastructure development in the area can play a decisive role in encouraging the possibility of encounter and consequently of dialogue. Other eminent contributors have clearly highlighted possibilities and challenges in this regard, such as which infrastructure should be used and how more-innovative technological solutions can be part of its development.

My contribution originates from a different point of view, one of an operator of public transport services on a local and regional scale.

DB-Arriva is part of Deutsche Bahn Mobility Logistics Group (DB ML Group), one of the world's main operators of transport and logistics for both people and goods, with revenue of more than 40 billion euros and 300,000 employees. In the area of local public transport, DB-Arriva operates in 14 European countries. That is in addition to DB's direct operations in Germany. With more than 55,000 people and more than 4 billion euros in revenue, DB-Arriva is among the top five players in the sector at the European level, with an increasing presence in central and eastern Europe.

Efficient and effective mobility no doubt needs an adequate infrastructure system, both tangible and immaterial: large corridors and connections that can put in contact distant parts of a region, as well as technological solutions, innovative modes of transportation, and the availability and usability of information.

In addition, a modern mobility system requires adequate services — that is, quality services that meet demand — and the capacity to use available infrastructures in an efficient and effective way. Such a system also requires a capacity for connecting the main communication axis with the territory in order to make these infrastructures a development input for the regions they pass through; the implementation of sustainable technological and operative solutions at the economic, social and environmental levels; an effective use of public resources as required by the local public transport, or "regulated market"; and the capacity for understanding and interpreting transport demand that is increasing both in quality and complexity.

"Mobility" is a complex system with a plurality of players involved — states, regions, municipalities, regulating bodies, manufacturers, operators, resident citizens and travelers, among others — that also involves governance mechanisms on different levels and with a need for public regulation.

The challenge is to have an overall systemic view, with a commensurate governance plan and with coherent decision models. This almost never happens.

Such a challenge appears more and more complex and exciting if we look ahead five to 10 years and take into consideration those areas or territories that strongly require incentives and tools to sustain development. That is the case with the METR area, I think.

Here I will try to summarize which factors are determining (and will determine in the future) the direction of mobility development and therefore need to be analyzed and considered in depth.

Public transport as we know it will change dramatically in the next 10 years. All of the players, starting with regulating bodies and operators, will need to reinterpret their roles if they want to meet the mobility demand of the next decade and continue playing an important role.

The current situation has a number of facets:

- **Megapolis/urbanization.** I think that the accelerating trend leading to a progressive confluence of the population in large-to-giant metropolitan areas is plain for all to see. In 1950, cities with more than 1 million inhabitants numbered just 86, with only two megapolises having more than 10 million inhabitants, New York and Tokyo. Today the list of metropolises consists of more than 450 cities, and more than 20 percent of the world's population live in such places. Meanwhile, megalopolises number 22. The overall growth of the population worldwide corresponds to a progressive confluence of population in big metropolitan cities.

- **So-called glocal cities.** In parallel to the megapolis phenomenon, the growth of "glocal cities" is also evident. There have been changes in governance and in the organization and importance of national states,

and this has characterized the political, civic and economic life of the past 100 years. “Glocal cities” are physical points in a specific area, therefore local. At the same time, they are junctions where there is a gathering of transit flows and economic, social and cultural functions influencing development at a global level. These “glocal cities” are organized in networks consisting of relationships generating knowledge. They are also economic and technological networks that overtake the traditional assets of the political system, exposing crisis and inability to govern as a reality of our century. The attempt to react to this phenomenon by drawing up supranational political organizations — in addition to causing enormous problems — doesn’t seem to be able to intercept demand and flows of these big metropolises.

- **Digitalization.** Here again this is an evident phenomenon that is progressively modifying values, habits and relations. Nowadays the dominant issue seems to be tangible and intangible “connectivity” and the actual availability and usability of information and knowledge. In 2009, the devices connected to the global network totaled 2.5 billion, while by 2020 they will total 30 billion, according to some estimates.

- **Lack of resources.** Demand for energy, food and water is increasing, as is the concentration of this demand in specific areas, but “production” of these resources is not. Renewable energies are becoming more common, and research into technological innovations in this sector is continuing.

- **Population.** The profile of the population is changing at global level. By 2020, the number of retired people in Europe will exceed 1 million, while the number of young people entering the workforce and the percentage of the population belonging to Generation Y will increase significantly. For example, according to some estimates, Generation Y will represent 40 percent of the active population in Germany in 2020. As everyone knows, Generation Y, consisting of people born in 1981 through 1994, and Generation Z, consisting of those born in 1995 through 2009, have totally different qualities and values compared with generations that have come before. These are the “digital native” generations. Their values include confidence, sociability, diversity, collective action, technological savvy, multitasking, need for flexibility, constantly connected via social network.

The facets described above pose challenges to the “new mobility” and require a capacity for reading and understanding existing phenomena, so that we are ready to suggest possible solutions for new demand and its related needs.

The organization of mobility and specifically of collective transport in big metropolises is just one example of possible applications of these challenges. Other applications include how “glocal cities” are and will be in contact with the “local” area in which they are situated; how to comply with an increasingly irregular and large demand for volume; how to implement “sustainable” solutions; and how to integrate different modes of transport. Three more issues are which governance systems should be implemented — by default, less and less based on a “decision center” and less and less “top down” — and how to make information available and usable to encourage appropriate social behavior and meet emerging needs in a flexible way and how to listen to and talk to Generations Y and Z, who will be new citizens and new travelers.

There are many issues to think about, and I would like to share some reflections from the point of view of a local public transport operator, as DB-Arriva is defined.

First, the current challenge for an operator of collective transport services is to transform from a “transport operator” into a “mobility solution provider” — to transform from a simple organization of factors for production of collective transport service (bus, train or other means of transport) into a structure with the knowledge and competencies for recognizing and intercepting demand. This structure must be well-advanced in technology, capable of collecting and organizing information and making it usable, flexible enough to suggest and implement the appropriate mobility solution, and able to integrate technical solutions and resources.

Second, that transformation presupposes an “upgrade” of regulating bodies, in terms of knowledge, competencies, organization and governance. This also presupposes a collaborative-cooperative partnership approach. It is only thanks to the cooperation and interaction between the “new” regulating bodies and the “new” mobility solution provider that new solutions, ones able to meet the needs of the new mobility demand, can be found.

Third, liberalization — the process that would cancel the historical dominant approach and introduce a dynamic of debate and change — is hoped for, especially in a context that is becoming more and more complex and nuanced. This is the only solution to “free” resources and energies and to new solutions.

I believe the METR region can represent an interesting area for applying and testing new models. Maybe we can start with the “glocal cities” located in the region, which can be seen as a symbol in cultural and historical terms and can represent — more than the national states — the network on which the “new mobility” can be based.

Designer and Co-Founding Director,
PriestmanGoode

Paul Priestman

Paul Priestman is a designer, co-founding director of Priestman-Goode, and global creative director of CSR Sifang, one of the world's largest rolling stock manufacturers. He is respected around the world as a leading authority on transport, aviation, and product design, and he is known for his award-winning future concepts — visionary ideas to improve our everyday lives and encourage sustainable, long-term thinking.

Priestman was president of the Design Business Association from 2001 to 2003, chair of the Design Sector Skills Panel from 2004 to 2006, and is currently on the council at London's Royal College of Art. He has been voted one of London's most influential people, regularly represents British design on government missions around the world, and is a vocal supporter of the value of design to business.

Paul Priestman

New Transport Design for the METR Region

Paul Priestman, one of the world's leading design experts, explains how to get rid of outdated infrastructure stereotypes and how public transport can become as efficient as the Internet.

In 1985, while studying at London's Royal College of Art, I visited China for the first time, funded by a series of design competitions I had won. I remember the way cities on the mainland looked then, thousands of people in Mao suits on bicycles. Now I make visits a few times a year to China, where my company, PriestmanGoode, has an office. There are just as many thousands on China's roads today, but the bicycles have been replaced with cars. This is a trend that we've been able to observe in many cities around the world, particularly in fast-developing countries. Thankfully, this is starting to change. Rising environmental concerns over carbon emissions are making people — both decision makers and consumers — increasingly aware of the need to become greener.

Though I am a product designer by training, PriestmanGoode has specialized in transport design over the last 15 years. In that time, the industry has changed enormously. Personally, my philosophy has always been to make things better and more efficient to use, as well as to build, run and maintain. In recent years, the need for sustainability has become tangible. Attitudes within the transport industry have changed, as has consumer behavior. This, along with fast-developing technology, means that today is a particularly exciting time to be working in transport. If you look at cities all around the world, infrastructure is struggling with the number of personal vehicles. I view my role as a transport designer to make public transport an attractive, comfortable option that will get people out of their cars and offer a sustainable long-term solution for city-wide, nationwide and worldwide mobility.

As global creative director of one of the world's largest rolling stock manufacturers, CSR Sifang, I work on rail projects all over the world. And it's interesting to observe that for an industry where technology is developing rapidly, the same level of innovation isn't currently being applied to entire infrastructure networks. I think the advent of high-speed rail, particularly in countries that are investing in largely new infrastructures, offers immense opportunities for innovation, for an overhaul of traditional rail networks, and an opportunity to herald the new age of rail, which is vital for the future of a sustainable economy.

Having worked on so many different projects has led me to think differently about things, to not accept the status quo and to constantly challenge the norm. I am adamant, for instance, that there are better, more efficient, greener ways of running these new high-technology trains than by having them stop at stations. To that effect, my company developed the Moving Platforms concept, a completely interconnected rail infrastructure where local trams connect to a network of non-stop high-speed trains, which enables passengers to travel from their local stop to a local address at their final destination — even one in another country — without getting off a train. The totally joined-up network would allow passengers to transfer directly from one moving tram or high-speed train to another. This new infrastructure mimics the way the Internet works, creating a system similar to the one that allows your home PC to connect to a computer on the other side of the world via a series of connected networks. It's a big idea, but the technology is there. We can make shuttles dock in space, so docking trains is feasible.

All around the world, new 21st-century train services are being built on station-based infrastructure that was designed in the 19th century for steam trains. We should be rethinking infrastructure and building an interconnected local-to-global rail network. Current plans for high-speed rail will require a new network of major stations, taking up huge amounts of space and with a cost and environmental impact that are potentially vast. For the most part, these stations function as large car parks that are packed during working hours, empty the rest of the time and only in use by passengers for short periods of the day.

In addition, a major problem with high-speed trains is that they aren't very fast. Slowing down and speeding up as they move between stations means they are only able to travel at their full speed for limited periods of time, wasting vast amounts of energy in the process. Many rail passengers use cars to get to their main-line embarkation station, so being able to link up to the high-speed train directly from a local tram or train service means we could reduce car usage in towns and cities. Existing local stations would serve the feeder trams, enabling passengers from rural areas to access the high-speed line easily. The infrastructure also could be used for local deliveries and freight, which would help get trucks off the roads and ease congestion on motorways and in towns and cities.

While Moving Platforms is of course a big idea designed for future implementation, design thinking can equally be applied to small-scale, low-cost solutions to improve transport. Such was the case in Curitiba in Brazil, which developed a simple, clever solution to create one of the most efficient urban rapid transit systems in the world.

In the 1960s, city planners feared that population growth would lead to overcrowded development and a sharp increase in car ownership, which in turn would lead to congested roads and air pollution. As a result, they decided to change the face of the city and to invest in mass transit in order to make it the preferred mode of transport in the city. Today, 80 percent of the population of Curitiba gets to and from work through mass transit. The solution was simple: Dedicated lanes for bus service, pre-boarding fare collection and raised waiting platforms that

meant passengers — including those with reduced mobility — would be able to swiftly get on and off the bus.

This was a simple solution, which saw design thinking radically affect both the quality of the environment and the experience of passengers. Crucially, local government officials in Curitiba had the foresight and ambition to think differently and develop a long-term solution. We need more design thinking at a higher level, both in government and in transport companies, to ensure that the products and services being developed don't just meet today's needs, but foresee and solve tomorrow's problems.

Part of the issue is that many transport projects are led by governments that are only in power for terms between four and eight years, while infrastructure needs to be considered as long-term investment. Thankfully, there does seem to be a general consensus around the world that investment in high-speed rail, and mass transit more generally, is the way forward for a sustainable economy. But in order for this to work, we need to think about public transport, rail, metro, air rail and even walking as holistic systems. Cities need to be reclaimed by people and infrastructure made to improve quality of life for citizens.

One way this can be done is facilitating easier connections between different modes of transport, but also by using simple design thinking to encourage mass transit as the preferred option. A great example of this is the air-rail link in Hong Kong. While most airports around the world are designed such that you are faced with a bank of taxis as you step out of the arrivals terminal, in Hong Kong, you step out and directly reach the air-rail link to the city center. There, passengers need to make a concerted effort to try to find a taxi. This is a great example of how a simple change in architectural layout can radically affect human behavior. More of this kind of thinking needs to be applied to our cities. We need to change them from car-centric societies to people-led and mass-transit-led economies.

Aside from making it physically easier for passengers to choose mass transit, the other key area that needs to be developed is the experience of public transport for passengers. My company is the leading aircraft interior design consultancy in the world, and we have worked on countless projects for manufacturers like Airbus, Boeing and Embraer to airlines such as Turkish Airlines, Thai Airways International, Air France, United Airlines and Qatar Airways, to name just a few. In aviation, passenger experience rules supreme.

I remember the first project that we did for an airline. In the late '90s we designed the first lie-flat seat for Virgin Atlantic. It might sound standard now, but at the time, it was a great step forward in improving the passenger experience. And looking back, we see the impact it had on the industry. It was a real catalyst for change. The first two airlines to offer lie-flat seats were British Airways and Virgin Atlantic. Where competition between airlines had previously been just on price, it was now about comfort and about which airline offered the best passenger experience. Other airlines caught on, and cabin interiors are now among the main tools that airlines use to differentiate themselves.

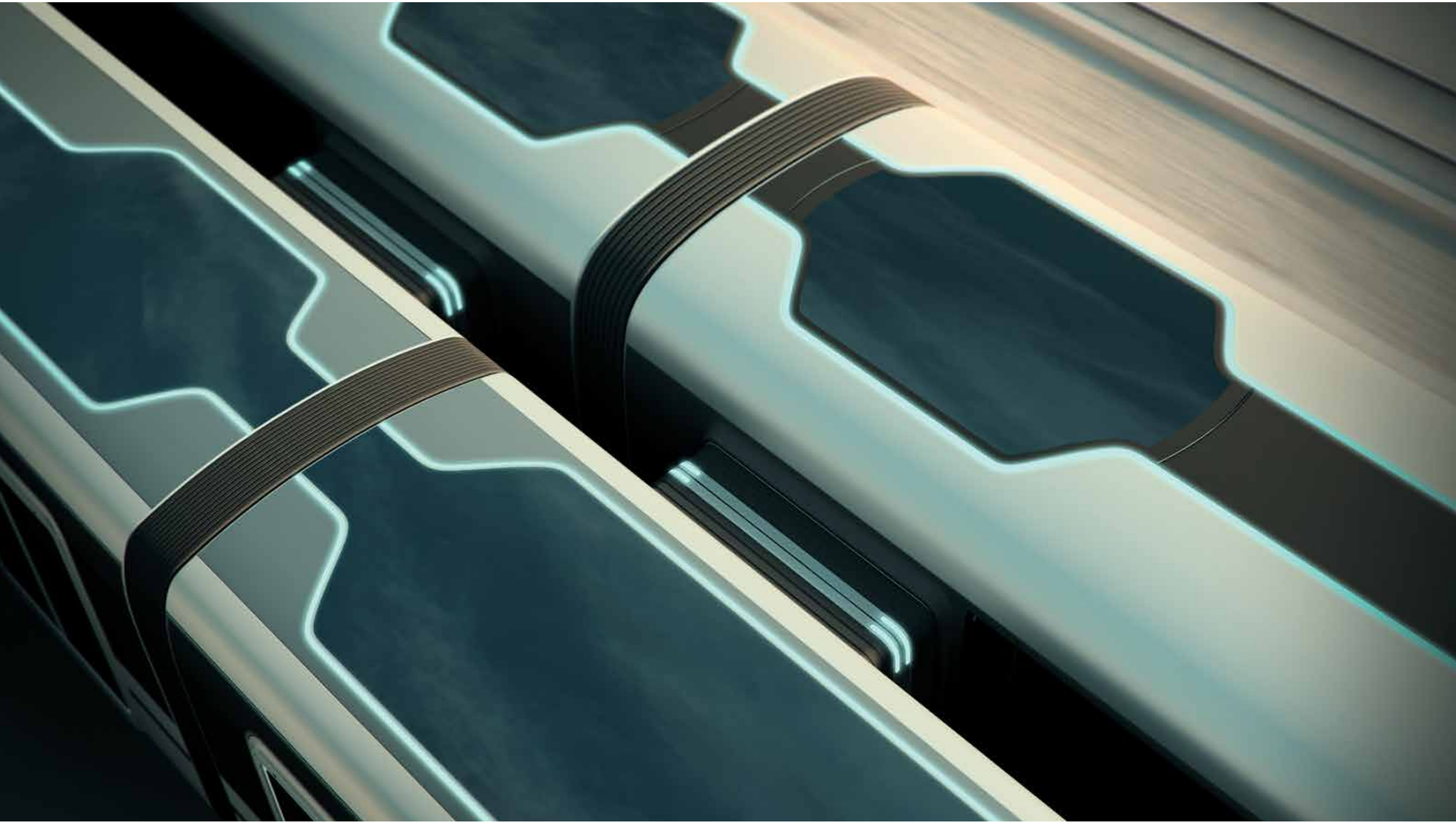
Arguably, there is less competition in rail, which in many countries consists mostly of government-run services or single franchises running on particular lines. However, I would argue that the real competition lies with other modes of transport, particularly with car travel and short-haul air travel. As preserving the environment and reducing carbon emissions continue to be priorities for governments, creating an attractive and comfortable rail offering to get passengers out of their cars and out of the air must become paramount for rail operators.

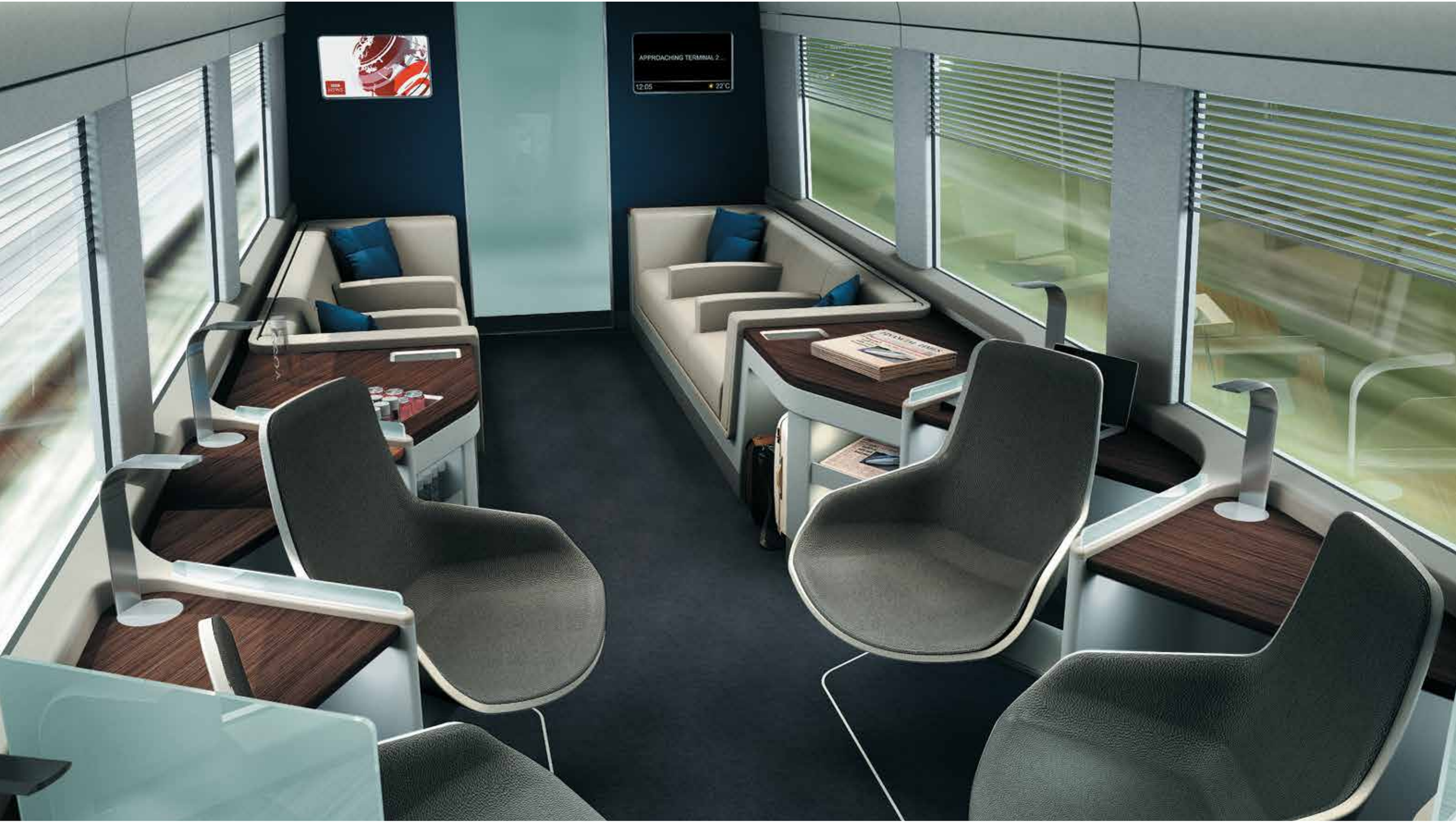
Some countries already offer a superior passenger experience on trains. We've been working in China for a few years now, and the main high-speed trains there include fully lie-flat rotating seats, so that passengers can always face the direction of travel. Train cars also include hot-water dispensers so that passengers have access to tea. While these may seem like small details, they are crucial to making passengers feel more comfortable.

In 2010, we designed a concept high-speed train to offer a vision of what the future of high-speed rail could look like. Our design included private berths in second class, which could be booked for business meetings or for families traveling together. The first-class train car stood out from run-of-the-mill first-class cars and included a luxurious bar, a viewing platform and sofas more reminiscent of a high-end lounge. If we are going to offer a first-class product on rail, then it needs to be really first-class. If we're going to lure passengers out of their cars — a comfortable, private environment — let's offer them more than the current alternative.

We also need to look at the ways in which the airline industry is embracing technology as part of the passenger experience. Though the majority of rail passengers have their own devices, whether tablets or mobile phones, there should be an opportunity for better integrating them within the fabric of trains, whether as a source of entertainment or information.

And it's not just long journeys that could benefit from a better passenger experience. As designers across all modes of public transport, we regularly work on airport train services, both inter-terminal and airport-to-city. The latter is one area that could hugely benefit from more design thinking. While it's true that services like the Arlanda Express in Stockholm — which is often lauded as one of the best air-rail services in the world — and the Heathrow Express in London offer a comfortable journey, we need to look at what passengers need and how to make





the best use of their time on that journey. For business passengers, air-rail services are often the last chance to connect to their email before a flight or, upon landing, the first opportunity to get in touch with the office. Our LoungeLink concept included individual working stations with adjustable privacy screens that would enable passengers to maximize their time in transit. The concept also included check-in stations, all with a nod to offering stress-free travel from home to destination.

Airlines have understood the value of offering passengers a superior interior product to stay competitive. If we're going to invest in new high-speed rail systems around the world, it is imperative that the experience with those trains is the best it can be, so that passengers actually use them. Crucially, it is important that they are designed to solve tomorrow's problems, not just today's.

Longevity is at the heart of transport design. A train will have a lifecycle of up to 50 years, during which time technology, consumer behavior and demographics are likely to see significant changes. Because of this, future-proofing needs to be at the heart of transport design.

Some characteristics of the future train, for instance, are important for practical reasons. A double-decker train doubles capacity, which is crucial with growing passenger numbers and ever-increasing populations. A sleek, aerodynamic design is imperative for a train that travels at very high speeds. Trains must also be both hardwearing and flexible. Trains can change hands between operators, which often means they will need to go through an internal re-brand. And advances in technology mean that some elements of a vehicle may need to be replaced in order to become more efficient, as certain technologies become cheaper and more readily available.

We know, for instance, that solar-paneled glass currently exists. And while it is too expensive at present to implement on a high-speed train, the technology will undoubtedly become cheaper over the next few years as it is perfected, which means that by the time a new vehicle is actually built, you may be able to use it.

This is where design thinking is crucial to transport and infrastructure projects. Designers are trained to come up with solutions to tomorrow's problems today. We know that around the world, populations are growing and age expectancy is rising. This means that in 20 years, trains will have to cope with higher passenger numbers, including a likely increase in passengers with reduced mobility. Because designing trains means that you are designing objects that will be in service for 50 years, it's imperative to create solutions for tomorrow's demographics.

Finally, it's important that rail and mass transit design be timeless. Vehicles should reflect a sense of place and visual heritage and avoid clichés of what the future might look like. We've just worked with Transport for London, creating the design vision for the new-generation, deep-level Tube, which will launch in 2022. The design is inspired by contemporary London, its culture and architectural landmarks, and iconic British transport design. London's Tube is one of the most iconic trains around the world. We are proud to have designed something that is part of the very fabric of London life, celebrating all that is great about London's environment: cutting-edge technology, rich history and diversity.

Transport is one of the few areas of industrial design that has seen some truly iconic designs over time, including the Flying Scotsman, the Mallard, the Shinkansen and, more recently, the new high-speed trains in China. The latter are a great example of how transport design and mass-transit in particular can act as a sign of modernity and economic prosperity, flying the flag for a country's achievements in technology and engineering around the world.

One of my main inspirations has always been Isambard Kingdom Brunel because of his great ambition and vision. Big infrastructure projects rely on a long-term view and sometimes a touch of altruism to affect how we might live in the future. By contrast, political terms and short-term investment restrict what can be achieved, all in the name of quick wins. We need to be thinking about the greater good in order to truly innovate and progress for subsequent generations. And design needs to be part of the process from the outset.

Olga Revzina

Partner, Herbert Smith Freehills

Olga Revzina is the head of the infrastructure and public-private partnership (PPP) practice in Herbert Smith Freehills CIS LLP. She is a member of the Paris Bar and the St. Petersburg Bar. Ms. Revzina actively participates in the elaboration of PPP legislation in the Council of Experts for the State Duma, Russia's lower house of parliament, and in the Council of Experts for Russia's Ministry of Economic Development.

Legal Aspects of International Transport-Related Infrastructure Projects in the METR Region

Herbert Smith Freehills is an international law firm that makes infrastructure one of its main specializations. It advises state authorities, state-owned companies, Russian and international sponsors and lenders, including infrastructure funds, and subcontractors and operators on all aspects of large-scale investment projects in the transport, utilities and social sectors.

Olga Revzina

Legal Aspects of International Transport-Related Infrastructure Projects in the METR Region

Olga Revzina, a partner with Herbert Smith Freehills CIS, delves into the legal issues related to the financing of transport initiatives and gives the ins and outs of public-private partnerships.

- This article addresses key transport development trends in Russia, comparing these Russian trends with the situation in the rest of the METR region, given the unique position and role of Russia in this sector.

1 Vital Need for Highways in Russia and Drivers for PPP Globally

As the largest country in the world, Russia clearly needs a developed road network. Geographical conditions and unique territorial characteristics are the fundamental forces in the development of transport accessibility in Russia. Moreover, the existing Russian road network was mainly constructed in Soviet times and is therefore a technological inheritance of the 20th century. Today Russia is facing an acute need for building new roads and reconstructing existing ones that comply with modern regulations in terms of environment, safety, and quality.

Given the vital need for developing a road network, Russian public authorities have recently taken a step toward administrative reform. In particular, in 2009 the Russian government introduced a new authority responsible for the road sector, a state company called GK Avtodor (State Company Russian Highways), which was in addition to the existing federal agency, Rosavtodor. The mission of GK Avtodor is to form and develop Russia's national high-speed highway network, highway infrastructure and highway services, as well as attract investment via the public-private partnership (PPP) mechanism. In fact, both agencies are responsible for developing the highway network, but each concentrates on a different aspect: Rosavtodor largely works on developing and reconstructing existing roadways, while GK Avtodor is mainly focused on constructing new toll highways, primarily in the European part of Russia. This split of work isn't set in stone and is flexible but reflects the current situation.

Generally, the attempt to develop administrative structures that better promote infrastructure problem-solving has been a common worldwide trend. In this context, similar state companies responsible for a particular part of the overall infrastructure development process have been established in some countries. By way of example, in 1982 Austria established ASFiNAG — which in German stands for "Autobahn and Highway Financing Stock Corporation" — a publicly owned corporation focused on planning, financing, building, maintaining and collecting tolls for the Austrian autobahns.

Olga Revzina

In an increasingly competitive global environment and in the aftermath of the global economic crisis, governments around the world are focusing on new ways to finance projects and build infrastructure. This is where PPP is becoming a popular tool to bring together the strengths of both sectors. Recently, PPP has also come to play an important role in developing highways in Russia. While it is recognized that project procurement through PPP may be contractually more expensive than the implementation of projects carried out via traditional means of procurement, certain advantages make a strong case for concession-based PPP.

First of all, private sector financing of essential infrastructure needs to relieve the pressure on budgetary requirements, allowing governments to spread out expenditures on expensive projects over time and thus release currently available resources for other purposes. This mechanism can also be very helpful where there is a budget shortfall accompanied by an existing social demand on a particular infrastructure unit. A good example of such a project is the construction of Motorway 8 in Greece, a 215-kilometer road connecting Athens with Patras. One of the main reasons for choosing a PPP approach was the desire to procure the project without increasing the country's sovereign debt. Moreover, most regional PPP projects in Russia have been delivered in the context of a budget shortfall.

Another advantage of PPP lies in the commonly recognized ability of the private sector to tackle inefficiency and respond more effectively to user demand. This is because the private sector is usually in a better position to provide greater levels of expertise and efficiency when constructing and running infrastructure projects than is the public sector.

Reasons for this higher efficiency include greater innovation, a commercial approach to problem-solving, better governance, improved competition and more efficient management. Furthermore, the whole lifecycle approach assists in selecting the most efficient solution for the long term, rather than the cheapest solution in the short term. The private sector also imposes discipline on projects, through the motivation to make a profit, and ensures that project implementation — even for large-scale projects — is speeded up. As a result PPP offers increased value for money and presumably a higher quality of motorways along with greater certainty of outcome. For instance, the expansion of the A1 highway between Hamburg and Bremen, which is considered to be the largest PPP project in Germany, was completed after only 49 months of construction — three months earlier than originally planned.

Finally, although PPP always represents a large item of expenditure, it constitutes off-balance sheet financing, which doesn't influence a company's credit history and allows it to keep debt to equity (D/E) and leverage ratios low. This is the reason why a significant number of PPP projects contemplate the establishment of a special-purpose company, which consolidates the assets of the investment companies. Some examples are Project Y in Austria and the Western High-Speed Diameter in St. Petersburg.

Best foreign practices confirm the belief that PPP delivers a higher quality of motorways, and it has already proved itself in Russia. The debut greenfield road project was a concession in the Moscow region for the construction of the M-1 Odintsovo bypass. The concession was granted by GK Avtodor in 2009, and the toll road was successfully launched on Jan.1, 2014.

2 Overview of Current Projects in Russia: Moving Toward METR Trends

The need for new infrastructure ensuring transport accessibility is common to all METR countries. Yet the scales of the projects needed are various, given the different geographical conditions and technological level of existing infrastructure.

For instance, in France and Spain, both the railway and road sectors are developing fast. In the Middle East, the predominant position belongs to the rail sector. In Russia, the road sector is currently most significantly underdeveloped.

Generally, local points of infrastructure development are concentrated in large cities and their suburbs (Paris, Brussels, Moscow, St. Petersburg, Abu Dhabi, Istanbul), especially where the need for alternative routes to decrease heavy traffic problems is high. At the same time, public and business communities in eastern and western countries also demonstrate a deep understanding of how to improve transport accessibility within the country. For instance, France has established a high-quality and large-scale system of railroads across the state. Turkey has been actively promoting the construction of bridges, which significantly reduce the length of journeys between its cities, such as with the Gebze-Izmir road project.

In Russia, the pipeline of highway projects looks impressive and promising. Below we consider some large-scale highway projects.

Rosavtodor is implementing a federal concession project to construct an all-Russia truck tolling system, similar to the German one, that integrates Russian Glonass space navigation and cellphone networks to monitor the distance traveled by trucks over 12 tons and applies charges based on mileage. The project has crossed the PQ phase, although the bid submission date has been postponed several times so far. We also note that there are talks around restructuring this significant project.

GK Avtodor runs three major PPP projects, namely the M-11 Moscow–St. Petersburg Highway, the M-4 Don Highway and the Moscow Central Ring Road, and it is about to start some new projects.

With the M-11 Moscow–St. Petersburg toll highway project, the most recent tender was for a concession to construct Sections 7 and 8. The launch of the operation is scheduled for the beginning of the 2018 FIFA World Cup, for which Russia was chosen as the host country.

Olga Revzina

The M-4 Don highway project involved road development, the creation of bypasses and the implementation of toll systems.

Another project currently being run by GK Avtodor is the construction of the Moscow Central Ring Road, which is a toll road encircling Moscow and its outskirts.

The Moscow government has also recently launched the first intracity concession project for the construction of the Kutuzovsky toll bypass, which is intended to improve traffic circulation in the central part of the city. The shortlisted tenderers were announced in May, and the winner should be decided in September.

Finally, a widely discussed greenfield project that has recently become one of the key infrastructure targets for the Russian government is the construction of the Kerch Strait Bridge. However, it hasn't yet been decided whether the state will appeal to private investors, or whether the use of the bridge will be free.

As a general note, toll roads are still largely criticized in Russia, but this is no doubt one of the problems inherent to any developing PPP market. Russia is only now taking its first steps toward such a phenomenon, and it will take a certain amount of getting used to. At the same time, the number of ongoing toll-road projects clearly demonstrates the willingness of the Russian authorities to develop in the direction set by other developed METR countries.

The majority of highway projects are still focused on Moscow and the Moscow region. However, there is a promising trend indicating that PPP will be rolled out to other regions with some major deals, both geographically and legally. Recently, the commercial close was reached for a toll bridge project in the Udmurtia region.

3 Market Considerations: Mirroring and Opposing Global Trends

As mentioned above, the ongoing projects in Russia clearly evidence its intention to keep pace with the rest of the world. However, as is usually noted by research into any phenomena in the country, Russia has its own special path of development.

Fast growth, ambitious strategy, tough deadlines, promotion and application of the PPP mechanism as a tool: All of these factors together hold benefits but also bring challenges to the scene. We will address some of the issues that have emerged on recent highway PPP projects.

First, there are the challenges of the procurement process. Due to the relative novelty of PPP program, there is a certain gap in the capacity to hold efficient tenders. Both the public and private sectors share the view that the only purpose of expensive and timely procurement processes for tenders is to ensure true competition. In reality, achieving this goal involves facing difficulties. We address some of these below:

- Corporate restrictions on companies in the bidder's group. Tender documents (TDs) for major concession projects usually set forth high qualifying criteria related to the PPP and construction experience of the bidder. In this context, the TD usually specify corporate links that may be used by the bidder to confirm its compliance with such qualifying criteria. In countries with developed PPP markets, such links vary, as most PPP projects involve foreign investors who might have relations within their corporate groups that, on the one hand, are of a type completely unfamiliar to a tender-based country, but on the other hand, don't make the companies within the group any less related. In particular, relations within the group may be represented by common ownership, common directorship or any other common source of control.

The problem of excessive corporate restrictions exists within developing PPP markets where a lack of experience on the part of the tender organizers results in their unwillingness to rely on unknown foreign corporate relations.

For instance, TDs for large PPP projects in Russia tend to impose restrictions on the test of corporate control and primarily appeal to "vertical" corporate links. Practically, this means that a bidder with a sophisticated corporate chart lacks the legal opportunity to meet qualifying criteria because its corporate links with other companies within its group don't fall within the scope of the TD. Thus, the corporate test implemented by the public sector in Russia for qualifying companies requires adjustments.

However, recent tenders of GK Avtodor clearly demonstrate that the approach is changing and is becoming more market-oriented.

It should also be noted that tenders all over the world are subject to very detailed scrutiny from regulatory authorities. For instance, in the European Union, strict rules for open government procurement apply. In particular, several European Commission (EC) directives deal with public procurement of supplies and works, including in the construction sector. What is more important is that the EC has the authority to impose sanctions for breach of the EU competitive tendering rules in public sector procurement and construction and, moreover, that it is very active in exercising this authority. The main purpose of such activity is to stimulate competition. For this reason, it is of the utmost importance to comply with the requirements of the TD.

- Secondary infrastructure market assets. It is undisputed that construction and operations experience is critical to understanding whether a project will be delivered on time and within budget and to ensure that the service levels required are met. For this reason, TD always contain

requirements as to the experience of a potential private partner, to be evidenced by related documentation. Taking into account the long-term character of PPP projects, this issue may arise when a participant intends to confirm its experience by referencing a project that it sold at a later stage of project implementation.

In fact, it is not at all uncommon that at an operational stage, where a newly developed infrastructure asset is substantially de-risked, the initial developer sells the project to a longer-term investor. By way of illustration, the European Services Strategy Unit Database records 281 equity transactions in the UK involving 716 PPP projects between 1998 and 2012. Moreover, the sale of secondary market funds with portfolios of PPP assets is another important way in which ownership of equity in PPP projects has transferred to new owners.

Multiple transactions of the same special purpose company (SPC) occur for a number of reasons. First, there are usually two or three shareholders in the SPC, and all of them may sell their equity, sometimes collectively but usually individually. Second, shareholders sometimes sell only part of their equity and retain the remainder, or sell it at a later date.

Third, construction companies may sell equity to new infrastructure funds or joint ventures established with financial institutions, such as pension funds, or they may sell equity via the secondary market. Finally, equity may be resold for commercial or financial reasons connected with the parent company. This is why equity transactions in the PPP market are inevitable — this is the normal way of conducting business.

Among the top sellers of PPP equity in the UK in recent years are John Laing, Carillion plc, Lend Lease Corporation and Interserve plc. For instance, in 2004 Carillion sold 50 percent of its stake in Sheppey Route Limited, a company implementing the A249 Stockbury (M2) to Sheerness DBFO project, to John Laing. The other 50 percent of this project was sold by Carillion to Barclays European Infrastructure in 2011. In 2012 Atlantia (one of the largest concessionaires on the Italian motorway network) sold 99.98 percent of its equity in Autostrada Torino-Savona to SIAS Group (Italy's main motorway operator). This transaction increased the average remaining life of the motorway concessions part of the SIAS Group from 11 years to 13 years. In 2010 Aecon (Canada) sold its 25 percent share in the Cross-Israel Highway to Israel Infrastructure Management, which became the 50 percent shareholder in the project.

In Russia, however, there are clear difficulties in recognizing sold projects for the purposes of meeting the criteria set by the TD for qualification, despite the fact that the sale of a project doesn't deprive an investor of relevant construction experience, especially from a short-term perspective. Therefore, given the developments in secondary and further infrastructure investments, potential bidders should have the right to meet qualifying criteria by referring to sold projects.

Securing of bidder obligations. Bid security is commonly used in procurement procedures as a protection for the public side against bidders withdrawing their bids prior to the end of their bid validity period or refusing to sign the contract. The amount of such security is usually calculated as a percentage of the budget estimate of the procurement requirement or a percentage of the bidder's bid price.

Model TDs developed in most European countries don't contain a mandatory requirement to provide bid security, as the risk of fraudulent bidders is substantially decreased when the PPP market becomes more developed.

The Russian Law on Concessions expressly requires shortlisted tenderers to provide a deposit to secure their obligation to enter into the concession contract. Moreover, there is a tendency for bid bonds to be provided by tenderers at the PQ stage with further security being provided by shortlisted tenderers at the bidding stage.

We note that there is little legal rationale for this requirement, as the filing of an application at the PQ stage doesn't oblige a tenderer to submit the bid. It is only after the bid is filed that the tenderer becomes obliged to participate in the tender. Furthermore, the idea of securing the tenderer's obligations at the PQ stage actually lacks an economic rationale, as preparation for PQ filing is always very time-consuming and costly, meaning that the investment of time and money in the application already represents a form of security evidencing the tenderer's good faith.

Finally, a separate problem in Russia relates to the mode of security provided for by the law. In contrast with other countries that usually accept bank guarantees as security, Russian law requires bidders to provide a deposit to the tender organizer. What makes it even more burdensome is that the amount of such deposits is becoming increasingly large, something that automatically limits the number of investors that are ready to divert such funds out of their ongoing business.

Obviously, this is just another example of the developing character of the Russian market and another area where we should consider adopting foreign countries' best practices.

Confidentiality. It is commonly recognized that transparency is an essential principle of procurement procedure. This refers to the openness of procurement policies and practices and especially to the basis for proposal evaluation. For instance, as mentioned above, strict anti-monopoly rules have been adopted in the EU. In Russia, the principle of transparency has largely been promoted as well, for instance, by putting in place an all-Russian website that is constantly updated with comprehensive information on every tender and by imposing

very strict obligations on tender organizers to make almost every single part of the tender procedure public.

At the same time, it is indisputable that while taking part in a tender, bidders are often expected or even required to disclose certain information that may be sensitive for them, such as corporate structure, patents and copyrights, or that could benefit a competitor. So it is highly important for the public sector to ensure the confidentiality of the bid. At first glance, it may seem impossible to combine transparency and confidentiality. In reality, warranted confidentiality is key to a transparent procedure.

For example, in the Netherlands, the EU open-government procurement rules have been transposed into even stricter national legislation. In particular, one of the principles expressly declared by the Dutch authorities is the protection of the intellectual property rights of a candidate and warranted confidentiality. As for Russia, current concession tenders lack clarity and certainty as to ensuring confidentiality, which inevitably leads to a certain degree of reluctance from the private side to be fully open with the potential public partner. This also impedes the development of PPP in Russia. There is therefore a need and duty on the public side, not only to maintain transparency but also to ensure the confidentiality of the bid process, when relevant, from the very beginning of the tender.

Another area meriting a closer look is the concept of the infrastructure investor.

It goes without saying that PPP projects normally concern huge technical, intellectual and financial resources. It also goes without saying that all the resources necessary to implement a large-scale project won't be consolidated in one single company. This clearly suggests that PPP is a team sport and requires collective efforts and various consortium structures. Therefore, it is of the utmost importance to gather a reliable and competitive team of financial institutions, construction companies and operators.

When this issue arises in a full-fledged PPP market, it doesn't cause serious difficulties, as its key players have already managed to prove their expertise and reliability.

The problem posed by investors' lack of experience in this regard is inherent to infrastructure markets that haven't yet fully formed. Unfortunately, this is a real issue for the current infrastructure market in Russia, where any form of multilateral cooperation between different groups of investors (banks, constructors, operators, etc.) doesn't give the appropriate level of comfort. This is because the relevant players are still a little unfamiliar with each another and the investment regime isn't adequately tested. Moreover, investors may also not be fully aware of how to properly meet the TD requirements; this is because the rules of the tender game aren't always very clear.

Countries all over the world tackle this problem by setting up independent platforms for the consolidation of qualified market participants. The latter trend has shown up in Russia: Currently GK Avtodor has ambitious plan to establish a National Association of Operators and Investors in Road Infrastructure. The association will promote the formation of a national PPP market by creating a pool of construction and investment companies willing to provide equity/debt financing and having the organizational, investment and technical capabilities to implement PPP projects in infrastructure.

The benefits of such an institutionalized investor community are relevant for both the public and private sectors. Such a community will enable the improvement of PPP regulation, backed up by the consolidated opinion and expertise of the business community. In addition, it will help promote the value-for-money principle and the innovative development of infrastructure.

Then there is the problem of financing sources related to PPPs. Despite the PPP's high profile and wide reputation, current Russian large-scale highway projects rely mostly on public funding. Russia faces the problem of the "quasi" private partner. One of the main drivers for PPP is an alternative source of financing. The current problem emerging on the Russian market is that large-scale projects are often funded by state-owned companies that are only formally private entities.

This issue turns out to be inherent at the infant stage of PPP development. There are examples from the early 2000s of European project finance deals that demonstrate this. A good example of such a project is the Netherlands' HSL-Zuid line linking Amsterdam and Rotterdam to Belgium, launched in September 2009. The project was conducted by a joint venture, 90 percent of which was owned by the stated-owned Dutch national railways while only 10 percent was owned by the private side. This is essentially only the appearance of a public-private partnership, which covers relations that are actually closer to a public-public partnership.

Finally there is the matter of risks and how to move toward the development of risk allocation standards. Risk allocation is another important governance challenge that both sides of a partnership usually face when negotiating the structure of their relationship. Although every road project is unique and risk allocation strategies may vary from project to project and from country to country, in general, those risks related to the environment where the project is implemented should be retained by the government, while the risks that are directly related to the project are mostly allocated to the private partner. Risks that are beyond the control of both the private and public partners can be shared by both parties.

The implementation of these principles in the real world is, however, very difficult. Recent negotiations of public and private partners in Russia during pre-tender and tender procedures reveal that the potential partners may turn out to be unable to agree on risk allocation and are usually willing to shift risks to the other side. The reason for such problems may largely be the absence of experience or low experience in doing PPP projects and thus the absence of a really tested understanding of how the risk materializes and who is in a better position to manage it. That is why it is highly important to be flexible and to attempt to agree on risk allocation as early as possible, as in practice, a later transfer of risk may constitute a deal-breaker for an investor. Such flexibility shouldn't prejudice the idea of balance between the public and private partners.

A recent piece of research in the UK conducted by experts in PPP showed that site availability and political risks should be retained by governments, while relationship risks, the risks of legislation changes and force majeure risks should be shared by the public and private partners. The majority of the remaining project-related risks, ones that are directly associated with the project itself, should be assumed by the private partner. The research also found four risk factors (the level of public support, project approval and permits, contract variation and lack of experience) that couldn't be allocated clearly to a specific party.

Another issue relates to the proper study of traffic and the related risks which, if they materialize, may give rise to dramatic consequences. The importance of correct risk allocation in PPP was revealed in the debut M1-M15 private toll road in Hungary, which was also the first fully privately funded road to be built in Europe, purchased without a single penny of taxpayers' money.

The project was delivered on time and on budget by 1996. However, the investors encountered difficulties almost right from the start, as the expected traffic didn't materialize. The traffic projections made by the relevant authority were overly optimistic, and the toll revenue collected by the private investors wasn't sufficient to service the debt. In addition, the timing of the project was unfortunate: a recession, the effect of rapid economic reforms and high inflation all negatively affected the project. Moreover, the presence of an alternative road, as well as delays at the border, which more than offset the time savings, were major problems. Finally, the road was characterized as the most expensive toll road in Europe, which resulted in legal action against the concessionaire to reduce tolls.

Many years of protracted negotiations took place and restructuring plans were made, culminating in the nationalization of the project in 1999. Uncertainty surrounding the ongoing court challenge and the general unpopularity of tolls led the Hungarian government to choose nationalization as the most politically expedient solution. Shareholders lost equity and the bank lenders to the project suffered. Even though the tolls were removed, traffic increased only marginally.

There are no hard rules for risk allocation standards. Practice combined with careful analysis gives the answer to the most negotiable question arising between public and private partners: Who is in a better position to mitigate the risk?

4 Future Outlook: Russia and METR

The market particularities and difficulties described above give rise to obvious obstacles to developing Russian road infrastructure. However, more important and notable is that a closer look at the situation reveals a very solid platform for the successful development of the sector. In particular, this is evident when one assesses the variety of ongoing projects and those in the pipeline.

This trend, combined with the boost given to the infrastructure sector by preparations for the 2014 Winter Olympics in Sochi and further growth expected in light of preparation for hosting the 2018 FIFA World Cup, creates numerous opportunities for both the public sector and domestic and international investors.

The need for modernization and for a broadening of the road network with improved quality in challenging economic conditions appear to be the key drivers for the development of road infrastructure in Russia.

Russian governmental agencies responsible for the development of this sector demonstrate constant pro-activity, readiness to cooperate and openness for dialogue. The overall positive attitude is supported by a strong project pipeline, in particular for the development of toll roads in the European part of Russia.

The successful completion of construction stages and the gaining of experience in subsequent operation and maintenance activities — on major pending projects such as the Western High-Speed Diameter in St. Petersburg, the M-1 Odintsovo bypass and the M-11 Khimki bypass — are expected to demonstrate market readiness for a stable flow of projects. Additionally, the near future should reveal customers' reactions to the developments and their ability to use the projects. The Asian part of Russia remains more focused on achieving social goals and developing complicated territories rather than implementing commercially attractive projects; however, specific opportunities might be found in this region as well.

The current pipeline includes the preparation of tenders for the construction and operation of several sections of the Moscow Central Ring Road, the continued construction of the M-11 Moscow–St. Petersburg highway, the creation of the first Moscow intracity toll road and the implementation and operation of a global Russian heavy truck toll system.

Despite the fact that, currently, the number of players in the market is limited to a relatively small group of investors, financial institutions and

contractors, it is notable that both the market and the project pipeline require capable newcomers and the popularity of project pre-launch events demonstrate that the opportunities are unlikely to be left untaken.

Under these circumstances, those who will be able to bring best practices and expertise to the Russian market on the one hand and, on the other hand, put forth real flexibility in competing with existing strong players will reap the rewards and benefits from implementing road projects in Russia.

With stagnancy and project preparation periods in Russia a thing of the past and European road developers and financiers searching for new receptive markets worldwide, Russia's ambitious road development plans reveal challenging and future-oriented opportunities both for private businesses and the public sector.

Similar trends exist in other METR countries. Across the GCC, there are ambitious plans under way to implement the GCC integrated rail project, which would link Kuwait, Saudi Arabia, Bahrain, Qatar, the UAE and Oman by rail. Many Middle Eastern countries are also developing their own domestic rail networks. In the UAE, Saudi Arabia and Qatar, the leading countries in rail sector development in the Middle East, some significant projects are already under way. Since winning the hosting of the 2020 World Expo, Dubai is fast-tracking its metro expansion plans, while Abu Dhabi is expected to go out to tender and further work on the Abu Dhabi Metro project this year.

In 2013 Turkey advertised a number of incredibly ambitious infrastructure projects in the lead-up to 2023, the 100th anniversary of the founding of the modern Turkish republic. Some of the most attention-grabbing in the infrastructure sector are the Canal Istanbul project, the much-needed third bridge over the Bosphorus, an underwater tunnel and a national network of high-speed rail lines.

C Conclusion

From the overview provided in this article and notwithstanding differing transport developmental targets in different countries, it is obvious that METR countries are currently focused on the development of internal transport infrastructure based on an understanding of the importance of the benefits that developed transport systems can give and their key role in developing the economy.

Ultimately, the implementation of ambitious projects in this region is likely to boost connectivity in the METR region, demonstrating that historical transport routes maintain their importance, irrespective of the historical period.

Giuseppe Sciarrone was born in 1947 in Mantua. He is one of the leading advocates of the liberalization of rail transport in Europe. He was the chief executive officer of the Centre for Research Transport Systems (part of the Fiat holding). After that, he held various positions in the Ferrovie dello Stato Italiane (FS). In 2000, Sciarrone left FS to establish and chair the first independent rail freight operator, Rail Traction Company, which provides transport services between Italy and Germany. In 2006 he became one of the founders of the company Nuovo Trasporto Viaggiatori (NTV) providing services for passengers on Italian high-speed rail line. From 2012 to 2013, he served as its CEO.

NTV is Europe's first alternative operator of passenger traffic on high-speed rail. In 2012, the company's fleet of 25 high-speed trains began providing services to passengers, and in 2013, it was able to carry 6.2 million people, representing 25 percent of the market. The company's turnover in 2013 amounted to 250 million euros, and it employs about 1,000 people.

Giuseppe

Co-Founder, NTV S.p.A.

Land Transportation Networks and Corridors

Sciarrone

Land Transportation Networks and Corridors

Giuseppe Sciarrone, the cofounder of privately held Italian railway operator NTV and one of the leading advocates of European alternative carriers, explains where we are headed with freight and passenger rail and discusses the elimination of traditional railway operator monopolies.

Sustainable and eco-friendly development should be one of the main goals of global economic policy in the 21st century. It is well known that transport systems are one of the major sources of pollution and, in addition, account for a significant share of electricity consumption. Thus transport must play a key role in ensuring sustainable development. This means that environmental and energy efficiency requirements in the design of transport networks should no longer be considered simply an obligation that must be met. They should be seen as a crucial factor in the modernization and development of the transport sector.

There are at least three ways in which the sector can contribute to the health of the planet. First of all, it can produce environmentally friendly vehicles. Second, it can develop more energy efficient and eco-friendly transport systems. Third, it can decongest large cities. There is no doubt that, to achieve this goal, trains can and should play a leading role. It is vital to ensure the mobility of people in major conurbations — the sprawling urban areas consisting of several cities — through the creation of integrated transport networks of all possible types of rail, from trams and metros to regional railways.

Railway transport development can also ensure the mobility of people and freight along major transport corridors through the upgrading and/or construction of long-distance rail links. Indeed, major conurbations and large transport corridors are the best illustrations of rail's potential, namely rail's ability to move a large number of people and freight along particular routes within a limited period of time.

As we know, high-speed rail is being developed around the world. In 2010, there were 10,000 kilometers of high-speed rail in operation globally. And despite the recent economic crisis and a slowdown in new projects, we can expect that the overall network of high-speed rail will amount to more than 30,000 kilometers by 2030.

Today, people around the world recognize that high-speed rail is the right solution for railway companies seeking to resolve issues related to passenger transportation along high-passenger-traffic routes. There are two main reasons for that.

The first reason is that high-speed rail can significantly increase the quality of passenger service. The success of a transport system has always depended primarily on speed. The history of railways has been driven by the desire to reach ever higher speeds: from 47 kilometers per hour for George Stephenson's steam locomotive in 1829, to 574.8 kilometers per hour for Alstom's AGV high-speed train in 2007, not to mention magnetic levitation trains.

Secondly, in most cases, the new high-speed lines are built in areas already served by traditional rail lines. Consequently, the new high-speed rail is able to increase the carrying capacity of the rail system. It has a positive impact not only on passenger transport over medium and long distances on the high-speed lines, but also on freight and intra-regional passenger transport on the traditional lines. This is because the new high-speed rail relieves pressure on existing railways, freeing up space for local passenger trains and freight.

However, accepting the fact that new high-speed rail is almost always justified in the context of a general expansion of the railway system, the following question is still unresolved: Should this new rail exclusively serve passengers, or can it also carry freight?

In most cases, as global experience shows, preference is given to the transportation of passengers over medium and long distances.

This choice is due to at least three reasons. First, specialized usage allows all trains to run at the same speed on the new line and, as a result, have the same travel time. This maximizes the carrying capacity of the new infrastructure.

Second, thanks to the common speed and the resulting increase in reliability, specialized usage significantly increases the service trust level. This is one of the most important factors determining passengers' choice of transportation. Moreover, experience has shown that introducing a mixed-use system on a traditional line significantly reduces its reliability.

Third, the maximum speed of freight trains meets the traditional rail line standards, but not high-speed rail requirements. Of course, it is advisable to upgrade the freight train fleet in order to bring their efficiency as close as possible to that of high-speed trains. That is especially the case since traditional lines will be able to guarantee shipping speeds and reliability demanded by the market if they are freed from passenger service.

However, this doesn't mean that it is impossible to consider the possibility of a freight train with special characteristics for use on high-speed rail. For instance, when there is a need to transport freight in a particularly short amount of time, this requires transportation speeds exceeding those of trains on traditional lines. In any case, it is desirable that such special freight trains are sent on high-speed rail only during limited periods of the day, without creating situations typical of mixed-use systems.

Giuseppe Sciarrone

The main consideration in the design of high-speed networks is the placement of terminals in a way that ensures maximum availability of the high-speed trains to residents of large cities.

Large cities around the world are characterized by an increasing decentralization of places to live and work, while existing railway stations are usually located in city centers. Because central districts usually feature heavy traffic, the benefits of high-speed rail risk being whittled down due to how long it takes to reach the station from the suburbs. However, if the existence of a "central station" is essential, it seems advisable to establish extra "stops" — that is, not necessarily large stations — that are equipped with large parking lots along the high-speed rail and that are in peripheral areas on the main roads leading to or from the city. This approach would secure complete integration of high-speed rail with urban public transport networks and private vehicles.

For these purposes, special attention should also be given to the integration of high-speed rail with air transport so that air passengers can easily access any point in the country using high-speed rail upon their arrival. Therefore, it is important to ensure that high-speed railway stations are located close to large airports.

When considering high-speed rail in light of ongoing projects in Russia and Turkey, it is advisable to ensure their coordination with each other and with the European high-speed rail network — in other words, they ideally should provide for transport continuity between neighboring countries. This means that it would be useful for such new projects to take into account the European high-speed rail interoperability criteria and standards.

Obstacles to interoperability can be broken down into three categories: the difference in track width, the difference in power systems, and the difference in signaling systems.

The "physical infrastructure" problem related to different gauges is the most difficult to solve, while the two other "system" hurdles can be eliminated through effective planning of rolling stock. These obstacles mean that we have to abandon the idea of full integration of high-speed rail networks.

In addition, some remarks should be made on the transportation of freight in the context of large regular flows along transport corridors. It has already been noted that the transportation of freight, with a few exceptions, doesn't require high speeds and, therefore, doesn't need to use new high-speed rail.

In this regard, the more logical solution is to send freight trains along traditional rail lines, which are well-suited for this. In this context, we can talk about two main areas of activity.

The first area concerns load and offload points in rail networks. With this topic, it is necessary to take into account that the future of rail freight, in all likelihood, is represented by two types of trains: those equipped only for the carriage of the type of freight commonly used to transport goods from place of production and/or storage, and those trains designed for mixed, or intermodal, transport in "road plus rail." That is a system in which the freight is carried in boxes and/or shipping containers by trucks or other road vehicles at the beginning and end of the journey, but transported by rail for the rest of the trip. The intermodal method can also be seen in "sea plus rail," whereby freight is transported by rail after a long sea journey.

These types of intermodal systems offer significant development potential and require rail network managers to plan for these possibilities through identifying suitable locations for terminals and ensuring that they are properly equipped. In the case of multimodal transport in "sea plus rail," such terminals should obviously be placed in ports and designed in a way that guarantees efficient load and offload operations.

In the case of "road plus rail," multimodal transport requires so-called "cargo transhipment points" to be effective. There has been significant growth in the number of cargo transhipment points in Europe in the last 20 years. They need to be properly equipped to allow both for intermodal operations and those operations associated with the processing of cargo, including storage and packaging.

Efficient and optimized networks of ports and cargo transhipment points are a necessary condition for creating modern freight transportation systems.

The second area of activity requires the introduction of a so-called rail template for the line used by freight trains. Currently, there is a tendency to curb transport tariffs by increasing the dimensions of the unit load. Making use of traditional rail lines and providing access to rail with bulky cargo units is another important condition for significant development of rail freight.

Rail networks throughout the world have always been run as monopolies by large state-owned companies.

More than 20 years ago, in the early 90s, the European Union decided to open the rail transport market to competition. This decision was based on the fact that, in comparison with well-developed road and air transportation, rail was increasingly losing market share, and its position could only be restored by abandoning the traditional monopoly in favor of a liberalized and, as a consequence, competitive system.

Today, freight and intermodal passenger transport have been fully liberalized in Europe, since 1999 and 2010, respectively. Meanwhile,

the inland passenger transportation of people has been liberalized only in Italy, in 2012.

Countries in a region that wish to create a new, modern transport system should consider the question: Can liberalization help increase the share of rail transport?

Undoubtedly, the answer will be yes, if liberalization creates competition between rail operators based on improving service quality and curbing prices. New operators entering the market can only succeed through high levels of quality and reasonable prices, thus forcing the traditional monopolies to improve and thus creating a positive spiral for the benefit of the market and passengers.

The Italian experience may be the most advanced in Europe and is of great importance in this respect, both in freight transportation and passenger transportation by high-speed rail.

In the case of freight liberalization, this affected primarily international connections between Italy and the central and northern regions of Europe through the central Alpine arch (Sempione, Gottardo and Brenner). When new operators, all of whom aimed to improve quality of service — in the case of freight, this mainly means punctuality — entered the market, the established market operator reacted positively by aligning itself with the same levels of punctuality. The result was annual growth of 10 percent from 2000, compared with annual growth of 1-2 percent in the 90 years prior to liberalization. The high growth rate after 2000 lasted almost until the end of the first decade of this century, when a serious economic crisis significantly reduced the volume of freight transported.

In the case of passenger traffic, liberalization has affected the services offered in the new Italian high-speed rail network (Turin-Milan-Bologna-Florence-Rome-Naples, about 1,000 kilometers) and has resulted in a new railway company, Nuovo Trasporto Viaggiatori (NTV), entering the market in April 2012. Since then the company has been competing successfully with the old monopoly, Trenitalia.

The result was very positive and can be generalized as follows: In one year alone, 2012, during a severe economic crisis that hit almost all economy sectors, the high-speed rail ridership increased by 15 percent compared with the previous year. For example, NTV transported more than 2 million passengers, and its competitor's (Trenitalia's) traffic volume not only avoided suffering any reduction, but actually increased by 6–7 percent.

This increase was due to a significant improvement in the quality-price ratio of the service — the quality became much higher, while the prices were reduced by 30 percent — and can be broken down as follows: One-third can be accounted for by passengers switching to rail from air, another third by those switching from private road transport, and the rest by new passengers attracted by an improvement of services and lower prices.

Of course, the Italian experience also shows that liberalization is a complex and delicate process and requires a host of other improvements.

One solution is a complete separation between the company providing infrastructure management and handling security and those companies operating the services. This separation would occur not only from an accounting perspective, but also in terms of not belonging to the same company. This approach allows all rail operators to engage in equally competitive conditions.

Currently, in all countries, infrastructure managers are members of the same monopolistic company to which the state railway operator belongs. This enables the later to enjoy a significant and unjustified competitive advantage.

At a time when the countries of the region are launching large-scale programs of modernization and improvement in the transport sector and, in particular, the rail network, the liberalization of the industry and the separation of operating companies from infrastructure managers are two issues requiring discussion and resolution in the shortest possible time.

Andreas Seiler

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Andreas Seiler is a senior researcher at the Swedish University of Agricultural Sciences (SLU), Department of Ecology, Grimso Wildlife Research Station. He obtained his master's degree at the University of Gottingen in Germany and received his Ph.D. in 2003 in wildlife ecology at SLU. His professional interests cover the relationship and interference between humans and wildlife.

Mr. Seiler's field of expertise is animal and landscape ecology, with a special focus on conflicts between transportation, infrastructure and wildlife. His work addresses applied questions and is done in close dialogue with practitioners and stakeholders. These projects range from infrastructure investment projects to monitoring studies of mitigation measures, to research projects on animal behavior and wildlife-vehicle collisions. Mr. Seiler was a member of the Infra Eco Network Europe (IENE) in 1996 and helped re-establish the network and install a new secretary in 2008. Since then, he has been an elected member of the IENE Steering Committee, with special responsibility for IENE's international conferences. Mr. Seiler participates in the CEDR research program SAFEROAD on Roads and Wildlife.

Andreas Seiler

Ecological Challenges for New Transport Infrastructure in the METR Region

A safe, efficient, and well-connected transport system is usually perceived as key to a prosperous future. European transport policies therefore aim to unify transport regions, develop green corridors for fast intermodal transport, and remove legal, technical, and physical barriers to ensure efficient mobility in the future.

Human mobility and wildlife mobility have very similar needs. The important issue for humans and wildlife is that they now use competing infrastructures. Green corridors for efficient vehicle transport and green infrastructure for wildlife hardly go well together. Where these two networks intersect, natural movements are inhibited, and animal populations may become isolated and vulnerable.

Modern transport systems, along with their supporting infrastructure, entail substantial environmental impacts. They consume non-renewable natural resources, including our most limited asset: space. The transport sector is one of the main drivers in the global loss of biodiversity, both directly, by affecting natural living spaces, and indirectly, by laying the groundwork for other sectors to spread and use natural resources. Furthermore, transportation represents about 20 percent of global carbon dioxide emissions and contributes significantly to climate change and air pollution.

In many respects, today's mobility is therefore far from being environmentally and socially sustainable. To achieve sustainability, we need to limit unnecessary growth in transport, optimize intermodal cooperation, improve planning and decision processes, and, above all, decouple transportation from its direct environmental effects. New transport strategies must be developed in concert with adapted planning for land use that integrates green and transport infrastructures and aims to reduce the overall impact.

Traffic is responsible for the death of hundreds of millions of wild animals in Europe each year. Some species, such as amphibians and large carnivores, are especially exposed and sensitive, but even among common wildlife species, the toll of traffic can be substantial and threaten the local management and survival of those species.

Andreas Seiler, a senior researcher at the Swedish University of Agricultural Sciences and a specialist in wildlife issues related to transport, discusses how foresight and planning can be used to achieve ecologically viable transport in the METR region.

It is known that collisions with larger wildlife, such as wild boar or deer, produce a considerable economic cost to drivers and transport operators. Less well-known is that even with railway traffic, especially high-speed systems, collisions with larger animals can cause expensive repairs and extensive delays.

Many species are killed in traffic during their attempt to cross a road or rail line, and even those that don't try to cross may suffer from barrier effects. Transport corridors impose movement barriers directly, through their physical presence and attributes such as fences or gullies, and indirectly, through traffic mortality, repellence and avoidance. Barriers can entail undesired changes in the abundance and resilience of wildlife populations, on their genetic exchange and viability, and ultimately on biodiversity at large.

Traffic noise, light, invasive species, chemicals and particulate matter, and various other disturbances spread from infrastructure into the adjacent landscape and degrade living conditions for both wildlife and humans.

Therefore, even if the area taken up by roads or rail lines may seem small, traffic and infrastructure affect an area that is substantially larger, perhaps more than 20 times larger.

Developing an infrastructure adapted to ecology is fully possible and economically defendable. If new infrastructure is planned wisely and intelligently, damages to ecosystems and wildlife can be largely avoided at a much lower cost than the price one must pay for remedying existing damages and restoring connectivity that is already lost.

The following steps help achieve an ecologically adapted and sustainable transport infrastructure in the METR region.

The very first question to address in any development plan is whether it truly requires new infrastructure to meet the anticipated transportation demand. Maybe the need for increased mobility could be tackled more efficiently by enhanced Internet services that change how and where people work, or by improved public transport rather than old-fashioned highways. Maybe existing means of transport can be used more efficiently, or perhaps an upgrade of existing infrastructure would equally suffice. New infrastructure doesn't automatically solve an increased demand for mobility.

It might sound ridiculous, but in many cases, the decision for a new road or railroad has been made unofficially long before any strategic

evaluation of whether or how the transport demand can be met most effectively. Responsible strategic evaluation must balance economic, environmental and social demands. And it must be evident that new infrastructure, no matter how well adapted, always comes with a net loss of natural living spaces and thus biodiversity.

As a rule of thumb, large, “unroaded” nature areas should be avoided as places for new infrastructure development. The declaration of the IENE 2014 International Conference on Ecology and Transportation in Malmo, Sweden, promotes roadlessness as an important criterion in spatial planning and nature conservation. The lack of roads — and railroads — is characteristic of areas that are still devoid of the negative and disturbing effects of modern transport and thus still have a high potential for being ecologically whole and coherent.

Even if such areas in the METR region may no longer comprise virgin habitat, they are likely to provide fundamental ecological benefits that can no longer be found elsewhere. Large, undissected areas already have been lost in western Europe, but they still do exist in eastern European countries such as Poland, Romania, Bulgaria, Russia and Ukraine, as well as in the areas along the European Green Belt. As a consequence, protection of roadlessness leads to a bundling of transport facilities into corridors, a development that may be beneficial from an economic point of view as well, since various infrastructure owners can share costs for mitigation measures. The principle of transport bundling can also be applied to existing secondary and tertiary infrastructure. Bundling can be achieved by temporary road closures, traffic calming, or speed reductions on less important road linkages.

Vehicular traffic and wildlife should be separated wherever possible. Ideally, major transport facilities could be built underground or encapsulated akin to pipelines on stilts to provide wildlife — and pedestrians — sufficient space to get from place to place. However, entire road tunneling or encapsulating may not be feasible at present, but it is fully possible and in fact, necessary, to provide adapted crossing structures that sustain a safe and sufficient mobility for both vehicles and wildlife. Such structures should be placed where transport corridors intersect with the ecological backbone of the landscape — in other words, its green and blue infrastructures. For the transport sector, the concept is familiar and very useful, as it helps determine where mitigation efforts for mobility must be prioritized. As postulated by the IENE 2012 declaration, there is an urgent need to integrate green infrastructure with the expansion plans of the Trans-European Transport Network (TEN-T) in order to ensure that mitigation will be considered early enough in the planning process to be addressed fully and cost-effectively.

Where green infrastructure and transport infrastructure intersect, ecoducts, fauna passages or landscape bridges provide the technical solution of choice. Experiences with such constructions are many, and there is sufficient technical and ecological knowledge available to provide detailed guidance for their planning and design. Excellent examples can be found in the Dutch Long-Term Defragmentation Program or the more recent German Defragmentation program.

Ecoducts typically are aimed at multiple species, entire habitats or ecosystems and therefore must provide a space large enough for a variety of species, sometimes including humans. Smaller passages — which are designed for a particular set of species, such as culverts for amphibians, badgers or otters — provide an important and less costly mitigation that can be implemented frequently where a concrete need or opportunity exists.

Bigger wildlife, such as deer or carnivores, may even accept passages that weren’t designed for them. If sufficiently large and undisturbed, conventional bridges and underpasses for private roads or pedestrians may provide valuable passages for these species. Minor adjustments in their design — protective screens, enlarged width, non-asphalt ground cover, suitable vegetation connecting to the passage — may increase their effectiveness with fauna. In addition, bridges over streams and rivers can provide important passages even for terrestrial wildlife, if those bridges offer a shoreline that is big enough and dry.

As stated, wildlife and vehicles should be kept apart, to prevent costly and dangerous collisions and to protect species that are especially sensitive or exposed. This can be done by installing exclusion fences or gullies that keep animals off the road and lead them to dedicated safe passages. Other methods include closing roads temporarily or deterring wildlife from roads when vehicles approach.

Physical separation of wildlife and vehicles is necessary in situations where vehicle traffic patterns cannot be changed and/or where collisions cannot be accepted for economic, safety or ecological reasons. This includes most highways and many rail lines, especially high-speed lines, as well as smaller roads in particular circumstances, such as where amphibians are concerned.

Important to a successful mitigation is good knowledge about where and when wildlife is killed in traffic or where accidents occur. Many administrations, however, lack appropriate data, although this information may be easily obtained from maintenance crews, police reports, field inventories and citizen involvement. Citizen science is a promising tool, thanks to the use of smartphones, social media and Internet-based reporting.

Areas next to transport infrastructure are intensely affected by issues such as the spread of chemicals, particles and noise and by groundwater flow. Although cleaner fuel and more-efficient engines already

have eased the toxicity along transport corridors, there are other agents that need to be controlled. Traffic noise is of particular concern for wildlife and humans. It is a significant problem in cities but increasingly acknowledged in rural areas and sensitive nature sites, as well. Noise diminishes the perceptual environment of many species, especially birds and bats, interferes with their mating and foraging behavior, and can lead to weaker individuals and fewer offspring.

While many species are sensitive to the presence of modern transport infrastructure and traffic, some species can cope with a stressed environment and even benefit from the habitats that can be provided in the embankments, the turf strips bordering roads and railways, or the other areas within transportation corridors. In fact, the value of open vegetation strips next to roads for plants and insects was recognized long ago. For many species linked to grassland habitat, these road strips can provide an essential refuge. They are multi-purpose areas: If well-designed and well-integrated, they can provide a valuable enrichment to the landscape and strengthen its green infrastructure.

When mitigation might not suffice and negative impacts cannot be avoided, some loss of nature may be offset by habitat protection or restorations near the site of the impact or at other strategically important sites. Biodiversity offsetting provides another tool for financially compensating for biodiversity losses by supporting other areas of environmental value. In most countries, compensation in the form of biodiversity offsetting is optional, whereas in some, such as Germany, Australia and New Zealand, compensation is compulsory and is an integral part of spatial planning. The European “no net loss initiative” is a step in this direction.

Overall, we have considerable ecological knowledge, practical experience and technical means at hand to develop ecologically adapted transport infrastructure. Thus, there is no excuse for repeating yesterday’s mistakes and for not considering current knowledge and best practices. Practical handbooks and guidelines concerning wildlife and traffic are available.

Some questions — for example, those related to the efficacy of technical mitigation measures for wildlife populations or the adequate level of mitigation needed to maintain the desired status in nature — are still open and need to be addressed on a large scale, preferably through international cooperation where costs can be shared and data obtained more quickly.

A final barrier to successful implementation remains in the attitude of decision makers and stakeholders. Ecological concern in road and rail construction has long been ridiculed or perceived as an irritating obstacle to progress. However, this mindset occurs when ecological concern is merely an add-on to an infrastructure plan already in progress and not part of the overall objective for the new infrastructure. In addition, many of the costs related to the impact on wildlife typically aren’t understood or considered thoroughly. But where the costs are obvious, such as in animal-vehicle collisions and the resulting repairs and traffic delays, those costs can be astonishingly high.

This paper was co-authored by members of the IENE Steering Committee, including Andreas Seiler, Anders Sjolund, Elke Hahn, Marita Bottcher, Lazaros Georgiadis, Carme Rosell, Tony Sangwine, Yannick Autret and Miklos Puky.

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Yury Spektorov

Transportation Projects in the METR Region: Strategic Implementation Aspects

Yury Spektorov of Bain & Company makes the case for applying integrated approaches, project management and risk management to rail projects to make them as successful as possible.

Anyone who has gone skiing in the French Alps, whether in democratically priced Val Thorens or in fashionable Courchevel, will have noticed numerous tourists with a pronounced British accent. That is because those ski resorts are as accessible for Londoners as they are for the French. During the winter season, high-speed Eurostar trains arrive from the UK capital. It takes the train seven hours to cover more than 800 kilometers, but, unlike passengers traveling by plane, these passengers don't face any restrictions on sports equipment that can be brought on board and don't need to make any complicated logistical arrangements.

Hardly anyone thought about this opportunity for tourists while considering the project to build the tunnel under the English Channel and a high-speed railway going through it and linking the UK with mainland Europe. The Alpine route is possible due to intermodality designed into the new transportation system: For part of the route, the train goes along a high-speed link at up to 300 kilometers per hour, and the rest is standard railway at a speed normal for an ordinary passenger train. As a result, Eurostar sells up to 2,500 tickets for "ski trains" in the winter, totaling as much as 2 million euros, and British tourists spend up to 40 million euros at the ski resorts every year.

The impact of such integrated transportation solutions is similar to the smartphone revolution. When Steve Jobs presented the first iPhone in 2007, he showed the audience an iPod music player, a phone and an Internet communicator all in one device, something they had never seen. In 2014, sales of mobile applications for the iPhone via its App Store reached $15 billion — a market nobody even had fathomed 10 years ago.

Similarly, a number of transformative projects have been implemented globally in transportation integration over the last 20 years. One example is AIRail, the joint project of German railway operator Deutsche Bahn, the Frankfurt airport and Lufthansa Airlines. During the project, high-speed railways were launched in 2001-2002 linking Frankfurt with Stuttgart and Cologne. Not long after, these high-speed railways had conquered the local transportation market between those cities. However, the Frankfurt airport gained much more in return: the two-hour access zone of that transportation hub increased by 10 million people and, therefore, long-haul traffic grew significantly.

By 2009, more than half of the passengers flying from Frankfurt started their journey in other German cities, and the total traffic has increased by 20 percent since the high-speed railway was launched. Therefore, the Frankfurt airport enhanced its position as the largest hub of the region as a result of integration with the high-speed railway.

Integrated transportation generates positive impact for airports of various sizes. The Cologne/ Bonn airport, also on the route of the AIRail project's high-speed railway, has positioned itself as the transportation hub for European flights. LCCs and charter carriers operate here successfully, and passenger traffic CAGR reached 7 percent after the high-speed railway was launched. That is a high growth rate for a mature European market.

Another example is the Bergamo airport, about 45 kilometers away from Milan. In the early 2000s, it was a small airport with passenger traffic slightly over 1 million people per year. However, after RyanAir selected the airport as its hub in 2003, traffic skyrocketed, reaching almost 9 million passengers in 2013. Currently, Bergamo is the fourth-largest Italian airport. The leading European low-cost carrier selected that airport as its connection hub because of its transport accessibility, one of the factors considered. The airport is located on a high-speed motorway; as a result, more than 10 million people can get there in less than an hour.

Intermodal transportation solutions increase travel opportunities significantly. They also set the new standards of comfort and speed for passengers. For example, Switzerland has implemented the Fly Rail Baggage Program that covers the Zurich, Geneva and Bern airports as well as more than 80 railway stations. No matter what the departure airport is and what airlines are used, baggage is automatically sent upon arrival to the destination station, and the passenger may pick it up there the same evening or next morning. Passengers leaving Switzerland also may check in their baggage at the railway station at their point of departure and receive it at the destination airport.

In Russia, higher mobility might be achieved through new transportation solutions and their integration. The first is the low-cost air transportation model that has become a tremendous success in Europe, Asia and America in recent years. The first Russian low-cost carrier, Dobrolet, has been planning to begin its operations soon. It could inevitably become one of the market leaders. By way of note, two of the five largest European airlines as of 2013 were RyanAir and EasyJet, both low-cost carriers.

The second initiative in Russia is setting up bus carriers, since the bus transportation market is in a rather embryonic state there. However, it is

successful business in many developed countries. It offers clients significantly lower prices, although they are combined with less comfort and longer travel time. For example, the largest U.S. bus transportation company competes successfully with the railways: a Washington-New York ticket costs about $30-40, and that is at least two times cheaper than travelling by train. In Russia, bus transportation would also be facilitated by toll highways.

The third key transportation initiative is the development of high-speed railways. Taken together — high-speed railways, new bus transportation companies and low-cost air carriers — these three solutions would improve the mobility of the population significantly, thus increasing the size of the passenger transportation market. Those solutions could even be integrated with each other. For example, high-speed railways could provide access to new airports. In turn, bus companies could effectively expand access to high-speed railway stations.

Risk management is another major area of importance in rail development. As a rule, transportation and infrastructure projects are perceived positively by the public during the launch stage. This is primarily due to the huge upside potential for the economy. However, projects are subject to scrutiny throughout their lifecycle, and during the implementation stage, public opinion is very sensitive to various issues. This means that projects are subject to the inevitable criticism if any risks arise, such as increases in cost or time to completion.

The main causes of failure for projects already undertaken is that they exceeded their budget or failed to comply with deadlines. Speaking from my experience doing consulting work for Bain & Company, I believe there are three key components required in order to eliminate such issues. The first is the project management system, the second is talent management and decision making, and the third critical factor is risk management. If the focus on those components was insufficient during the planning stage, the ability to manage time and cost declines dramatically during the implementation stage.

A project management system is the critical success factor in a major infrastructure project. At a very early stage, a project management office should be set up as the capability center and key decision-making center. It should coordinate the project at a broad, global level. Then the project should be broken down by geographies and by functions. This is necessary because any given infrastructure project consists of numerous sub-projects. Therefore, the project structure needs to be optimal for project management purposes.

The next task is to implement a uniform approach to budget control and decision-making at the local level. According to Bain & Company's experience, the stage/gate methodology is one of the most effective approaches in this area. It stipulates that projects will be divided into stages with "gates" between them. The results of each stage are evaluated by an authorized committee, and the project is passed to the next stage only if the previous stage is approved by the committee.

Unfortunately, in many companies, the "HR department ideology" still prevails, instead of a flexible talent management system. Different infrastructure facilities require people with different capabilities. The current labor market is totally different from the market that existed when earlier major projects were implemented in Russia. Projects such as the Baikal-Amur Mainline, or BAM, didn't face the issue of attracting skilled resources. Now, however, the selection and retention of skilled resources is crucial for a major project. Headcount plans will need to be aligned with the new transportation system strategy during the modernization of the BAM and the Trans-Siberian Railway, as well as in the course of high-speed railways construction. A systematic approach to rotations and career development is required.
Bain & Company's observations also show that it is critical to create a flexible organizational structure that will evolve in course of the project.

Organizations usually start thinking about risk management when a hazardous situation has already emerged. The global financial crisis of 2008-2009 is a vivid example. Risk management specialists were highly sought, but unfortunately only after several major international banks went bankrupt. Similar situations have occurred in many industries.

The correct risk-management system includes identifying all relevant risks and completing their qualitative and quantitative analysis, as well as activities for reducing the probability of hazardous situations. The most resource-intensive analysis is required in order to identify risks. In addition to changes in the competitive environment and communication with the public, financing issues should be worked out with investors. It is also necessary to review the suppliers, and concerns may be raised both by monopolies in certain industries and by the lack of reliable and sustainable companies in others.

Legislative and legal-risk mitigation help avoid issues with planning permits and land use if there are private owners. Engineering and construction aspects also need to be reviewed. For example, the potential impact of the regional geological profile and climate upon the project schedule should be analyzed. Special attention will need to be paid to imported technologies due to their high complexity and resulting operating risks and technology localization risks.

I believe that high-quality risk management, combined with a strategy of project integration, is the key to successful development of transportation infrastructure in METR region.

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Future Challenges for Airports

Future Challenges for Airports

Rene Steinhaus, who leads the aviation and airport department at A.T. Kearney in Berlin, outlines the challenges that airports will face in the future, including those brought forth by the need to develop passenger service and address environmental issues.

Airports are the pacemaker of modern life. We are used to flying in and out on a daily basis to cities for business meetings and holiday trips. The number of passengers traveling through one of the world's biggest 50 airports in one day is greater than the population of many small cities. And airports are cities of their own: They deliver any service you can imagine, just as in a city. What's more, it isn't just in the movies that people live at airports: Many airports are developing business and residential areas close by.

Aviation is a quick-developing system. As one part of this system, airports will be facing some challenges in the future, mainly from changing airline networks and capacity supply, issues related to revenues and environmental issues.

As the platform for the airline business, airline networks have experienced significant changes over the last two decades. In the past it was very common for a national carrier to link one country to the world. At their home bases, they only encountered home carriers from other countries flying on bilateral agreements. No carriers were allowed to transport passengers between other countries. Domestic routes faced very little competition. And if it occurred, these small newcomers were quickly eliminated with dumping prices.

After the liberalization of the European market, the airline world went through the same stages as had happened earlier in the United States. Many new airlines were founded. New business models like low-cost carriers were established. High competition led to mergers and to an airline consolidation. Now, after two decades, the European market is consolidated into three major legacy groups and their alliances (Lufthansa, Air France/KLM and IAG) and four low-cost carriers (EasyJet, Ryanair, Wizzair and Norwegian). Smaller airlines suffer from being squeezed between these two business models or disappeared (some examples include Malev, Spanair and Olympic). Others found strong investors from outside of Europe in order to survive (such as Air Berlin, CSA and Alitalia).

What's more, the remaining legacy carriers get squeezed between low-cost carriers on the one side eating heavily into their loss-generating short-haul business, meaning intra-European and feeder flights. On the other side, they are facing strong price and capacity pressure on their profitable long-haul routes from Middle Eastern carriers.

This development will change the airline world and therefore the airline networks significantly. On intra-European routes, the large network carriers are reacting to the low-cost carrier, or LCC, competition and to their own cost disadvantages by outsourcing the production to the low-cost carriers in the group. Lufthansa is currently transferring all decentralized traffic not touching their hubs to Germanwings and has further plans to develop the "Wings Product" across Europe as an analog to the traditional LCC Model. Air France plans to transfer this task to Transavia and Hop. And IAG (British Airways and Iberia) will develop the 100-percent owned Vueling to its intra-European carrier. To avoid losing loyal clients and frequent flyers, these network-LCCs cannot simply copy the "no frills" concept. Their customers are used to premium services like lounge access, pre-boarding, fast lanes and collecting points in frequent flyer programs. The traditional LCC carriers require new markets to maintain their growth rates. Creating new routes on secondary airports is getting more and more difficult. Therefore, they are discovering the business travel market and are moving directly towards the traditional airports of the network carriers. To compete in these markets they are implementing more and more enhanced service packages like reserved seats and even frequent flyer programs. As a result, network carriers and LCCs are getting more and more similar.

For airports, it will be a challenge to serve the requirements of cost reduction and growing productivity. The typical turnaround time — the time between arrival, handling, and departure — of an A320 or Boeing 737 for a network carrier is about 50 minutes, while for LCCs it is down to 25 minutes. Aircraft generate revenue only when they are flying. Many airports should start thinking about how to provide the required procedures like boarding via two doors (in the front and in the back of the plane) in their current infrastructure. The design of new terminals will require such elements to be built-in from the beginning while requiring the construction of less-expensive terminal infrastructures to reduce cost.

Making the situation even more complex, network airlines link the short-haul flights with long-haul flights at their hubs. Only in some markets, like London or Paris, can you fill a huge wide-body aircraft from the local market for long distances every day. In Frankfurt, sometimes up to 150 so-called feeder flights are filling one jumbo jet going on a long-range flight. And at the other side of the flight, feeder flights are bringing the passengers to their final destinations.

Imagine the big puzzle that results from this situation in the event of delays and connections. Today, not only airlines compete with each other: Air systems are in competition. This network is competitive only if the complex processes of a hub operation are synchronized like perfect clockwork. Passengers missing their connection flights and staying in a hotel instead of arriving home to their families will next

time think twice about taking that same connection. If it happens again, you lose them as customers forever, even with competitive ticket prices.

Strong cooperation between the airport and its hub airline is essential for success in the strong growing hub markets. The number of transferring passengers at the Top 20 hubs in Europe has quadrupled since 1990, to 180 million transfer passengers, with an average growth rate of 6 percent — which is higher than the average growth rate of global passenger traffic at 4 percent. Twenty years ago, the options to fly from A to B were very limited. Today passengers have many options to get from A to B via C, even in the same airline group. For example, to fly from Berlin to Sao Paulo in the Lufthansa system, you can choose among transfers in Frankfurt, Munich or Zurich. In the AF/KLM-system, you can choose between Amsterdam and Paris. The same is true for thousands of intra-European connections. Internally, these hubs compete in the same group, with their own network planning and allocated fleets. This approach keeps the competitiveness of the overall system very high.

A new business model set to emerge in the future is the implementation of low-cost, long-range flights. The first examples of these operations are Air Asia X, Scoot and Norwegian. While it is very difficult to operate on a lower cost basis in long-range operations, one of the main success factors for lower prices is maximum utilization of the flights — that is, seat load factor. The airlines need to have ways to generate this maximum use, such as by flying from very large local markets or feeding the flight by linking it to the short-haul LCC networks. This is a chance for European LCC hubs like London-Gatwick, Barcelona or Berlin to establish a completely new kind of hub. As one example, Norwegian choose London-Gatwick as one of the first bases for its long-range operation exactly for those reasons.

The task of the airport in any hub partnership is to provide enough capacity for the airlines to grow and to guaranty reliable and cost-effective processes tailored to the requirements of its hub. That first task, providing enough capacity, is especially getting more and more difficult for airports in Europe. The European ATC Organization Eurocontrol forecasts that demand will exceed future airport capacity by more than 10 percent in 2030, even if all current capacity enhancement projects can be delivered.

Airport congestion will accelerate rapidly in 2025-2030, as unaccommodated demand almost doubles. The urgency of this situation is underscored by the long periods that have been needed thus far for building new capacities in Europe. The last runway addition in Frankfurt took 13 years from the first discussions to the opening. The last runway in Amsterdam took 18 years. This isn't competitive with the strong growing Middle Eastern hubs where decision, approval and construction of completely new airports take half the time.

In times of capacity shortfall in European airports, a very important competitive factor will be the intermodal traffic. If the air traffic is congested in some areas in Europe, it will be to the advantage of other airports to redirect traffic demand towards their own air hubs by rail. High-speed rail changed the picture of transit in Europe. On many routes where travel time by train became less than two hours, the air route was canceled or only sustained to feed the air hub.

With travel time of two to four hours, the competition between rail and air is strong. Airports linked to rail will have a huge advantage by participating in a huge intermodal network. The German railway, for example, is cooperating with many airlines, linking their flights with the "Rail & Fly" service to more than 5,600 stations in Germany. This gives airlines the possibility to feed their flights without using the feeder network of the competing home-based carrier. To give an example of the impact: the long distance railway station at Frankfurt Airport has 23,000 passengers per day and about 5.6 million passengers per year. This is more than many airports.

In addition, for airports not linked to rail, new opportunities will open up, with new aircraft types coming to the market in the next few years. Lower seat-mile cost with these aircrafts will make the operation of so-called thin routes competitive. Airlines will link smaller markets directly to each other. For example, the new Bombardier C-Series will enable airlines to fly with smaller 100-seater aircraft direct from Europe to North America.

The winning airports will be the ones that identify their future market and cooperate with the airlines operating at its location in order to provide unique products in their specific markets.

Revenue challenges are another part of the picture. Operational challenges for airports today include the need to reduce the EBIT margin of core businesses, which are aviation and groundhandling. Therefore it is essential for airports to grow their non-aviation business. In large airports, there is a revenue share of about 40 percent but is generating about 80 percent of the EBIT.

Optimizing the non-aviation business has huge potential for most of the airports I have seen. The main non-aviation drivers are travel retail (mainly duty-free), car parking, food and beverage, advertising, real estate and services. If we look at retail, many of the business travelers don't have time for shopping in the city they visit. The only chance for them to buy small presents for home or to get informed about new products is at the airport. A few minutes between security, lounge and boarding are the chance to buy. For leisure travelers, shopping and eating at the airport are the first part of the vacation. They want to be entertained. This is the chance for airports to generate revenues.

Rene Steinhaus

Optimizing the passenger process — and having a passenger-friendly terminal layout that has good walkways, as well as good flight and gate information for passengers — are important factors for reducing passengers' reduce stress levels and giving them extra time for shopping. Global retailers are specialized to operate shops at airports and to optimize revenues. Most of the airports are acting as a mall provider, renting out the spaces to retailers and restaurants. Here it is important to differentiate airports with a mall approach from those airports with local brands, offers and special promotions, because the travelers have the choice to buy at your airport or on the other side of the flight.

Airports are developing themselves more and more as service platforms. They operate as the infrastructure provider for various bodies, including the airlines, retailers and online-service providers, to provide integrated and seamless services. New technologies and data availability are opening ways for new services and passenger experiences. Tracking, navigation and identification via mobile phones are opening the way to individual tailored services. To give one example: In a flagship store of an online retailer at an airport, you find a new electronic device. After buying it, you find it directly delivered to the trunk of your car parked at the airport when you return. The car is of course cleaned and serviced, just as it always is when you park it at the airport in your automatically pre-reserved parking zone. The payment is made from your bank account at the end of the month. Choosing the right technologies and developing partnerships are the challenges for airports in this business.

Finally, there is the environmental impact of airports. Air travel is an important driver of our modern lives, and nobody wants to give it up. Everybody wants to have access to air travel. But airports are facing dramatic challenges in their surrounding areas, limiting the competitiveness of airports in Europe.

For example, while 24-hour operation is usual for hub airports worldwide, Frankfurt had to accept a very strict night curfew to open a new runway. After 11 p.m., nothing is moving anymore at one of the biggest hubs in the world.

The aviation industry is making huge steps in the reduction of pollution and noise emissions. Every new aircraft generation is reducing fuel consumption by 15 percent to 20 percent. Also important for airports is noise reduction. The change just now under way in regional and single-aisle aircraft is slashing aircraft noise footprints by up to 75 percent, according to manufacturers.

The big next step for airports in noise and pollution reduction is being developed very quietly. Currently tests are under way to taxi aircraft to the runway with electric power. This can be done in two ways, with electric engines in gear or with remote-controlled tow trucks. The engines aren't started until the aircraft is close to the runway. The results of this approach will be significant.

Airports also have ideal distances and parking/charging conditions for electric handling vehicles. Many versions already exist, including huge passenger buses. They could be charged with their own solar power. Some airports already have installed solar devices in their green areas. A huge part of the energy consumption is used for the climate control of terminals and for lighting aprons and runways. New terminals are being developed with special solar energy technology: the glass windows have special materials to let in light and let out heat from the sun if required. Like at home, LED lights are dramatically changing the quality and consumption of lighting. One other huge challenge for airports will be the implementation of green fuel: New logistics and standards need to be tested and established.

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Pablo Vazquez Vega

Assessment of Infrastructure Projects

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Assessment of Infrastructure Projects

INECO's Pablo Vazquez Vega describes how to effectively invest in transport infrastructure and assess the economic benefits and risks of transport projects.

A society's economic growth, income level, and overall progress depend on how advanced the activities are within a specific area, and an adequate transport system is of paramount necessity. High-speed rail brings significant socioeconomic changes that affect the cities and regions through which it passes and affect the entire country because of its impact on the overall transport system.

Spain is a world leader in high-speed rail. The country has put much effort into developing high-speed rail and intermodal transport in order to create an intermodal network that is efficient, environmentally friendly, and economically competitive. Over the past 10 years, the number of kilometers of high-speed rail network in Spain has increased more than fivefold and now totals more than 3,100 kilometers. Thus, Spain is the second country in the world in the number of kilometers of high-speed network in operation.

In addition, Spain stands out globally for its ability to design, build and maintain efficient and safe transport networks.

Both the construction and operation of high-speed rail infrastructure can benefit all economic agents, reducing costs and increasing productivity, allowing intermodal transport systems to complement each another, and facilitating passenger and freight transportation.

Evaluating the effectiveness of investment in transport infrastructure, as a rule, is carried out using a macroeconomic approach — in other words, by taking into account the cumulative impact on the economy.

Traditionally, macroeconomic effects include changes to the growth rate of the gross domestic product (GDP), economic welfare (GDP per capita) and productivity of private capital and labor as a result of public investment in infrastructure.

It is important to bear in mind that doing proper risk assessment and reduction, in particular before commissioning the infrastructure, is a key factor in ensuring greater confidence in economic evaluations at subsequent stages of the lifecycle of an infrastructure project.

It is important to allocate resources, both time and money, for engineering surveys, analysis of projected demand, analysis related to future operations, real estate transactions and other issues in order to improve the quality of service for the entire lifecycle of the project and minimize negative and unintended consequences. This way, you can avoid exceeding budgets or having delays in construction and launch.

The short-term effect of a specific project can be evaluated by measuring changes in the economic activity generated during the construction phase and any additional effects on demand for goods and services in the rest of the economy.

The construction of high-speed rail represents a significant investment burden, which has a short-term economic impact on economic activity (increase in GDP) and employment. By measuring these, it is possible to estimate direct, indirect and induced effects of the construction of high-speed rail.

There are three types of effects. Direct effects correspond to an increase in production in those sectors that receive direct infrastructure investments — mainly the construction sector, but also others. Indirect effects include increased productivity in the sectors supplying the project, such as construction and manufacturing. Other additional effects include increases in the income of companies and individuals as a result of growth in GDP.

Direct, indirect and additional effects can be calculated in the form of income, output, surplus values and extra jobs by using the input-output model (the Leontief method). Additional effects may eventually double all the direct and indirect effects.

As an example, a study carried out in Spain showed that every 1 million euros invested in infrastructure creates about 20 to 30 jobs through direct, indirect and additional effects. The GDP growth rate in this instance would be between 1 million euros and 1.5 million euros. The combined short-term effect can be calculated through the investment multiplier method, which can be used to estimate the impact on GDP.

After an infrastructure project is completed, it works as a comparative advantage, leading to positive impact on the productivity of enterprises in the target area. For example, a new railway line can reduce the cost of consumer mobility and raw material transportation, thus increasing the efficiency of companies supplied by it and boosting their output.

The prevailing view is that higher public investment in infrastructure leads to higher productivity and GDP growth.

Macroeconomic effects support global investment plans for transport infrastructure. But when it comes to a particular infrastructure project, its specific benefits can be calculated from a microeconomic perspective as well.

Pablo Vazquez Vega

When a transport project is considered a possible public investment priority, its evaluation often includes cost-benefit analysis. This compares costs and revenues for the community throughout the project's lifecycle. Besides that, an additional profitability-financial evaluation analysis is carried out, allowing the entrepreneurs' standpoint to be taken into account as part of the decision-making process. In this case, it does not matter whether the money to be invested is public or private.

The two analyses are complementary. While the financial analysis includes only the income and expenses in the private sector, economic or socioeconomic assessments include all revenues and expenses regardless of who benefits and who loses out.

For example, within the framework of economic evaluation we can talk about the various microeconomic effects associated with the commissioning of high-speed rail that affect the well-being and socioeconomic development of the country. These include saving time, improving safety, increasing comfort and ride quality, reducing accidents, securing higher reliability and punctuality, promoting eco-friendlier decisions and others.

Cost-benefit analysis determines the project's potential impact as far as maximum consumer and producer profits are concerned. Opportunity costs and revenues are valued by calculating the differences between the situations "with" and "without the project." All factors that may be assessed are accounted for, but excluding any taxes and subsidies. There are also factors that are considered only in terms of potential revenues or expenses, such as how much time or material resources will be lost because of an accident.

There are a number of effects which, by their nature, cannot be included in the cost-benefit analysis but may be considered as part of a more complex evaluation. These include land planning, localization of economic activities, tourism, urban planning and abolishing administrative barriers.

The financial evaluation of large capital investments combines methods of project financing with traditional investment analysis. Revenue flows and payments throughout the project's lifecycle are calculated as part of it. This takes into account not only the profitability of the cash flow of the project itself, but also the profitability for shareholders. As for the shareholders, the margin will be determined by including a variety of tax and accounting factors, as well as compliance with the essential nature of the activities.

As part of the analysis, particularly with respect to new construction projects, it is also important to consider the risks that may be identified in order to ensure their proper management and mitigation. By doing so, it is easier to ensure a project's success, even if changes need to be made. These methods make it possible to manage risks that, without proper supervision, can lead to over-expenditure and delays in the project coming online. These include land risks, geotechnical risks throughout the entire length of tunnels and urban risks at entrances to big cities.

The attractiveness of new transport infrastructure is also connected to the intermodal centers that integrate the high-speed rail into the entire economic activity system of a region. These centers are a means of creating new business opportunities through the development of high-level trade and business centers and in other ways.

In sum, it is important to justify the implementation of important infrastructure projects, particularly the effects of proper planning, design, construction and commissioning. In this regard, the decision to start the project should be based on economic assessment and risk management.

Mario Virano

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General Director, TELT S.A.S.

Environmentally Compatible Transport Infrastructure

Mario Virano

Environmentally Compatible Transport Infrastructure

Mario Virano, general director of TELT (Tunnel Euralpin Lyon Turin) S.A.S., explains how balance can be achieved between mobility growth and environmental sustainability.

In the book “A Brief History Of the Future,” economic adviser Jacques Attali describes an increasing rivalry between those who are prone to moving from place to place and those who prefer a settled way of life. In the years to come, this structural peculiarity of the modern world will only escalate. The question of interaction between nomads, who travel around in search of anything new and make hundreds of acquaintances along the way, and people who see every encounter with “aliens” as an attempt on their identity and lifestyle, isn’t only about refugees or the displaced. It also often leads to divisions in the relationships between transport infrastructure and the environment.

Despite the fact that transport’s environmental impact is often criticized, mobility is undoubtedly one of the fundamental values in modern society that brings immense opportunities as far as business and personal relations are concerned. A city’s, region’s or even country’s accessibility or integration into the overall transport system frequently works as the key factor defining how attractive it is. To satisfy the demand for mobility without damaging the environment, we must make decisions aimed at securing environmental sustainability or, in other words, creating opportunities for today’s generation without creating new challenges for generations to come. In a world where the growth of passenger flow comes together with emerging economies’ development, balancing the growth of mobility and its effect on limited natural resources is of utmost importance.

Within the framework of the large-scale TEN-T transport infrastructure projects, the European Union looks first and foremost to encompass public approval of its tasks and methods, including those that affect the METR region, both in terms of approaches based on member state unity and on market integration. Transport corridors shape the future links between different parts of the union, prioritizing urban infrastructure objects, ports and airports.

Many of these corridors are rooted in history and culture and today are simply refurbished to keep up with the times. They include both the ancient routes originally followed by merchants and pilgrims — the Via Francigena, Silk Road, Imperial Indian mail track — and the new routes emerging as part of geopolitical integration or border-elimination strategies aiming to create a global economic space.

No matter what their origin is, such multifunctional corridors concentrate financial flows, activities and projects along certain lines and require clear definition of priorities — goals and rules — both on the national and international level. Territorial issues must be considered along with complex approach that takes into account macroeconomic conditions and the goal of social and territorial integration.

But there are other important matters, and one of the most significant is building up a set of rules accepted by all of the countries in the region. It is obvious that in order to guarantee maximum mobility within an area measuring thousands of square kilometers, common standards must be followed throughout the whole zone. Interplay between various member states’ transport network branches, as well as passenger rights and safety, must be provided for, while common market access and competition as stipulated by the EEC Treaty must be enacted.

This fact is hardly self-evident, but certainly critical: the very idea of multifunctional strategic continental transport networks is viable only as long as basic transport rules are gradually standardized. But it’s not only the basic parameters like engine power output, gauge width, signal and control systems that must be adjusted in compliance with common regulations. Common criteria for financial and economic parameters — a certain codex regulating investment decisions through benefit and expenditure analysis — must also be introduced. These include discount rates, project return estimation criteria, timesaving for various groups of operators and pricing quantification for external factors (environmental first of all). The latter can theoretically show whether local authorities are willing to pay a certain price for saving their natural resources with no mobility drawbacks.

Europe is unlikely to see an endogenous demographic increase, but it attracts massive streams of migrants from world’s poorest and least stable regions, which leads to various issues related to integration, coexistence and national identity. It should be pointed out that European identity is based on cities, which account for 50 percent to 75 percent of the population. Europe’s urban space consists of mid-sized cities, most of which have a long history.

There are only two megapolises in the EU itself, which are Paris and London, but if we take a look at the larger METR region, we will see two more, Moscow and Istanbul. Other than these cities, competition is provided by urban agglomerations — a number of separate, yet closely connected cities like the Belgian, Dutch and various English and German clusters and the Po Valley in Italy — that are the main drivers for production growth and technological progress. These work as integrated territorial systems and become increasingly competitive due to the fact that their member-cities turn into so-called smart cities and join the integrated, high-speed, high-practicality transport system.

This means that it takes less time to get from one city to another than to cross the whole agglomeration.

The TEN-T project, which is expected to cover 17,000 kilometers by 2030, is aimed at creating high-speed railway links between European cities. However, it isn't only about guaranteeing citizen mobility on the scale of a continent, but also about preserving and enriching the environment in terms of its historic and cultural diversity. It is obvious that as long as no high-speed transport connection capable of making intercity travel as easy and comfortable as the intra-urban connections is established, all we will see is people leaving underdeveloped areas to move into more-developed ones. This will result in an uncontrollable increase in megapolis population density on the one hand and downturn suffered by other regions on the other.

As opposed to this prospect, the well-balanced, polycentric European model of territorial and social organization integrated through multifunctional, high-speed transport corridors will work as an urban macro system, featuring rich natural resources like the Alps and resembling an intercontinental subway with nine lines and cities as stations.

The 2011 EU White Paper outlines the prospects of transport and environmental development up to 2050, increasing citizen mobility while taking ecological impact into account.

The strategy is based on four key principles:

1. Increasing transport's energy efficiency by improving engine and fuel response;
2. Increasing the efficiency of logistical chains by making use of transport infrastructure and sustainable transportation means;
3. Introducing innovative technologies to manage and optimize transport flow;
4. Guaranteeing competitiveness and market development.

These are the main ideas behind a new understanding of the environment, one that sees it as a phenomenon that can be incorporated in transportation planning — one that incorporates the rights of people living in the region, including the right to mobility, and that considers the factors behind climate-changing carbon emissions in order to reduce them — as opposed to regarding the environment as a pre- or post-anthropologic concept.

The program pays much attention to the qualitative aspects of freight corridors. In particular, it stipulates a gradual shift from wheeled motor transport to more-ecofriendly options. Other tasks include shifting to lower-carbon fuel in aviation — up to 40 percent of its overall energy demand — and cutting carbon-dioxide emissions in shipping. Both tasks are to be accomplished by 2050, while the 50-percent reduction in traditional fuel use in urban transport will become reality as early as 2030.

The White Paper sets no qualitative standards for rail transport as far as emission cuts or complex restructuring are concerned, but it does set prioritized actions for the development of this industry. Goal 4 is to triplicate the overall length of high-speed rail lines while maintaining the existing branched rail networks in all member states by 2030. By 2050, the all-European high-speed rail network must be completed, and most of the middle-distance passenger flow must be allocated for rail transport. Goal 5 is to finish the main multifunctional TEN-T network on the entire EU territory by 2030 and to bring a complete high-quality, high-capacity network with corresponding information services online by 2050. Goal 6 is to establish rail links, first and foremost high-speed rail links, between all major airports in the network and provide access to rail freight and, if possible, inland waterline systems to all seaports.

Europe also is setting out two other environmental tasks. The first is to "encourage business-based GHG certification schemes and develop common EU standards in order to estimate the carbon footprint of each passenger and freight journey with versions adapted to different users such as companies and individuals." The second is to establish international tariffs based on the payment-for-use and he-who-pollutes-pays principles and the regulations designed in 1998.

Despite the global financial crisis and multiple local political conflicts, the METR region still has bright prospects. One of the most notable challenges that it is facing is the ambitious plan to introduce specific environmental compatibility estimation to the design of transport corridors; this concerns the historic and geographic (both geopolitical and geomorphologic) conditions of the lands they cross.

The EU model of multifunctional transnational transport corridors seems to be the most advisable in this case. The reason is that it allows direct interstate negotiations on how transport connections should be organized, which are of utmost necessity when building a high-speed railway. This approach also stipulates signing international agreements to set target rules for such corridors, including special permissions systems, special categories, special compensational mechanisms such as extra financing sources and, finally, establishing special taxation zones at the beginning and end of the logistical cycle.

At this point, some light should be cast on the possible scenarios for the region's political and economic development. It seems advisable

to provide access to the METR region transport corridor market for those international operators working together with local companies. Russia allowed this for the enterprises that won PPP (public-private partnership) highway-construction tendering, and so did Turkey, where international capital and know-how stimulated the country's infrastructure development by revealing its true potential and showing how it can be realized. All of these tasks can be completed without breaching any EU ecological standards: Sustainable development doesn't result in decreased mobility but, on the contrary, leads to increased efficiency, integration and interaction, use of renewable energy sources, functional balance and technological innovations.

To achieve higher environmental compatibility, all future transport corridor construction projects should be built around five fundamental factors as top priorities:

1. The environmental factor, that is, the level of pollutant emissions and the overall carbon threshold for the whole project lifetime;
2. The territorial factor, which includes estimations and viewpoints of all interested parties (for example, adhering to the relevant agreement on involvement and information between the EU and Russia);
3. A coordinated and orderly effort to secure environmental protection along the whole length of the corridor by working out procedures, norms and regulations similar to the standards that the EU has designed while bringing together the industrial policies of its member states;
4. Clear and transparent international procedures regarding the environmental impact of economic activity, incorporating various tariffs;
5. Boosting the role of the private sector at all stages, from project design to construction and operation, to create a common METR transport space.

In this regard, the METR high-speed rail lines can follow the latest developments in international practice. Standards and procedures vary from country to country, but the commonality is that public opinion should be taken into account before construction gets under way. As far as environmental protection is concerned, the 2009 launch by Deutsche Bahn is noteworthy, as it was the first railway project to offer zero carbon dioxide emissions. This was achieved by using only renewable energy sources in a certain sector.

With regards to the METR project, it should be pointed out that developing a new fully environmentally compatible transport infrastructure, one that is capable of taking into account all of the local historical, political and cultural peculiarities based on advanced international practice, seems to be quite possible. For a large-scale international construction project to succeed, it should be based on various agreements between member states, including technical specifications and regulations as well as economic, financial and operational documents.

Environmentally Compatible Transport Infrastructure

In its passenger transport division, DB Group moves nearly 12 million passengers daily in its trains and buses Europe-wide (including in Germany). In its transport & logistics division, about 390 million tons are transported via rail and more than 95 million shipments over land every year in its European network. Deutsche Bahn operates more than 30,000 train runs daily on its 33,400 kilometer-long, modern rail network, which is open to competition.

Niko Warbanoff

Head of International Business Development, Deutsche Bahn AG

Niko Warbanoff is head of international business development outside the European Union for Deutsche Bahn Group and chairman of the board of managing directors of Deutsche Bahn International. He was born in 1975 and studied industrial engineering in the Department of Business Administration at Technical University (FH) Esslingen. After graduation, he worked for Daimler for 10 years, where he held managerial positions in locations including Great Britain, France, the United States and Asia. In 2009, he joined Deutsche Bahn AG.

Transport Trends in the METR Region

Niko Warbanoff

Trends in the METR Region

Niko Warbanoff of Deutsche Bahn AG spells out the effect that investment, liberalization and government measures can have on rail development.

Years ago, the Bundesbahn in the Federal Republic of Germany and the Reichsbahn in the German Democratic Republic were in a desperate economic situation, with joint debt of 34 billion euros and not even enough revenues to cover labor costs. A rail reform measure succeeded in reversing this trend by implementing key changes, namely introducing an entrepreneurial approach to business, providing debt relief and opening markets to competition.

On a European level, these changes were accompanied by several legislative packages aiming at creating a single European Railway Area. The First Railway Package required operational separation of infrastructure and transport services. International freight service providers were granted access to the Trans-European Rail Freight Network.

The Second Railway Package provided for European Union accession to COTIF (the international rail convention), established the European Railway Agency, and set a common regulatory framework for rail safety. It accelerated the liberalization of rail freight services. Access for all types of rail freight services was granted to the entire EU rail network by January 1, 2007.

Under the Third Railway Package, provision was made for the liberalization of international passenger services. Railway undertakings providing such services had to be granted access to the infrastructure in all EU member states as of January 1, 2010. Cabotage was also to be allowed.

With increased competition due to liberalization and with the changes brought about by the Rail Reform, Deutsche Bahn AG — the successor of both the Bundesbahn and Reichsbahn — has continuously improved productivity. As a result, rail traffic volumes increased by 36 percent in passenger transport and 58 percent in freight transport between 1994 and 2012.

With regard to the future, numerous studies confirm positive long-term prospects for rail. For example, the European rail freight market is set to grow at rates between 2 percent and 3 percent. This is flanked by continuing recovery and integration of the European economies. Additional positive factors arise from mega-trends such as an ageing society, environmental challenges, sustainability and globalization.

However, in order for national rail companies to take advantage of these positive trends, further policy steps are necessary to complete the Single European Railway Area.

Complete market liberalization is still a priority. While rail freight and cross-border passenger transport are liberalized, domestic passenger rail markets are still closed to competition in most European countries. Domestic passenger rail markets must be opened to competition, including mandatory awards of public service contracts under competitive tendering.

The future of rail companies depends to a large extent on their competitiveness compared to road transport. Factor costs such as infrastructure charges, energy taxes and the cost of CO_2-certificates (and specifically in Germany the costs of energy turnaround) as well as the cost of retrofitting silent brakes have reduced the ability of rail companies to compete on prices.

Insufficient investment in maintenance and new infrastructure to remove bottlenecks destroys the basis for high-quality rail transport. National governments and the EU must be prepared to dedicate part of their public budgets into the future. Furthermore, a stable regulatory framework for investments, including the ability to earn a sufficient return on investment, must be created.

The rail industry must remain innovative. The public private initiative Shift2Rail with a budget of 1 billion euros is therefore much supported, as it can contribute substantially to increasing innovations to reduce the costs of the rail system and increase its capacity.

From the business perspective of a rail carrier, policy steps towards a Single European Railway Area will be accompanied by establishing European-wide transportation networks and creating attractive cross-border products.

Technical obstacles are a major impediment for the completion of the Single European Railway Area. Some progress has already been made as a result of the EU regulatory framework. For example, the establishment of the European Railway Agency (ERA), the introduction of technical legislation and implementation of the TSI (Technical Specifications for Interoperability), for example, on high-speed rail and safety issues.

A great deal was further achieved with the new agreement on the Trans-European Transport Network (TEN-T) in May 2013. The agreement sets out priorities for a core transport network in the European Union and provides deadlines to make sure that all projects contributing to the core transport network are implemented as a priority. It sets standards to ensure that trains, ships, planes, trucks and cars can use the transport infrastructure without any technical problems.

However, a lot still remains to be done in order to reduce barriers to market entry, as reflected in the technical package of the Fourth Railway Package presented by the European Commission in January 2013. A fast implementation of the technical package, which has already received broad support in the European Parliament and by member states alike, is indispensable. This includes in particular strengthening the ERA in order to implement the regulations of the railway package efficiently. Faster authorization process and a foreseeable decision making process should be guaranteed. Market participants should have the right of appeal at the newly established ERA appeal body. Standardization should be applied: Rolling stock is produced in many different versions and thus operators are forced to deal with a tremendous variety of spare parts in maintenance. Therefore, standardization will cause high economic benefits that help to provide affordable and reliable rail transport.

A liberalization process like that in Europe is highly unlikely outside of Europe in the coming years. But cross-border traffic will be more and more important. Competition will grow probably on corridors through Turkey and Russia.

The Middle East just started to invest heavily in its rail business. It is to be expected that the GCC countries will invest more than 100 billion euros in rail infrastructure until 2020.

German engineers are playing an important part in helping to put an efficient comprehensive rail system in place, including a new high-speed line in Saudi Arabia. Every year, millions of Muslims make the Hajj pilgrimage to the Saudi Arabian city of Mecca, site of the religion's most holy location. Although Mecca itself is home to 2 million people, the annual pilgrimage continually taxes both the city's and the country's transportation infrastructure — and government officials expect the number of people taking the pilgrimage to grow to as many as 3 million.

Between Western Europe and Turkey, DB Schenker Rail, together with the Turkish Railway Company, started in September 2013 a new service known as the "Bosporus Shuttle" with three pairs of trains each week.

The customers will be guaranteed high reliability because it is able to offer end-to-end corridor management. Liberalization of the Turkish rail market is now under way and more competition can be expected within the coming years.

For climatic and logistical reasons, the railway in Russia is the only sustainable transport mode that secures cargo supply to the population and has efficient and reliable connections to many parts of the country and between economic centers. According to a SCI-Study from 2012, the modal split for rail passenger transport in Russia is around 65 percent, including urban rail, and in rail freight transport around 90 percent (without pipeline transport). Russia is a high-growth rail market with good long-term prospects.

Rail transport in Russia is in the fourth phase of the structural reform of privatization that is aimed at further developing competition in the railway industry. As a result of these reforms, a large number of freight-car operating companies have been established, namely ones that own and operate their cars but don't have the right to own locomotives or provide hauling services on the Russian Railways network. Current discussions therefore center on the permission for private traction on main lines for freight transportation.

All in all, for transport markets in metropolitan regions like those in the Middle East and Russia, rail is the only way to master the challenges. Congestion can be managed only by efficient use of rail and by combining rail with all other modes of transport and networking them to each other in an intelligent manner.

Ying Zhu

General Manager, CREEC

Ying Zhu is the general manager of China Railway Eryuan Engineering Group Co., Ltd. (CREEC). He holds a master's degree in engineering and is a professor-level senior engineer.

Mr. Zhu hosted the study of China's first ballastless track test line, and he compiled codes for a high-speed railway ballastless track and precision survey and other technical codes. He is the chief design engineer of the Shaoguan-Huadu section of the Wuhan-Guangzhou High-Speed Railway, the Guiyang-Guangzhou High-Speed Railway, and other projects. Mr. Zhu is also the initiator on the Chinese side of a project for a Eurasian high-speed transport corridor from Moscow to Beijing.

Ying Zhu

Railways pact

High-Speed and Their Im on China

Ying Zhu, an engineering expert with vast experience in high-speed railway design and management, describes the impact of high-speed rail transport on China's economy and society.

Governments around the world have been relying more and more on modern railway transport — and on high-speed railways in particular — in order to tackle energy crises, environmental pollution, traffic safety issues and other problems. We are in the beginning of a railway renaissance era. Not only does high-speed rail have obvious advantages in providing the public with safer, quicker, and more convenient transport services, but it also has become a crucial economic and development driver.

The rapid construction of high-speed railways has made a significant and profound impact on China's economic and social progress. In opening new opportunities for international cooperation, it also is accelerating industrial modernization, promoting new-generation urban planning and ecologically sustainable living, bringing more harmony to society and enabling alternative land uses along the rail lines.

First, there is the benefit of accelerated economic activities and regional development. By integrating the latest scientific and technological achievements, high-speed railways offer low travel time, high density, high efficiency, high reliability, punctuality and excellent service. These attributes allow them to play a major role in speeding up economic activities, improving market efficiency and promoting manufacturing in areas such as steel, electronics, materials, communication equipment and computer integration. A brand-new commercial culture characterized by speed, punctuality and scale-to-size is developing around high-speed railways. Their construction thus boosts purchasing power and enhances demand. As high-speed rail transport belongs to tertiary industry, given its land and energy conservation, low carbon emissions and low pollution, its development will directly increase the proportion of green services in national output. At the same time, it will facilitate the development of logistics, food services, warehousing, communication, information, e-commerce and other next-generation service sectors.

High-speed rail has become an emerging strategic industry with tremendous potential. It has given birth to a range of high-tech innovative enterprises in metallurgy, machinery, precise instruments and other industries, which have gradually formed a complete industrial chain. It has altered resource circulation and distribution both in adjacent territories and in the whole economic zone it covers. Working as a so-called economic corridor, it optimizes regional economic structure, allows developed industries to enter developing regions more quickly, supports emerging and traditional businesses in various regions, and plays a key role in promoting the optimization and modernization of China's economic structure and industry.

In one example, after the Beijing-Tianjin Intercity Railway was put into operation in 2008, travel time was reduced significantly, while new investment and industrial resource allocation opportunities emerged. Economic development in Beijing and especially Tianjin have enjoyed a major boost. In the first two years after the launch, economic growth in Tianjin reached 16.5 percent, which was much higher than the growth of gross domestic product. In 2009, the annual gross regional product in the city increased by 10.1 percent over the previous year. Real estate, logistics, tourism, catering and other industries in Tianjin also developed rapidly. In 2008, retail sales grew by 25.2 percent year-on-year, and the growth was among the best in China. In 2009, total retail sales went up by 21.5 percent.

The opening of this high-speed Beijing-Tianjin line has stimulated the market for existing passenger transport on this route, relieving pressure on freight lines and improving their transport capacity. The average passenger travel time was reduced by 20 percent, or about half an hour. More generally, the high-speed line has bolstered economic and other ties between the two cities. Moreover, it has sped up the development of secondary and particularly tertiary industries in the two cities, optimizing and modernizing the industrial structure.

In the second year after the launch of this Beijing-Tianjin line, the trade volume between the cities increased 25.2 percent. Primary industrial output decreased by 1.7 percent, with employment falling by 3.3 percent. However, output grew 4.7 percent in secondary industries and 7.7 percent in tertiary industries, and employment rose by 2.4 percent and 4.2 percent, respectively.

A second set of benefits from high-speed rail are optimized flows of regional passenger and freight, as well as a shortened logistics cycle.

Due to their large volume, high density and emphasis on public transport, high-speed railways can lessen the restraints on inter-regional economic ties imposed by distance and travel time. Therefore, the separation between cities will be gradually weakened, population mobility will be increased, more options for work and entertainment will become available, and regional resources will be shared, optimizing the allocation of those resources. High-speed rail will integrate the economic activities of various regions into one unified system. Since regions with stronger economies can stimulate the development of those falling behind, infrastructure and public service facilities will often be shared among regions. Human resources, raw materials, information and other valuable assets will no longer be limited by the boundaries of exist-

ing administrative areas. This means that their regional flows will be optimized and an urban agglomeration or metropolitan economy will be formed.

In addition, implementing high-speed rail projects promotes tourism and allows both human and industrial resources to be redistributed more frequently and effectively. This can be illustrated by the so-called "one-city effect," which can be observed when a high-speed line forms an intercity "half-an-hour life circle" and a "one-hour life circle." In general, if a person's commuting time is about one hour, the daily travel circle in this model will be characterized by convenience, quickness and comfort. If the travel time is three to four hours, it is defined as a business and weekend travel circle, with travel length suitable for business trips, recreational trips on weekends, or short vacations. If the travel time is six to eight hours, then it is considered a long-distance travel circle with higher costs. That kind of trip requires a lot of planning and happens only occasionally.

At 301 kilometers long, the Shanghai-Nanjing Intercity High-Speed Railway connects six cities in the Yangtze River Delta. That area has the most intensive urban agglomeration, most advanced workforce, most robust economic growth and most dynamic development in China.

Compared with highway transportation and civil aviation, high-speed rail has an edge in terms of price, duration, punctuality and transfer options. In the year after the launch of this Shanghai-Nanjing high-speed line, it served more than 60 million passengers. During peak hours, it had a one-way passenger flow of more than 16,000 people. The line has attracted passengers within 500 kilometers, which is one more example of high-speed rail's ability to integrate areas.

The areas along the line have stepped into "the era of one-city," and local entertainment and business trips, as well as industrial structure and even people's lifestyles, have been redefined. Cooperation among regional cities has been promoted, and industrial plans have been adjusted. In addition, industrial homogenization has been abandoned for the sake of differentiation and specialization. Areas with high-speed railway stations have developed into multi-functional city centers or sub-centers, forming economic circles with strong cohesion and integration.

In addition, rail is the most environmentally friendly form of transport, with resource conservation and environmental protection as its top values, and it has distinct advantages in ensuring ecologically sustainable development and the proper development of eco-tourism.

For high-speed trains operated at 350 kilometers per hour, the energy consumption per 100 passengers is only 50 percent of that of buses and 18 percent of that of aircraft. This makes rail the leader in terms of energy efficiency. Using the construction concept of "replacing roads with bridges," 0.029 square kilometers of land are saved for each kilometer of high-speed railway constructed.

High-speed railway greatly reduces the time needed to travel across regions, as well as urban and rural areas. It also lowers transaction expenses and costs during the circulation of commodities and optimizes resource circulation and allocation, all of which regulate the market and promote economic development. Moreover, through the construction of high-speed railways, passenger and freight transport can be separated, thus increasing the freight transport capacity of existing rail lines and allowing the costs of social logistics to be cut. It is estimated that $3.3 billion in social logistics expenses is saved when the proportion of railway freight transport is increased by just 1 percentage point within the volume of social freight traffic.

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