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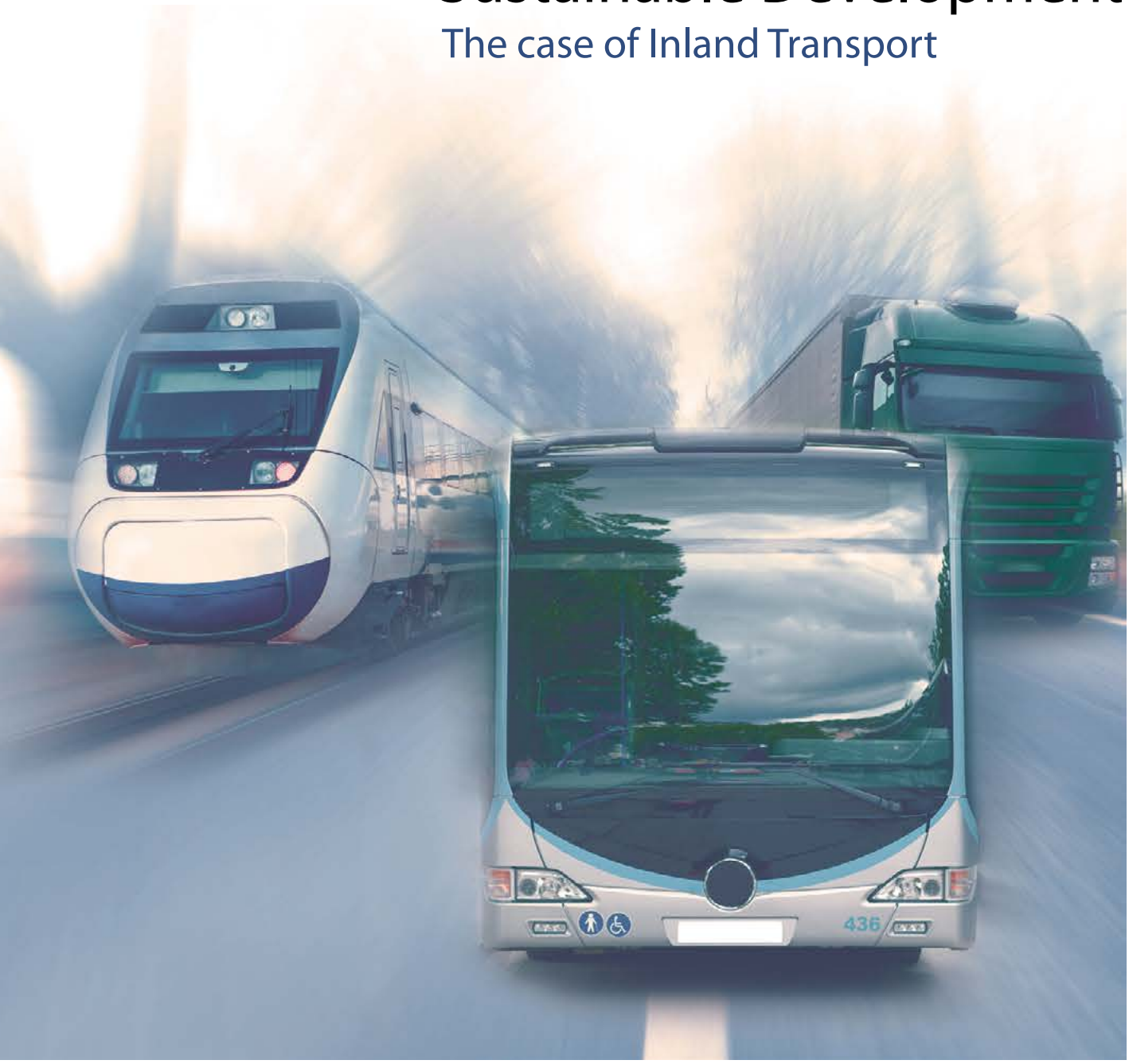
INTERNATIONAL UNION OF RAILWAYS
INTERNATIONAL ROAD TRANSPORT UNION

Transport for Sustainable Development

The case of Inland Transport



UNITED NATIONS

Transport for Sustainable Development

The case of Inland Transport

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Foreword

I commend the United Nations Economic Commission for Europe for initiating and producing this paper in cooperation with the United Nations Regional Commissions with support from the International Road Transport Union and the International Union of Railways.

This publication comes at a critical moment for the international community as leaders adopt the 2030 Agenda, our vision for sustainable development and a life of dignity for all.

The growing transport sector is an essential component of economic and social development, linking markets and facilitating trade. Transport is an important source of revenue and major employer. Success in achieving many of the Sustainable Development Goals will require affordable, efficient and environmentally sound transport systems.

At the same time, the transport sector consumes significant energy resources, generating air and noise pollution as well as greenhouse gas emissions. We need more political commitment to foster a low-carbon transport future. We also need action to reduce road crashes and other traffic accidents.

This study demonstrates that there are solutions. Our challenge is to share lessons and take action. We must generate more innovations to meet demands for mobility and transport while reducing their negative impacts.

I recommend this publication to officials in government, industry and academia as well as others interested in how to optimize transport to build a better future for all.

15 September 2015

Ban Ki-moon

Secretary-General of the United Nations

Acknowledgements

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The study was prepared by a team comprising of UN, IRU and UIC staff and other partners that contributed to the study, provided comments and delivered representative case studies. Among the major contributors and authors are Prof. A. F. Velegrakis (University of the Aegean, Greece) and Nikola Sahovic (University of Coimbra, Portugal). The authors and the team worked under the guidance of and benefited from significant contributions by Eva Molnar, Director of UNECE Sustainable Transport Division, Miodrag Pesut, Chief of Transport Facilitation and Economics Section, and George Georgiadis, Secretary of the Inland Transport Committee. For their invaluable contributions and comments, the team thanks Stephen N. Karingi and Tama R. Lisinge (UNECA), Francesco Dionori, Olivier Kervella, Victoria Ivanova, Nenad Nikolic, Walter Nissler and Christopher Smith (UNECE), Azhar Jaimurzina and Ricardo Sanchez (UNECLAC), Yuwei Li and Thanattaporn Rasamit (UNESCAP), Adel Al-Ghaberi (UNESCWA), Jens Hugel and Umberto de Pretto (IRU) and Andrea Braschi, Nicholas Craven, Jean-Pierre Loubinoux and Vincent Vu (UIC). In addition, the team would like to express gratitude to all colleagues who contributed inputs and provided advice and support during the course of preparation this publication and particularly to the editors Violet Yee and Bentley Jensen and the team assistant, Anastasia Barinova (UNECE).

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Acronym	Definition
ADB	Asian Development Bank
ADN	European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
AEGPL	European Liquefied Petroleum Gas Association
AGC	European Agreement on Main International Railway Lines
AGN	European Agreement on Main Inland Waterways of International Importance
AGR	European Agreement on Main International Traffic Arteries
AGTC	European Agreement on Important International Combined Transport Lines and Related Installations
ASEAN	Association of Southeast Asian Nations
ATP	Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be Used for such Carriage
AU	African Union
AUC	African Union Commission
CDIAC	Carbon Dioxide Information Analysis Center
CDM	Clean Development Mechanism
CECI	European Centre for International Cooperation
CEFACT	United Nations Centre for Trade Facilitation and Electronic Business
CEVNI	European Code for Inland Waterways
CNG	Compressed Natural Gas
COSIPLAN	South American Infrastructure and Planning Council
CTU Code	IMO/ILO/UNECE Code of Practice for Packing of Cargo Transport Units
DESA	(United Nations) Department of Economic and Social Affairs
DGSA	Dangerous Goods Safety Advisors
EATL	Euro-Asian Transport Links
ECA	(United Nations) Economic Commission for Africa
ECE	(United Nations) Economic Commission for Europe
ECLAC	(United Nations) Economic Commission for Latin America and the Caribbean
ECO	Economic Cooperation Organization
ECOSOC	(United Nations) Economic and Social Council
EDIFACT	(United Nations) Electronic Data Interchange for Administration, Commerce and Transport
EEA	European Environment Agency
EIA	(United States of America) Energy Information Administration

EIGA	European Industrial Gases Association
ERA	(European Union) European Railway Agency
ESCAP	(United Nations) Economic and Social Commission for Asia and the Pacific
ESCWA	(United Nations) Economic and Social Commission for Western Asia
ETS	(European Union) Emissions Trading Scheme
EU	European Union
ForFITS	For Future Inland Transport Systems
GCC	Cooperation Council for the Arab States of the Gulf
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GPL	Liquefied Petroleum Gas
GPST	Global Partnership for Sustainable Tourism
HDI	Human Development Index
HICP	Harmonized Index of Consumer Prices
ICAO	International Civil Aviation Organization
IDEP	(UNECA) African Institute for Economic Development and Planning
IEA	International Energy Agency
IIRSA	Initiative for the Integration of Regional Infrastructure in South America
ILO	International Labour Organization
IMDG (Code)	International Maritime Dangerous Goods (Code)
IMF	International Monetary Fund
IMO	International Maritime Organization
IPCC	Intergovernmental Panel on Climate Change
IRTAD	(International Transport Forum) International Traffic Safety Data and Analysis Group
IRU	International Road Transport Union
ISPS (Code)	International Ship and Port Facility Security (Code)
ITC	UNECE Inland Transport Committee
ITF	International Transport Forum
ITSAM	Integrated Transport System in the Arab Mashreq
IWGLTS	International Working Group on Land Transport Security
IWT	Inland Waterway Transport
LAIA	Latin American Integration Association
LANDSEC	(European Union) Advisory Group on Land Transport Security
LAS	League of Arab States
LDC	Least Developed Country
LLDC	Land-Locked Developing Countries
LPI	(World Banks) Logistics Performance Index
MDG	Millennium Development Goals
MERCOSUR	Southern Common Market

MFAG	Medical First-Aid Guide for Use in Accidents involving Dangerous Goods
NHTSA	(United States of America, Department of Transportation) National Highway Traffic Safety Administration
OECD	Organization for Economic Cooperation and Development
OTIF	Intergovernmental Organization for International Carriage by Rail
PEP	Transport, Health and Environment Pan-European Programme
PIDA	Programme for Infrastructure Development in Africa
RAI	Rural Access Index
RCP	Representative Concentration Pathways
RICAM	International Network of Mesoamerican Highways
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
RSSB	Rail Safety and Standards Board
SADC	Southern African Development Community
SAFE	Framework of Standards to Secure and Facilitate Global Trade
SC.1	(UNECE) Working Party on Road Transport
SC.2	(UNECE) Working Party on Rail Transport
SDG	Sustainable Development Goals
SEFA	European Syndicate on Steel Drums
SIECA	Permanent Secretariat of the General Treaty on Central American Economic Integration
SIGNI	Signs and Signals on Inland Waterways
SOLAS	International Convention for the Safety of Life at Sea
SPECA	Special Programme for the Economies of Central Asia
SRES	Special Report on Emission Scenarios
SSATP	Sub-Saharan Africa Transport Policy Programme
TAH	Trans-African Highways
TAPA	Transported Asset Protection Association
PWG-TBC	Project Working Group on Transport and Border Crossing
TEM	Trans-European North-South Motorway
TEN-T	Trans-European Transport Network
TER	Trans European Railways
TFEU	Treaty on the Functioning of the European Union
TIR	Customs Convention on the International Transport of Goods under Cover of TIR Carnets
TOD	Transit-Oriented Development
TOE	Tons of Oil Equivalent
C-TPAT	Customs-Trade Partnership Against Terrorism
TSA	(United States of America) Transportation Security Administration
UIC	International Union of Railways
UIRR	International Union of Combined Road-Rail Transport Companies

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UITP	International Association of Public Transport
UNASUR	Union of South American Nations
UNCED	United Nations Conference on Environment and Development
UNCTAD	United Nations Conference on Trade and Development
UNDA	United Nations Development Account
UNDP	United Nations Development Programme
(UN) DPI	(United Nations) Department of Public Information
UNECA	United Nations Economic Commission for Africa
UNECE	United Nations Economic Commission for Europe
UNECLAC	United Nations Economic Commission for Latin America and the Caribbean
UNEP	United Nations Environment Programme
UNESCAP	United Nations Economic and Social Commission for the Asian and the Pacific
UNESCWA	United Nations Economic and Social Commission for Western Asia
UNLK	United Nations Layout Key (for Trade Documents)
UNTDED	United Nations Trade Data Elements Directory
WCED	World Commission on Environment and Development
WCO	World Customs Organization
WHO	World Health Organization
WP.1	(UNECE) Working Party on Road Traffic Safety
WP.11	(UNECE) Working Party on the Transport of Perishable Foodstuffs
WP.29	(UNECE) World Forum for Harmonization of Vehicle Regulations
WTO	World Trade Organization

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Executive Summary

A well-functioning transport sector is an essential requirement for the economic and social development of all countries as well as for supporting regional and global cooperation and integration. Historically, development of the transport sector has been an indicator of a country's economic welfare and success. Well-developed, efficient, safe and secure inland transport systems offer important access to markets, employment, education and basic services critical to poverty alleviation; at the same time, transportation is a major driving force behind a growing world demand for energy and it has a significant environmental footprint.

Transport sustainability is shaped by socio-economic, demographic and environmental megatrends, i.e. major shifts in economic, social and environmental conditions that can impact people and transform societies. Present economic growth, which has been associated with a 'reversed' geographical fragmentation of production, has created particular transport patterns such as increasing transport volumes mostly in the non-OECD regions. At the same time, the significant changes in global population size, age structure, household size and urbanization expected in the twenty-first century may have substantial implications for inland transport, in terms of transport patterns, energy use and GreenHouse Gas (GHG) emissions. These will be further complicated by the mounting effects of climate change and inconsistency on the transport infrastructure and services.

As a cross-cutting sector, transport will play an important role in efforts towards achieving post-2015 sustainable development goals. As such, in addition to their value and job creation, inland transport systems need to be considered partly as enablers of sustainable development. Therefore, integrated approaches to policy making should be fostered, including planning for land use, infrastructure development, public transport systems and goods delivery networks, with a view to providing affordable, efficient, safe and secure transport, improving energy efficiency, and at the same time reducing pollution and congestion. In this study, the relationship between transport and social, economic and environmental sustainability worldwide is assessed by providing deeper insight into the current state of the five dimensions of sustainable transport – access (mobility of individuals and for societies), affordability (of transport for individuals and society), safety, security and environmental impact (of transport and on transport).

Accessibility - In transport, accessibility refers to the peoples' ability to reach goods, services, activities and destinations from a given location, using the available transportation system. Many factors affect accessibility, including the transport needs and abilities of individuals, quality of transport options, connectivity of the various links and modes, land-use patterns, and the quality/costs of alternative solutions. Transport accessibility has large impacts in both economic and human development, as improved accessibility to transport can facilitate the achievement of many economic, social and environmental objectives. Rural accessibility is a challenge in all regions; nearly one billion people worldwide still lack adequate access to road networks and continue to live more than two kilometres from an all-weather road. Fast urbanization, increasing congestion and insufficient access to public transportation in many areas call for a redesigning of urban mobility conditions, with an emphasis on facilitating infrastructure for more environmentally friendly modes like walking and cycling, as well as vulnerable groups such as children, persons with reduced mobility and the growing global elderly population.

International transport links are the most important facilitator of global trade and a prerequisite for economic development. Participation in global supply chains is essential for attracting foreign investment and enterprises as well as human capital. In many areas it is hampered by underdeveloped international transport links which undermine national and regional competitiveness. Foreign trade is especially important for small, land-locked and sea-locked economies, which are also dependent on hinterland and/or sea connections and border crossings. Emerging land- and sea-locked economies require particular attention, as their geography constrains trade and economic development. Inefficient border crossings reduce the efficiency of global trade, and are a particular challenge in parts of South-eastern Europe, the Caucasus, Central and East Asia, countries of the UNESCWA region and Africa.

Affordability - Transport costs money and, thus, transport accessibility is controlled by the costs (and returns) of the passenger and freight transport services as well as by the sustainability of the investments associated with upgrading, planning and construction of new transportation infrastructure. Transport affordability refers to the financial ability of people and societies to access adequate transport services without compromising their ability to purchase other basic goods and services, such as food, housing, education and health. It can be assessed from several perspectives, e.g. the level of private motorization, the costs of owning, driving and parking private vehicles as well as the quality and cost of alternative transport modes such as public transport and cycling. High income inequalities are an issue present in all regions, and low income groups, which spend a high proportion of their income on transport, are especially dependant on the availability of affordable public transport. At the same time, in the present global economic climate, national and local government capacities to offer affordable public transport are diminished by a lack of availability of public funds.

All available trends and projections relating to passenger and freight volumes suggest a strong future growth particularly in the non-OECD regions (see Chapter 2). The expected growth in freight and passenger transport will require planning and construction of new transportation infrastructure as well as the establishment of sustainable funding mechanisms for the transport sector. Efficient, safe and environmentally sustainable transport infrastructure is expensive and, despite recent improvements, transport networks in many regions still suffer from the under-investment of the previous decades. At the same time, infrastructure development is generally planned and financed within national budgets and under macro-economic constraints, and in competition with other needs such as education, health, housing or security. The 2008 financial crisis and its aftermath have increased pressures on national budgets and reduced public funding for transport infrastructure development, increasing the importance of private sector funding (as well as hybrid financing through public-private partnerships), and warranting more rigorous project feasibility assessment.

Safety -Transport related injuries are a serious social, economic and development issue. Developing countries and economies in transition bear the majority of this burden so transport fatalities and injuries are a development issue that disproportionately affects the poor in low and middle-income countries. Globally, well over a million people are killed annually in road traffic accidents causing, in addition, to human loss and suffering, billions of dollars of associated costs which amounts, in some countries, to 1-3 per cent of GDP. Underreporting and insufficient global harmonization of statistics are obstacles to improving insight into transport safety challenges — the first step in efforts to develop solutions.

Road safety depends also on driver behaviour, infrastructure quality and vehicle safety. Improvements can be achieved only by considering all these contributing factors and through adequate legislation modelled to respond to local circumstances. In order to break the cycle of increased casualties, road infrastructure safety and vehicle safety legislation, standards, traffic rules, management and programmes need to be strengthened, with special attention to vulnerable road users (motorcyclists, cyclists, pedestrians). The main precursors to railway accidents remain level crossing incidents along with high trespassing rates on railway infrastructure which leads to fatalities. Certain parts of Africa and Asia are suffering from a high rate of accidents on internal waterways involving commuters, often resulting from vessel overloading, poor construction and a lack of appropriate safety measures and their enforcement. Safety in transport of dangerous goods is a special focus area and deserves more attention as it presents severe risks for the population in general, property and the environment.

Security -The notion of transport security encompasses acts ranging from ordinary infliction of damage and everyday delinquency to highly orchestrated acts of terrorism directed towards transport systems infrastructure, passenger and freight vehicles. Due to their open areas, inland transport systems are relatively unprotected from security threats in comparison with maritime ports and airports. Transport related crime rates are high in many parts of the world, while analytical and statistical data on the phenomena needs to be strengthened in many others. A high volume of cross-border transport related crime in certain regions calls for a strengthening of international cooperation and coordination of responsive actions.

Both public and private transport systems stakeholders must, in cooperation with the relevant security services, work to establish national, regional and international frameworks that can ensure security of persons, infrastructure and freight. Economic cost of transport crime must not be overlooked and security systems in place should not interfere with the efficiency of operations and the movement of persons and freight within and across transport modes. In taking actions to guarantee such collective security, the stakeholders involved must safeguard the personal freedoms of individuals.

Environmental impact - Transport can affect or be affected by the environment in many ways and at different spatio-temporal scales. Inland transport requires infrastructure, the construction of which could involve extensive land use and, consequently, potential loss of natural habitat. Transport also requires energy. Unfortunately many of the most popular transport modes, despite energy efficiency improvements, depend on increasing amounts of non-renewable energy sources which contribute to the emission of greenhouse gases that severely affect the environment at the global level. Air pollutants from transport (nitrogen oxides, particles, carbon monoxide and hydrocarbons) reduce air quality and can have damaging (local) impacts on human health and ecosystems. Moreover, transport produces noise, which can also have significant implications for human health, particularly in urban agglomerations, and ecosystems. Keeping vehicles environmentally friendly throughout their lifetime and adjusting to a more environmentally acceptable transport modal split are key challenges today across the world.

Transport is not only a major contributor to the observed carbon emission growth and, thus, a probable contributor to climate change, but it is also a 'victim' of the effects of climate change and extreme weather events which can have a range of diverse impacts on transport infrastructure and services. These impacts will vary significantly by mode, climate change factor, and will depend on the local or regional circumstances and vulnerabilities, including those associated with the natural environment, as well as a broad range of socio-economic factors.

The way forward

Sustainable transport is safe, high-quality, and accessible to all, ecologically sound, economically viable, and a positive contributor to local, national and international sustainable development. Specific goals for sustainable transport may include: improved service quality and quality of access to goods and services, decreased transport related accident and crime rates, improved air quality, noise reduction, protection of natural habitat and open space, historic preservation, reduced local and GHG emissions, increased social equity, economic development, and a satisfying quality of life, as well as local goals consistent with the overall objective.

Economic, social and environmental sustainability can only be achieved through an integrated inland transport system. When water, road and rail transport work together, the comparative advantage of each mode can be exploited optimally. Integration of transport systems is a complex task with many dimensions. The optimal modal split of freight and passenger transport depends on countries' geographic, demographic, economic and historic conditions. Cooperation across transport modes, regions and borders as well as between public and private operators is needed.

Creating an efficient integrated transport network requires international collaboration. The United Nations Regional Commissions provide platforms for intergovernmental cooperation and address the sustainability of transport, across its five key areas — accessibility, affordability, safety, security, environmental impact — through a variety of legal instruments, analytical work and technical assistance, as well as through their governance structures. At the beginning of 2015, a total of 1,701 accessions by countries from six continents to the 58 United Nations legal instruments on transport were being serviced by UNECE. Continued and strengthened international cooperation through the United Nations Regional Commissions will be an important step in securing a future transport sector that strongly contributes to attaining sustainable development goals.


a Station
Departures
16:39 Platform —
Dartford
via Bexleyheath
Calling at: Page 1 of 1
Denmark Hill
Peckham Rye
Nunhead
Lewisham
Blackheath
Kidbrooke
Eltham
Falconwood
Welling
Bexleyheath
Barnehurst
& Dartford
Southeastern
Departures
16:40 Platform —
Orpington
Calling at: Page 1 of 1
Brixton
Herne Hill
West Dulwich
Sydenham Hill
Penge East
Kent House
Beckenham Jcn
Shortlands
Change at Orping
Southeastern
Departures
16:57 Platform —
& Dover Priory
Calling at: Page 3 of 3
Rear 4 coaches
Bromley South
Rochester
Chatham
Gillingham (Kent)
Rainham Kent
Kensington
Sittingbourne
Teynham
Faversham
Selling
Canterbury East
Ryleshan
Shepherds Hall
& Dover Priory.
Southeastern
Information
16:15:50
VICTORIA
The managers on duty:
John Hard
for Network Rail
J P Cooken
for Southern
Ken Tullet
for Southeastern
Departures
16:17 Platform 10
Horsham
via Hackbridge
Calling at: Page 2 of 2
Ockley
Warnham
& Horsham
Southern
Departures
16:17 Platform 18
& Eastbourne
Calling at: Page 3 of 3
Rear 4 coaches
Clapham Junction
East Croydon
Gatwick Airport
Haywards Heath
Hivelsfield
Lewes
Berwick
Polegate
Hampden Park
& Eastbourne
Southern
Departures
16:19 Platform 12
London Bridge
via Crystal Palace
Calling at: Page 1 of 1
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Clapham Junction
Wandsworth Common
Balham
Streatham Hill
West Norwood
Gipsy Hill
Crystal Palace
Sydenham
Forest Hill
Honor Oak Park
Brockley
New Cross Gate
& London Bridge
Change at West N
Southern
Departures
16:19 Platform 19
Horsham
via Crawley
Calling at: Page 1 of 1
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1. Sustainable Development and Transport

Sustainable development has been hindered by a widely held notion that development can be defined primarily as economic growth; this has been the framework used for many years by developed countries to achieve their current levels of wealth, and major developing economies appear set to follow a similar course. The problem with such an approach is that: (a) economic growth does not necessarily guarantee social equity and (b) natural resources are exhaustible, both in terms of quality (e.g. environmental pollution) and supply (e.g. oil/gas reserves) (Drexhage and Murphy, 2010).

1.1 Sustainable Development

The World Commission on Environment and Development (WCED) report 'Our Common Future' (1987) provides the 'classic' definition of sustainable development[1] as '*…the development which meets the needs of the present without compromising the ability of future generations to meet their own needs*' (WCED, 1987). Acceptance of the report by the United Nations General Assembly gave the term political salience and, in 1992, leaders set out the principles of sustainable development at the UN Conference on Environment and Development (UNCED) in Rio de Janeiro (Brazil), also referred to as the *Rio Summit* or the *Earth Summit*.

Sustainable development is a fluid concept (see e.g. DESA, 2013). In spite of ongoing discussions on its exact meaning, certain fundamental principles have emerged in the past decades (Drexhage and Murphy, 2010): (i) a commitment that decisions should consider equity and fairness and account for the rights of future generations; (ii) a long-term view should emphasize the precautionary principle, i.e. "*where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation*"[2] and (iii) sustainable development involves understanding and acting on the complex interconnections between its three pillars, i.e. the economy, society and the environment.

Acting on the complex interconnections between the economy, society and the environment should not be a balancing act; instead, there is an apparent need for convergence between the three pillars of sustainable development, i.e. the economic development, social equity and environmental health/sustainability; moreover, sustainable

[1] The framework for sustainable development evolved between the early seventies and the early nineties in many international conferences and initiatives. The 1972 UN Conference on the Human Environment (Stockholm) led to the establishment of the United Nation Environment Programme and numerous national environmental protection agencies. Stockholm's recommendations were further considered in the 1980 World Conservation Strategy (e.g. Talbot, 1980), a collaboration between the International Union for the Conservation of Nature (IUCN), the World Wildlife Fund (WWF), and UNEP, which aimed at prioritising conservation issues and defining key policy options. In 1983, the United Nations convened the World Commission on Environment and Development, comprised of representatives from developed and developing countries and chaired by then Norwegian Prime Minister Gro Harlem Brundtland, to address growing concerns over the '*accelerating deterioration of the human environment and natural resources and the consequences of that deterioration for economic and social development*'; in 1987, the Commission produced its landmark report '*Our Common Future*', also known as '*the Brundtland report*', see www.un-documents.net/our-common-future.pdf.

[2] Principle 15 of the Rio Declaration on Environment and Development (Annex I), of the United Nations Conference on Environment and Development (Rio de Janeiro, 1992) www.un.org/documents/ga/conf151/aconf15126-1annex1.htm.

development should aim at inter- and intra-generational distributional justice, i.e. should aim at the well-being of both the current and future generations of the global population in its entirety.

Presently, all three sustainable development pillars (economic, social and environmental) face great challenges: more than one billion people still live in extreme poverty, income inequality within and among many countries has been rising and unsustainable consumption/production patterns have resulted in increasing environmental degradation and dwindling natural resources.

1.2 Sustainable Transport

Transport is essential for the economic and social development of all countries as well as for supporting regional and global cooperation and economies. Historically, the development of a country's transport sector has been an indicator of its economic welfare and success. The direct value added by the transport sector to global GDP is about 3-5 per cent, and transport typically provides 5-8 per cent of average national total paid employment.

Between 1950 and 1990, the number of motorized vehicles in the world grew by roughly nine times, from about 75 million to 675 million. During the same period, the world population doubled, from about 2.55 billion to near 5.25 billion. The United Nations Department of Economic and Social Affairs (DESA) estimates that the global population will increase by more than 2.5 billion during the next 35 years reaching over 9.5 billion inhabitants in 2050. Population growth, coupled with continuing globalization and trade liberalization, is expected to accelerate the demand for transportation of both people and goods. The ever-increasing movement of people and goods has resulted in transport becoming instrumental to many economic and social functions and, thus, one of the controls of sustainable development.

Principles of development (increasing well-being and equity) as well as sustainability (preserving natural and man-made capital) should be inherent in sustainable transport policies and manifested in transport trends (Gudmundsson and Höjer, 1996). Adequate, efficient, and effective transport systems are important for access to markets, employment, education and basic services critical to poverty alleviation; at the same time, transportation is expected to be a major driving force behind a growing world demand for energy and it has a significant environmental footprint. Therefore, integrated approaches to policymaking should be promoted, including policies/planning for land use, infrastructure development, public transport systems and goods delivery networks, with a view to providing affordable, efficient and safe transportation, increasing energy efficiency, and reducing pollution and congestion effects.[3]

In recent extensive consultations with decision makers[4], different international organisations and industry associations have highlighted some of the current challenges associated with sustainable transport.

[3] See also: http://sustainabledevelopment.un.org/index.php?menu=238

[4] Consultation of Decision-Makers on Implementing Sustainable Transport New York City, USA, September 26th 2013 attended by 67 participants from all regions. Organized by DESA, Ford Foundation, FIA Foundation and UN-Habitat. See also http://sustainabledevelopment.un.org/index.php?menu=1569.

The International Energy Agency (IEA) provided an evaluation of future energy requirements under different development scenarios, based on a mobility model. It found that a lot of action would be required by the transport sector in order to remain within the +2 °C temperature increase scenario, including a so-called 'avoid, shift and improve' approach. [5]

The United Nation Economic Commission for Europe (UNECE) has suggested that transport is instrumental for poverty eradication. According to UNECE, there are five key dimensions of sustainable transport: (i) access – integrating countries in a broader market to eradicate poverty; (ii) affordability; (iii) safety, (vi) security and (v) environmental aspects.

The United Nations Environment Programme (UNEP) has suggested that there are five key areas of intervention, involving: (i) road safety - infrastructure; (ii) public transportation - mass transit; (iii) air quality - link to health issues; (iv) fuel consumption - link to energy and (v) new technologies. The World Bank has focussed on the significance of improving accessibility to transport services in rural areas, which will offer greater potential for economic growth, market access/consolidation, opening up of small businesses and employment and, thus, for poverty alleviation.

UN-Habitat stressed the importance of urban mobility and linking cities and urban areas in the twenty-first century, considering a mixed-use environment approach by integrating land-use and non-motorizing infrastructure.

The United Nations Economic Commission for Latin America and the Caribbean (UNECLAC) analysed the role of the transport sector in the progress towards the Millennium Development Goals (MDG), highlighting the high impact of the sector's performance for achieving most MDGs. It underlined the fundamental role of the public transport policies in reducing the increasing externalities of economic growth and in making sure that the saving and benefits from better transport services effectively contribute to reducing social and economic inequality, which remains a major challenge in the UNECLAC region (UNECLAC, 2012).

The International Road Transport Union (IRU) has suggested that buses/coaches and taxis should be placed at the centre of the transport policymaking debate, in order to double their use and achieve sustainable mobility for all.

The Asian Development Bank (ADB) has predicted that increasing demand for private motorisation in South-East Asia will exacerbate traffic congestion and air pollution, contribute to climate change and reduce road safety in this region. ADB discussed its 'Sustainable Transport Initiative', which involves the establishment of a Multilateral Development Bank working group on sustainable transport, initiation of innovative sustainable transport projects and capacity-building for sustainable transport.

Finally, UNECE has developed a new initiative to support the efforts of member States to promote sustainable housing and land management, in order to achieve green, inclusive, compact and resilient cities, which are regarded as prerequisite to sustainable transport in the urban environment. [6]

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[5] See also www.unep.org/transport/about.asp

[6] See http://sustainabledevelopment.un.org/index.php?page=view&type=1006&menu=1510&nr=2603

1.3 Assessing Sustainable Development

Each transportation system is unique, with its complexity derived from the pluralism of its hardware (infrastructure and vehicles) and of the people and organizations involved. The complexity is multiplied by the existence/roles of the different transport modes, the various regulatory and legislative bodies, service providers, builders, financing systems, technologies, land-use patterns, and, most importantly, human behaviour. Therefore, no single measurement of sustainable development allows an evaluation of the current state and progress of sustainability of transport.

Transport sustainability is linked to many factors (e.g. DESA, 2013) making it necessary to establish a set of indicators to determine the current situation and trends. It is theoretically optimal to define these indicators based on the capital approach, i.e. of the sustainability of the total capital base of global society (UNECE, 2012). This capital base can be defined as consisting of three types of capital[7], frequently referred to as the 'triple bottom line' of transport sustainability (Richardson, 2005):

- Social capital, which refers to "the institutions, relationships and norms that shape the quality and quantity of a society's social interactions" (World Bank, 2011). Transport connects people and provides access to basic social services; it is therefore a necessary condition for social sustainability.
- Economic capital refers to (tangible and intangible) financial capital. Transport provides access, connects people and business and is therefore essential for economic sustainability.
- Environmental capital refers to the natural capital, including stocks of natural resources, land and ecosystems. Transportation affects environmental capital negatively through pollution, Greenhouse Gas (GHG) emissions, energy use, waste generation and loss of natural habitat. Mitigation of these impacts is crucial for transport sustainability.

The economic, social and environmental pillars of sustainability are closely linked and a single policy distinction between these pillars is neither possible nor beneficial. In fact, the close linkage between all aspects of sustainability and efficiency, once understood and acknowledged, encourages the private sector to set sustainability goals in order to meet external demands coming from a growing number of concerned stakeholders. [8] Evaluation of the current state and future challenges involving the sustainability of transport should be made on the basis of trends/projections in transport accessibility, affordability, safety and security, environmental impacts, as well as the presence/promotion of integrated transport (e.g. intermodality).

Transport accessibility can be measured against, for example, infrastructure density and quality. At the same time, international transport links play an important role in the economic development of regions. The flow/volume of international freight transport and border-crossing efficiency can provide an assessment of the performance of the transport system with respect to international accessibility. Mobility is an important factor for social and economic inclusion. Access to the most basic goods and services requires mobility; an affordable transport system is thus a prerequisite to social and economic development. Individual affordability can be evaluated by, for example, the share of transport expenditure

[7] Typically, five to six types of capital are used: financial capital, produced capital, natural capital, human capital and social capital. In the present report, these types have been aggregated into the three pillars of sustainable development: social, economic and environmental (see also UNECE, 2012).

[8] Wilmsmeier G., et al, "Efficiency — key ingredient towards sustainable supply chains", ELCAC FAL Bulletin No. 331, Number 3 / 2014.

relative to the total household income/consumption and/or the development of transport pricing. Transport systems should be also affordable for societies; therefore, public expenditure in a sustainable form as well as alternative funding options should be also evaluated.

Traffic accidents (fatalities or injuries) lead to substantial social and economic losses for families and society. In order to evaluate transport safety, particularly in the road sector, the current situation, trends and controlling factors (e.g. speeding and drink-driving) of traffic accidents should be assessed. Finally, transportation negatively affects the environment through the consumption of non-renewable fuels, local and GHG emissions, noise and ecosystem degradation. At the same time, transport infrastructure and services are impacted by the environmental conditions and their variability.

Table 1.1 summarises the relation between the three pillars of sustainable development, the key issues and particular performance indicators. The following chapters that focus on individual dimensions of sustainable transport, as defined above, contain overviews of indicators listed in table 1.1, i.e. the current regional and global situations across those dimensions, the challenges facing transport policymakers and selected best practices contributing to achieving more sustainable inland transport of passengers and freight.

Table 1.1 Transport for Sustainable Development: Transport themes, 3 pillars of sustainable development and general and specific performance indicators

	Access	Affordability	Safety	Security	Environment
Impact on capital	***Economic capital:*** Access to markets and employment ***Social capital:*** Access to basic social services	***Economic capital:*** Affordable access to employment and education opportunities. Long-term economically sustainable investments ***Social capital:*** Affordable access to basic social services	***Social capital:*** Safe transport for individuals and increase of human and cultural capital safety ***Economic capital:*** Safe transport to avoid costs of traffic accidents	***Social capital:*** Secure transport for individuals and increase of human and cultural capital security ***Economic capital:*** Secure transport to avoid losses in infrastructure, goods and human capital	***Natural capital:*** Transport that is sustainable with respect to energy use, emissions and land use to maintain the natural capital of the world
Indicators	***Indicator 1:*** Infrastructure density ***Indicator 2:*** Infrastructure quality ***Indicator 3:*** International transport *Indicator 4:* Burden of border crossing	***Indicator 1:*** Household transport spending ***Indicator 2:*** Price of transport ***Indicator 3:*** Transport Public investment ***Indicator 4:*** Transport Private investment	***Indicator 1:*** Road fatalities ***Indicator 2:*** Seat-belt use, impaired driving and speeding ***Indicator 3:*** Active level crossings	***Indicator 1:*** Terror threats ***Indicator 2:*** Criminal activities	***Indicator 1:*** Transport Energy consumption ***Indicator 2:*** Emission of greenhouse gases and local pollutants ***Indicator 3:*** Local pollutants from transport ***Indicator 4:*** Noise from transport
Sustainability targets	*Infrastructure density linked to social development performance* *Minimize population share without access to all-season transport road/rail* *Strategic international links especially for landlocked countries* *Efficient border crossings*	*Affordable for all incomes* *Long-term investment plans* *Thorough pre-investment analysis*	*Minimize road fatalities and injuries* *Minimize rail and IWT fatalities and injuries* *Minimize accidents involving dangerous goods*	*Prevent terrorist threat/attacks* *Prevent criminal activities*	*Reduce dependency on non-renewable energy sources* *Minimize greenhouse gas and pollutant emissions* *Minimize noise from transport* *Minimize waste from transport and improve recycling*

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2. General Trends Controlling Transport Growth and Demand

Transport sustainability is controlled by socio-economic, demographic and environmental megatrends, i.e. major shifts in economic, social and environmental conditions that can impact people at all levels and transform societies. In recent decades, large sections of the global society have benefited from market access and the dissemination of knowledge and technology, but others remain marginalized. Stronger trade and investment links have augmented global interdependence, but also increased the contagion risks from a financial crisis. Disparate population and economic growth dynamics have resulted in greater income inequalities, whereas environmental degradation has worsened due to non-sustainable production and consumption patterns. At the same time, long term climatic changes and extreme weather events (SREX, 2012; IPCC, 2013) can result in large transport infrastructure damages and costs (UNECE, 2013), and undermine efforts to achieve sustainable development.

This chapter will provide an overview of global and regional economic development, as well as social, demographic and environmental trends, and describe their implications for the future development of the inland transport sector in accordance with the principles and requirements for achieving sustainable development of society.

2.1 Economic Development

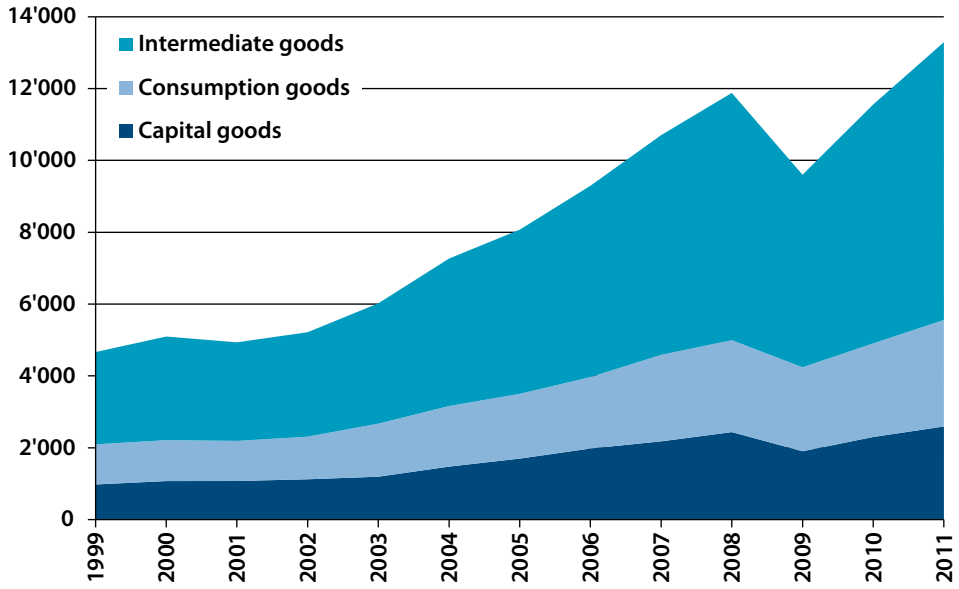
2.1.1 Global Trends

Globalization was accelerated in the nineteenth century, when technological progress in the transportation sector cut the cost of transportation and drove a sustained trade expansion of about 4 per cent annually throughout the century (DESA, 2013). The latest globalization boom has been, however, qualitatively different, as underlying global production patterns have fundamentally changed through the rise of transnational corporations and globalized transport chains. Assembly-oriented export production, mostly concentrated in the industrialising East Asian economies, has introduced a 'reversed' geographical fragmentation of production, creating at the same time further requirements for efficient global transport networks.

It is interesting to note that, in the past decades, trade has grown at much faster rates than those of the World GDP (United Nations, 2010). There is, however, a structural regional diversity in trade growth. Growth in production of manufactured goods has been mostly limited to Asia, whereas in Africa and, to a lesser extent, in Latin America trade growth has been dominated by increases in commodity exports and/or imports of manufactured and capital goods (Erten and Ocampo, 2012). At the same time, foreign direct investment has been growing faster than world trade, reaching 1.5 trillion United States dollars in 2011 (UNCTAD, 2012). Trade flows have recovered from their 2008–2009 collapse (Figure 2.1), but growth is projected to remain slower than that prevailing before the 2008–2009 crisis, at least for some years (United Nations, 2013).

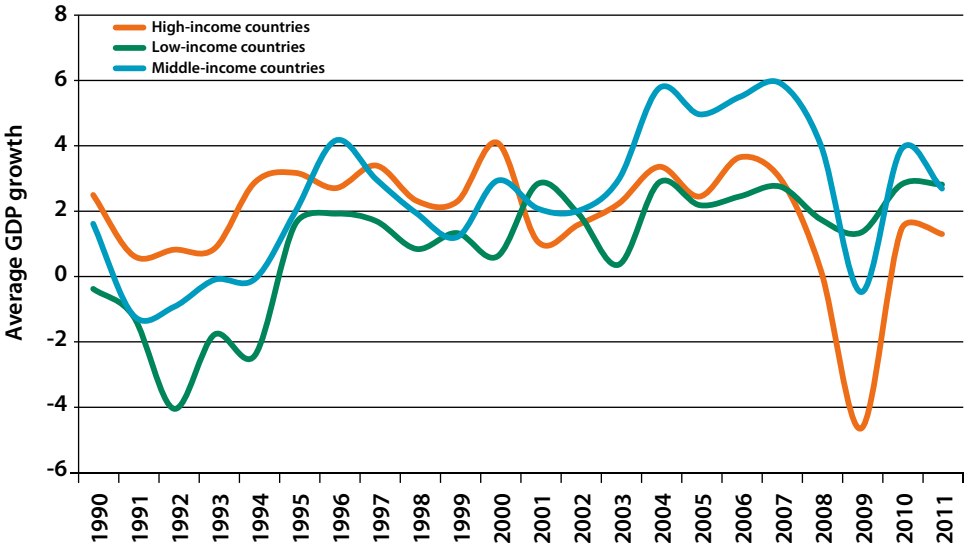
In recent years, economic growth has been consistently higher in the low- and middle-income economies than in the developed countries (Figures 2.2 and 2.3). Nevertheless, average per capita growth may hide increasing income inequalities (Dervis, 2012) that undermine prospects for sustainable development (Berg and Ostry, 2011), threaten economic stability (Stiglitz, 2012), impact on transportation patterns (e.g. Lau, 2011) and, ultimately, affect the sustainability of the transport sector.

Figure 2.1 Trends in non-fuel exports in the 1998–2011 period (in billions of United States dollars)



Source: DESA, 2013

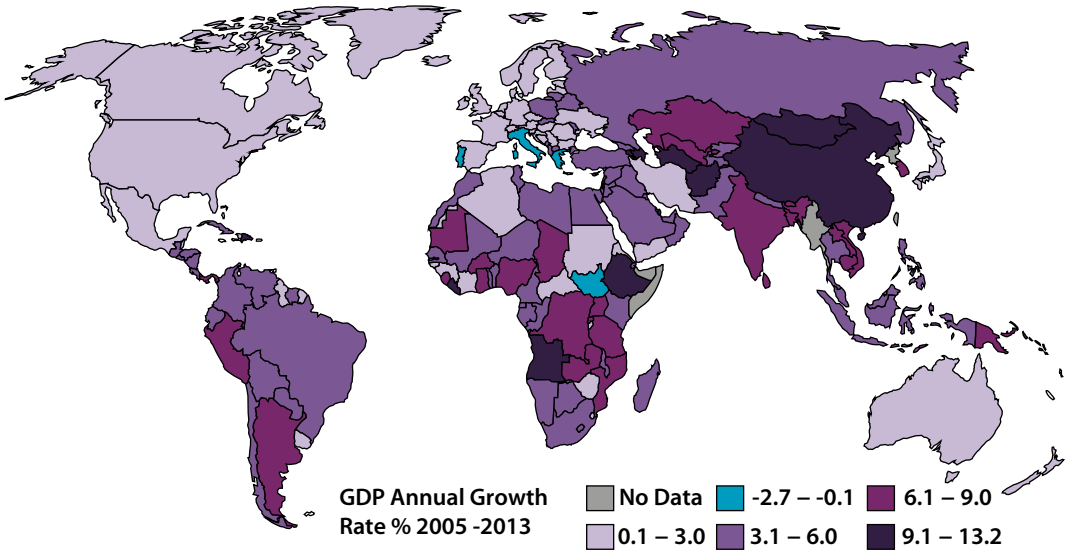
Figure 2.2 Trends in annual GDP growth in high, low and middle-income countriesSource: DESA, 2013



Source: DESA, 2013

In addition, the outsourcing/offshoring of jobs requiring mid-level skills that have been facilitated by changes in global production patterns and improved transport sector efficiency can affect considerably labour markets (Abel and Deitz, 2012). At the same time, continued growth in emerging economies can be a growth engine for the world economy, providing also opportunities for other developing countries; nevertheless, the gravity shift to China and India (the major drivers of this process) can also change the character of end markets and pose new challenges for economic development. Globalization may also increase the cyclical interdependence of national economies making them more vulnerable to external shocks. Changes in consumer demand in end-markets are likely to be transmitted in real time to producers, with large implications for economic growth, employment and the transport sector (Cattaneo et al., 2010; Keane, 2012).

Figure 2.3 Average annual GDP growth rate at constant 2005 prices for the period 2005–2013



Source: World Bank

Passenger and freight flow trends as well as transport infrastructure development are controlled by economic growth and its spatial distribution, as well as demographics and environmental policies. It is expected that transport volumes are likely to grow strongly in non-OECD regions, although there are certain challenges that may affect their growth, such as the availability of sustainable funding mechanisms for the development of sustainable capacities.

2.1.2. Regional trends

Western European and Nordic countries, Canada, Mexico and the United States of America have had an annual low/moderate economic growth (1–2 per cent on average) in the years after 2005. In comparison, economic growth has been higher in Eastern Europe, Asia, most African countries and certain Latin American countries (Figure 2.3), forcing a narrowing of the gap between the per capita income of the poorest and the richest countries. For example, the 2005 per capita income in Tajikistan was 92 times lower than that of the United States of America, but by 2011 this difference had been reduced to about 40 times (UNECE, 2012).

This section contains a brief overview of GDP, and the evolution of unemployment and rail and road freight transport volume in the member States of the five United Nations regional commissions. Table A2 in annex II to this report provides a more detailed basis for correlation analysis relevant to sustainable transport.

UNECA region (excluding UNESCWA member States)

Africa has benefited from unprecedented growth while a large part of its population remains trapped in economic poverty, facing rampant unemployment and inequality. The continent has averaged 5 per cent annual growth over the last decade, with some countries returning more than 7 per cent. Leading the growth were Equatorial Guinea, Liberia, Angola and Chad, with 10 per cent average annual growth between 2002 and 2012, while the most lagging behind country during that period was Zimbabwe, losing over a fifth of the value of its economy. Underpinning this growth were relatively high commodity prices, increased domestic demand (due especially to increased private investment in infrastructure and energy) and improved economic governance and management (UNECA and AU, 2014).

In most UNECA member States, according to International Labour Organization (ILO) estimates, unemployment has been steady during the past decade, regardless of the actual rate. In 2012, thirty-nine African countries had unemployment rates at lower than 10 per cent, while only six were below 5 per cent. South Africa has suffered consistently high unemployment at 25 per cent during much of the past decade, while Algeria showed the most progress, cutting unemployment from 29.8 per cent in 2000 to 9.8 per cent in 2012. The global unemployment rate in the continent was estimated at 6.0 per cent in 2013, and unemployment numbers are set to rise from 202 million in 2013 to 205 million in 2014 (UNECA, 2014).

Most of Africa's railway lines and roads are in bad condition and need huge investments, while the proportion of paved roads on the continent today is five times less than those in developed countries. As a result, transport costs alone are 63 per cent higher in Africa than in developed countries, hampering its competitiveness in the international and local markets (UNDPI, 2014). Algeria is the only country from the UNECA region with available road freight transport statistics[9], while data on rail freight transport is available for only a dozen or so countries.[10] In most of the countries for which data is available, there is a clear dip in rail freight transport volume between 2008 and 2010, as in the UNECE case, as a result of the economic crisis.

UNECE Region

In the UNECE region, growth and development in recent years has been diverse. Although the GDP of all member States was seriously affected by the 2008–2009 financial crisis, the long-lasting economic growth and unemployment repercussions have been concentrated only in some of the member States (Figure 2.4). In 1995, more than one quarter of UNECE member States (for which data are available) had double-digit unemployment rates. This number peaked in 1999, when nearly half of these countries had an unemployment rate above 10 per cent.

Following the rapid economic growth at the beginning of the twenty-first century, only seven UNECE member States had double-digit unemployment rates in 2007. The

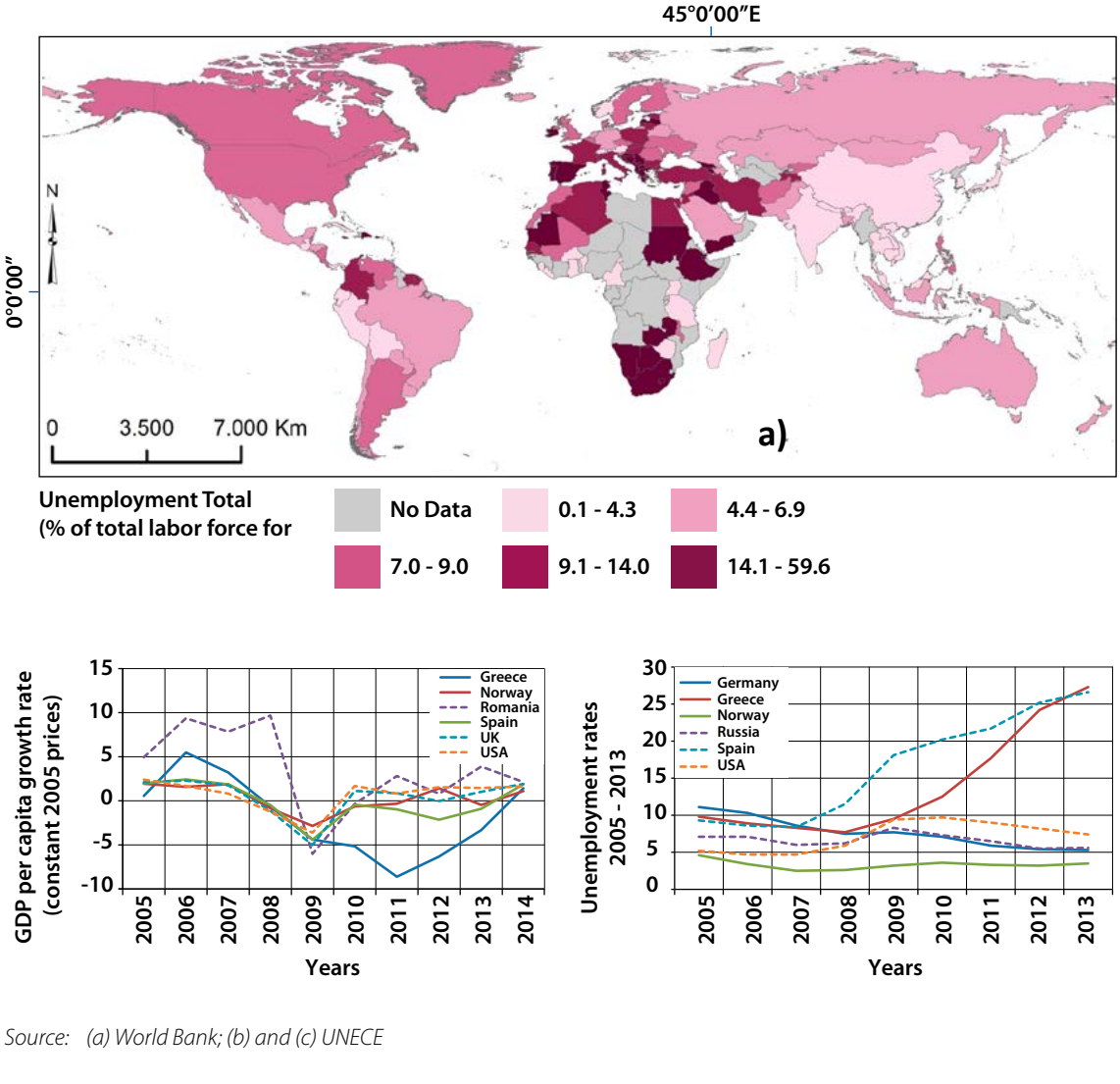
[9] http://data.worldbank.org/indicator/IS.ROD.GOOD.MT.K6

[10] http://data.worldbank.org/indicator/IS.RRS.GOOD.MT.K6

2008–2009 global financial crises resulted in a return to the 1995 levels, with about one-third of UNECE member States exhibiting unemployment rates of more than 10 per cent. In 2009, only nine UNECE States for which data was available had unemployment rates below 6 per cent, with the unemployment rate in Norway being 3.2 per cent. The former Yugoslav Republic of Macedonia showed the highest unemployment rate (32.2 per cent), followed by Bosnia and Herzegovina (24.1 per cent). In Estonia, Latvia and Lithuania unemployment rates more than doubled in 2008–2009 whereas, over the same period, unemployment in the United States of America increased from 5.8 per cent in 2008 to 9.3 per cent in 2009 (see also UNECE, 2012).

In the following years (2009–2012), only 13 of the 43 UNECE member States (for which data have been available) achieved unemployment rates below 6 per cent. The southern European countries showed devastating increases in their unemployment rates: Spain had its unemployment rate soar from 18 to 25 per cent, Greece from 9.5 to 24.3 per cent, Portugal from 10.6 to 15.9 per cent, and Cyprus from 5.4 to 11.9 per cent.

Figure 2.4 (a) Unemployment rates in the world for 2012
(b) Economic growth rates (at constant 2005 prices) in selected UNECE member States
(c) Unemployment rates for the month of May (2006–2013) in selected UNECE member States

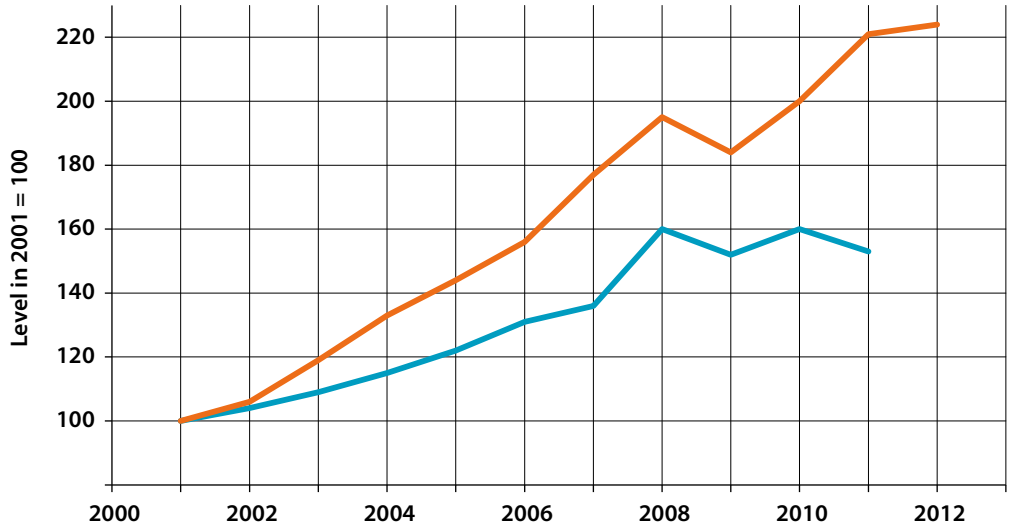


Source: (a) World Bank; (b) and (c) UNECE

In comparison, the unemployment rate in Germany has been steadily decreasing from 7.8 per cent in 2009 to about 5.5 per cent in 2012, making Germany the country with the eighth lowest unemployment rate in the UNECE region (after Norway, Switzerland, Austria, Luxemburg, Kazakhstan, the Netherlands and Azerbaijan). This, as well as Figure 2.4, shows that there is a large diversity in the unemployment rates of the UNECE region.

Inland freight transport increased considerably in the UNECE region between 2000 and 2007, with eastern and south-eastern European member States showing increasing demand for freight transport (UNECE, 2012). Following a sharp decline in 2009 due to the 2008–2009 crisis, inland transport freight recovered and continued its increasing trends. The available data on the relationship between economic growth and inland transport indicates a relative 'decoupling' since 2000 (Figure 2.5); this may reflect control by other factors such as demographics, income distribution, the global distribution of industrial production and the patterns of transportation — most of which have gone through major changes in recent years (see also Chapter 8.1.1).

Figure 2.5 Inland freight transport excluding inland waterways transport (blue line) and nominal GDP growth (red line) trends



Source: *World Bank* [11]
Note: *The volume of goods transported by railway and road vehicles in metric tons multiplied by km travelled.*

UNECLAC region (excluding UNECE and UNESCAP member States)

The 2008–2009 economic crises strongly affected the UNECLAC region, with 20 regional countries experiencing recession in 2009. While the majority bounced back in 2010 and 2011, eight countries were still in recession in 2010, including Haiti, which did not find itself in economic downturn due to the global crisis, but as a result of the devastating 2010 earthquake. Nevertheless, average GDP growth rates for the previous decade were positive for several countries, with Panama (7.43 per cent) and the Dominican Republic (5.46 per cent) leading the way in Central America, Peru (6.23 per cent), Columbia (4.53 per cent) and Argentina (4.35 per cent), after its recovery from national recession in the early 2000s; showing strong growth in South America, while Trinidad and Tobago (4.89 per cent) and Cuba (5.22 per cent) growth stood out in the Caribbean region.[12]

[11] For goods transported by railway: *http://data.worldbank.org/indicator/IS.RRS.GOOD.MT.K6* and for goods transported by road *http://data.worldbank.org/indicator/IS.ROD.GOOD.MT.K6*

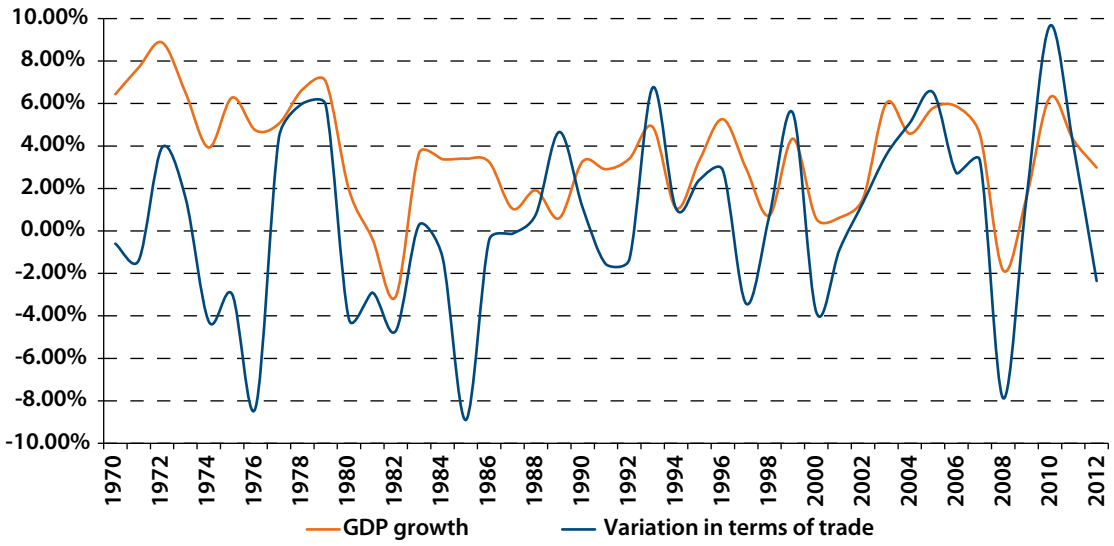
[12] http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG

Following an initial surge, economic growth in Latin America and the Caribbean has been slowing since 2011, and the data available for the first six months of 2014 indicate that the region will not match the growth rate of 2.5 per cent recorded in 2013. A regional growth rate of 2.2 per cent was forecasted for 2014 (UNECLAC, 2014a[13]).

Despite the periods of sustainable growth for a number of countries in the first decade of the 2000s, the overall growth performance of the UNECLAC region in the past thirty years has not been so encouraging. The region performed poorly in the three decades between 1980 and 2012, at least from the perspective of much of the Latin American and Caribbean population. The average annual gain in per capita GDP during these 32 years has been less than 2 per cent for 91.7 per cent of the population, and less than 1 per cent for 32.0 per cent. For a large number of countries, economic growth was insufficient to produce convergence with the per capita GDP of developed countries. Very importantly, income distribution in the region continues to be highly unequal. In Latin America, the richest 10 per cent of the population capture 32 per cent of total income, while the poorest 40 per cent receives only 15 per cent. Inequality levels are lower in the Caribbean.

Growth in Latin America and the Caribbean in the past three decades shows the heavy influence of external conditions. Long periods of limited access to external financial resources, crises in large economies in the region and beyond, and negative turns of events in export markets leading to terms-of-trade deterioration, have almost always slowed growth and, in certain instances, have led output to fall outright. Although the region showed significant resilience during the global financial crisis, thanks to its capacity to implement countercyclical policies and rapidly regain access to international financial markets, external variability continued to slow down its growth (UNECLAC, 2013).

Figure 2.6 Latin America and the Caribbean: GDP growth and terms of trade[14], 1970–2012 (percentage)



Source: UNECLAC, 2013

[13] Available from www.cepal.org/publicaciones/xml/1/53391/EconomicSurvey2014.pdf (accessed May 2015)

[14] The relative price of exports in terms of imports and is defined as the ratio of export prices to import prices. It can be interpreted as the amount of import goods an economy can purchase per unit of export goods.

A number of countries in the region are experiencing high unemployment rates, with Guyana having the highest levels during the past decade, surpassing 20 per cent. Six other South American and Caribbean countries have maintained unemployment levels higher than 10 per cent over the same period. Argentina has bounced back from an unemployment rate high of 18.3 per cent in 2001 to 7.2 per cent in 2012. Panama, Trinidad and Tobago, Venezuela (Bolivarian Republic of) and Belize have significantly reduced unemployment levels when compared to 2002, while eight regional countries currently have unemployment rates lower than 5 per cent of the total labour force.[15]

Intraregional trade statistics indicate that in 2010, 34.6 per cent of volume (metric tons) was moved by road transport, 1.3 per cent by rail, while river and lake transport accounted for 1 per cent of the total annual trade volume. In terms of value, road transport accounted for 41.8 per cent, rail 0.7 per cent, and river and lake transport for 0.42 per cent of the total value of traded goods. Maritime transport is by far the most dominant mode, representing more than 60 per cent of the volume and almost 50 per cent of the value of traded goods. Available data indicates that in most countries the volumes of rail and road freight transport have been increasing in the past decade. Since 2002 levels, Brazil, Chile and Mexico have increased rail freight volumes by 43 per cent, 22 per cent and 21 per cent respectively, while Argentina has experienced a slight decline of 4 per cent in 2009 compared to 2008 levels, but has since been increasing rail freight transport volumes. In Colombia, freight transport volumes were increasing until 2009 but have since dropped.

UNESCAP region (excluding UNECE member States)

Countries in the Asia and the Pacific region face a challenging task of sustaining growth and productive and decent employment in a complex and uncertain global economic situation. Prolonged recession in the developed world and slowdown in major emerging market economies further hampered export prospects (UNESCAP, 2014a). The economic crisis induced a slowdown in growth in most countries in the UNESCAP region including China and India, where growth rates in 2008 dropped by 5 per cent compared to the precious year, while Iran (Islamic Republic of), Japan, Thailand and a number of pacific island states experienced recession in 2008–2009.

The average growth rate of the developing economies of Asia and the Pacific is forecasted to rise moderately in 2014 to 5.8 per cent from 5.6 per cent in 2013. In line with the diversity of the region, economic growth momentum in 2014 will likely be varied across subregions. In South and South-West Asia, the forecast is for a significant increase in growth, to 4.7 from 3.9 per cent in 2013. Pacific island developing economies are also forecast to record a notable increase in growth, to 4.9 from 4 per cent in 2013, while East and North-East Asia is forecast to post stable growth in 2014 and growth in South-East Asia is projected to record 4.6 per cent (UNESCAP, 2014b).

The average regional unemployment rate between 2002 and 2012 was 5 per cent. Much like in the UNECA region, according to ILO estimates[16] unemployment has been stable in the past decade in UNESCAP member States, with 18 States recording average annual unemployment below 5 per cent between 2002 and 2012. On the other hand, the Islamic Republic of Iran and the Maldives have consistently been exposed to unemployment rates greater than 10 per cent during the same period. Indonesia and the Philippines had, by

[15] http://data.worldbank.org/indicator/SL.UEM.TOTL.ZS

[16] http://data.worldbank.org/indicator/SL.UEM.TOTL.ZS

2012, succeeded in reducing their record unemployment registered during the decade by 41 per cent, reaching levels of 6.6 per cent and 7 per cent respectively.

Available statistics show that the volume of road and rail freight transport has experienced growth at the UNESCAP regional level since the early 2000s. While a number of countries Bangladesh (-9 per cent), Japan (-9 per cent), the Republic of Korea (-8) and Thailand (-27 per cent) registered freight volume declines in rail transport during the period; the highest increases in rail freight volume transport for the 2002–2012 period were reported by Malaysia (239 per cent), Mongolia (166 per cent), Viet Nam (108 per cent) and India (105 per cent). China's rapid expansion of road infrastructure was followed in step by high inter-annual increases in road freight transport volumes, totalling more than 738 per cent in 2011 compared to 2001 levels, reaching 5,137,474 million-ton kilometres of transported goods. Significant volume increases were registered in Australia (47 per cent) and Viet Nam (193 per cent), while Japan was hard hit by the effects of the economic crisis in this area (and possibly the aftermath of the devastating tsunami of 2010) with road freight transport volumes in 2010 reduced by 25 per cent compared to 2009 levels (Wilmsmeier and Guidry, 2013).

UNESCWA region

The strong growth in the 2002–2012 decade in the Gulf region was driven by Kuwait, Jordan and Saudi Arabia, all registering an average of above 5 per cent for the period, while similar data for the period is registered in Egypt, Morocco and Tunisia with 4.5 per cent average growth rates. Qatar had the highest average GDP growth rate in the region during this period with an average annual growth of 12.83 per cent, however since a peak of 26.17 per cent in 2006 the growth rate has decreased to 2.56 per cent in 2012. Although the global financial crisis affected UNESCWA member countries and resulted in various degrees of decline in GDP growth rates between 2008 and 2011, due to high oil prices, growth in the region during the period was above the global average.

Table 2.1 GDP growth – global and UNESCWA averages, 2008–2011 [17]

	2008	2009	2010	2011
UNESCWA	6.4	2.0	4.5	4.7
World	1.6	-2.0	3.6	3.1

Source: UNESCWA

Economic growth in the UNESCWA region slowed down in 2013 compared to 2012, mainly because of the moderate oil revenue growth of major oil-exporting countries, namely Gulf Cooperation Council states. In 2013, the average growth rate in GDP in real terms was estimated to be 3.0 per cent for the Arab region, compared to 7.7 per cent in 2012. This fluctuation, also observed in 2011, is for the most part the result of highly fluctuating economic performance statistics in post-conflict Libya. The average regional GDP growth rate without the influence of the Libyan economy stood at 4.1 per cent in 2012 and 3.2 per cent in 2013. The crisis in the Syrian Arab Republic continues to have negative spillover effects on neighbouring countries, particularly with regards to subdued cross-border economic activities, including trade, investment and tourism (UNESCWA, 2014).

Only four countries in the UNESCWA region—Kuwait, Qatar, Saudi Arabia and the United Arab Emirates—have kept unemployment rates consistently lower than 6 per cent, with Qatar maintaining an average of 0.69 per cent unemployment over the 2002–2012 period.

[17] http://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG

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On the other hand, a number of countries have struggled with high unemployment during the same period, seven of which had an average rate of over 10 per cent, with Iraq and Yemen being the hardest hit with average rates of 18.62 per cent and 15.66 per cent during the period. There does not seem to be any correlation in regional unemployment with the global economic crisis of 2008–2009, as the majority of countries demonstrate stable unemployment rates, regardless if they are low, moderate or high.

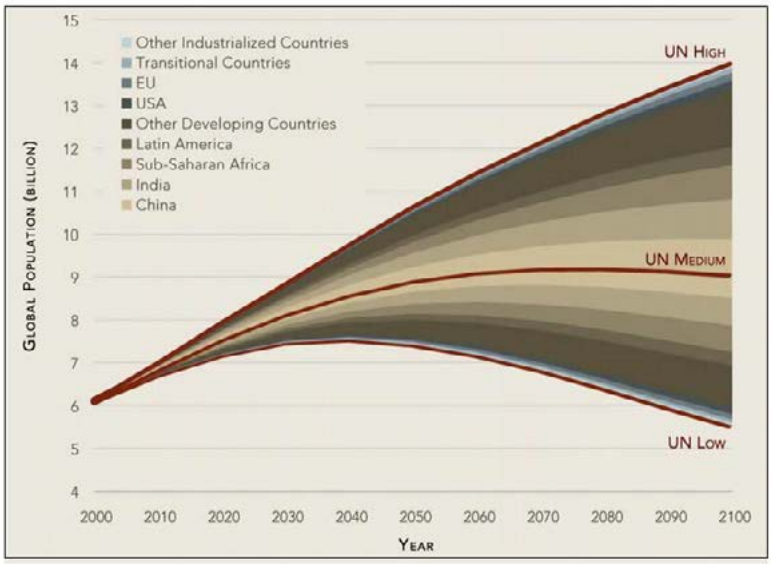
Road transport in Arab countries accounts for more than 80 per cent of the total transportation of passengers and freight. There are very limited statistics describing the volume of road freight transport in the region, and are to an extent available only for Morocco and Tunisia. Railway transport systems are available in a limited number of Arab countries, especially in Egypt, Iraq, Saudi Arabia, the Sudan and the Syrian Arab Republic (UNESCWA, 2009). According to available statistics, the rail freight transport volume has since 2006 decreased in Egypt and Iraq by close to 60 per cent, and by 33 per cent in Jordan. Elsewhere it has remained stagnant during the period, with a notable increase in freight volume reported only in Saudi Arabia (36 per cent). [18]

2.2 Social and Demographic Trends

Figure 2.7 Global and regional population size projections for the twenty-first century

Solid lines: Global projections

Coloured bands: Regional projections



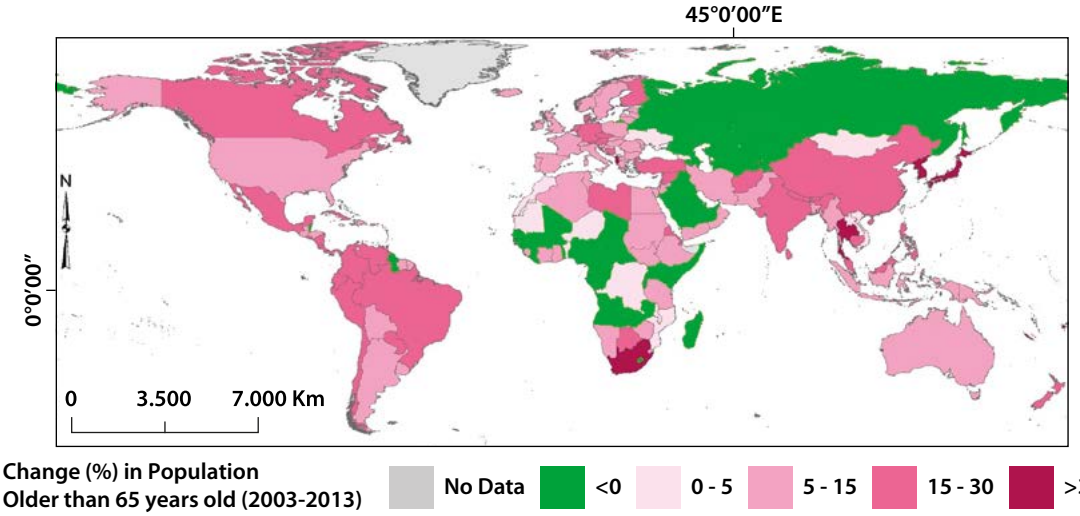
Source: O'Neill et al., 2010

Significant changes in global population size, age structure, household size and urbanization are expected for the twenty-first century (Cohen, 2003); such changes could have substantial implications for inland transport, in terms of transport patterns, energy use and greenhouse gas emissions (see also Chapters 2.3 and 7). An assessment of the implications of demographic changes on the basis of an energy-economic growth model that accounts for demographic dynamics (O'Neill et al., 2010) has shown for the twenty-first century (a) an increase of the population trend that will probably peter out after 2050 and (b) significant regional differences (Figure 2.7).

[18] http://data.worldbank.org/indicator/IS.RRS.GOOD.MT.K6

Population ageing, which presently takes place in many regions (Figure 2.8), is likely to increase in the future decades due to reductions in new births and the lengthening of life expectancy, particularly in China, Western Europe, Canada and Latin America. In comparison, certain parts of Africa and central Asia are likely to experience opposing trends. The number of people per household is also projected to decline in many areas due to living arrangement shifts towards nuclear families.

Figure 2.8 Changes in population older than 65 years of age during the period 2003–2013 (Percentage)

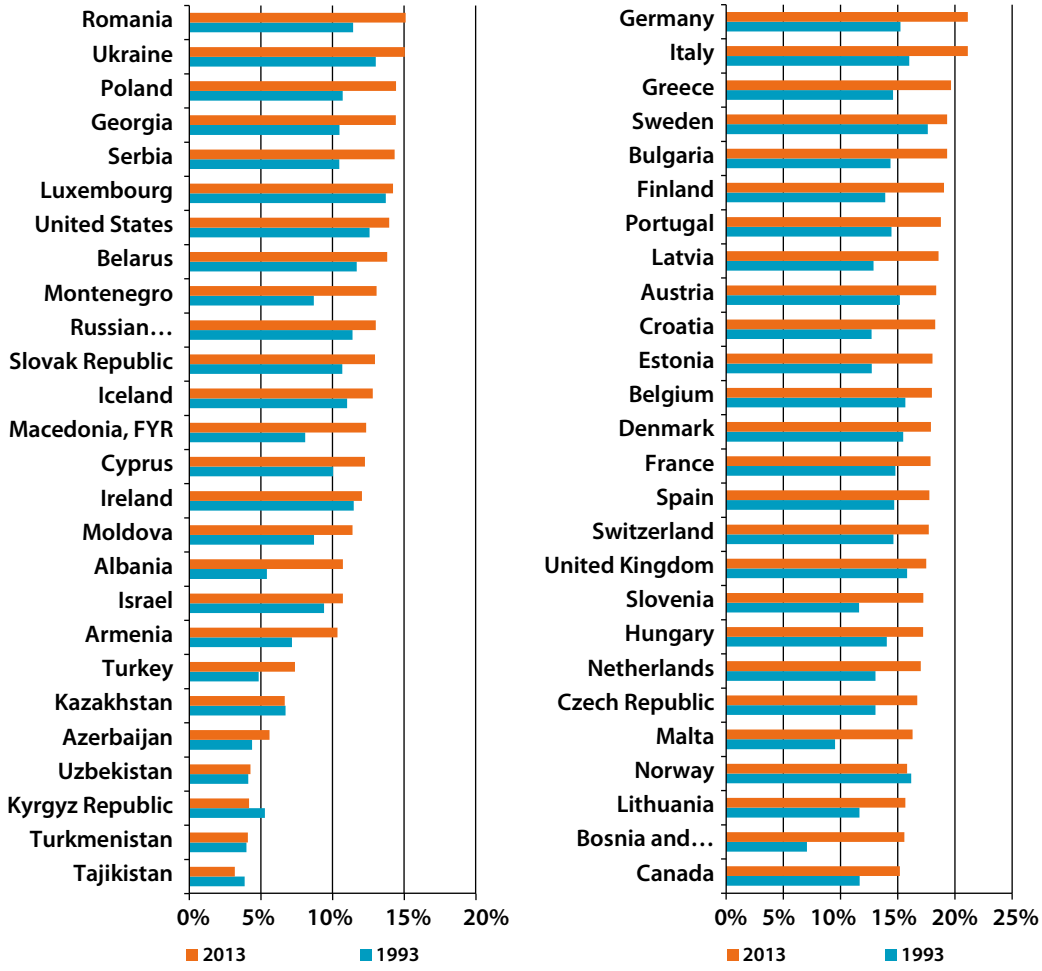


Source: World Bank

It appears that several regions have entered critical phases of demographic evolution. In Western European countries, populations have been ageing since the beginning of the twenty-first century, driven by low fertility/birth rates over the previous three decades. The effects of this ageing are likely to increase over time, if fertility remains at low levels and without offsets from immigration or rising life expectancy (Lutz et al., 2003).

Figure 2.9 shows the changes in the proportion of the population older than 65 years in UNECE countries during the 1993–2013 period. The proportion of elderly populations have increased in 50 of the 52 UNECE member States (for which data are available), with nineteen member States showing increases greater than 30 per cent, a further four greater than 50 per cent, Bosnia and Herzegovina by more than 100 per cent, while only Kyrgyzstan, Norway and Tajikistan showed an actual proportion decrease compared to 1993 rates. In absolute terms, the over 65 population increased by 31 per cent in the UNECE region between 1993 and 2013 (and is 15 per cent of total).

Figure 2.9 Change in the proportion of elderly (over 65 years old) population in UNECE member States, 11990–2013



Source: World Bank[19]

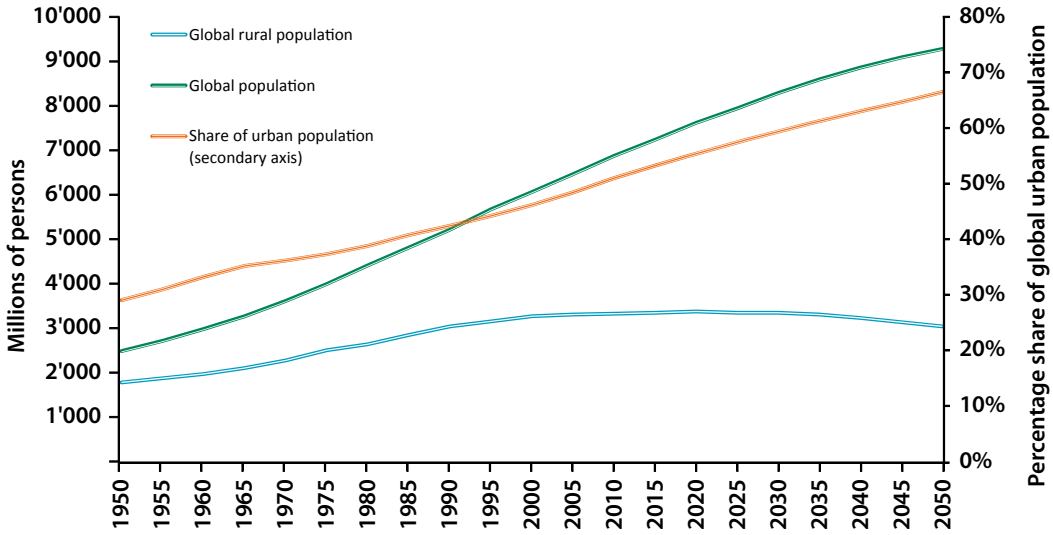
In other parts of the world (e.g. East Asia, Latin America), population ageing (and, possibly, population decreases) are also projected to occur if the current trends (Figure 2.8) continue. Urbanization has also altered (and will continue to alter) the global demography in an unprecedented manner. These trends are likely to significantly affect inland transport and its sustainability. Growth in the over 65 years of age population is exceeding the total population growth rate on all continents, as much as by a factor of three in Asia-Pacific and Latin America. Such changes in the population age distributions must be carefully considered when designing future transport systems; elderly people are likely to have particular needs, which must be accommodated.

Global population may grow by more than 2 billion by 2050, with the growth concentrated in urban areas (Figure 2.10). Urbanization, a direct effect of modernization and industrialization, allows individuals and corporations to take advantage of the opportunities offered by proximity, diversity, and market place competition, altering, at the same time, the socio-economic and environmental character of the growing cities and surrounding areas. Since the beginning of the twenty-first century, the number of people living in urban centres has grown to exceed the number of people living in rural areas and this trend is

[19] http://data.worldbank.org/indicator/SP.POP.65UP.TO.ZS

expected to perpetuate in the future decades, with the urban populations being projected to constitute more than 65 per cent of the total population by 2050.

Figure 2.10 Urbanisation trends and projections, 1950–2050



Source: DESA, 2013

Considerable regional diversity exists in the patterns, level and pace of urbanization. For example, Latin America and the Caribbean regions are highly urbanized, whereas least developed countries and land-locked developing countries are still predominantly agricultural, although they will also probably experience accelerating urbanization in the coming decades (DESA, 2013). On average, nearly 80 per cent of the population in developed regions resides in urban centres, whereas the average share of urban populations in parts of Asia and Africa is less than 50 per cent (Grübler and Buettner, 2013).

Nevertheless, it is Asia and Africa that will host nine out of ten of the most populous urban agglomerations in 2030, six of which will be in China and South Asia. Projections (DESA, 2014) indicate that the list of ten largest urban agglomerations will continue to be dominated by cities of the UNESCAP region in 2030 (table 2.2). These projections also indicate that for the first time in modern history no European or American cities will be amongst the ten most populous in the world.

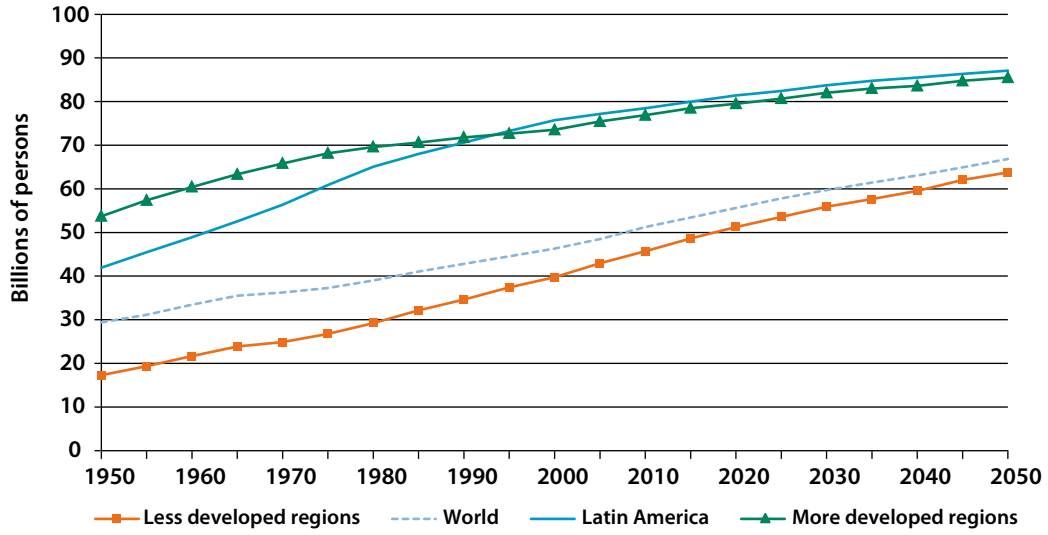
Table 2.2 Largest urban agglomerations by population size in 2015 and in 2030 (DESA, 2014)

2015					2030				
Rank	Region	Country	Urban Agglomeration	Population (millions)	Rank	Region	Country	Urban Agglomeration	Population (millions)
1	UNESCAP	Japan	Tokyo	38.00	1	UNESCAP	Japan	Tokyo	37.19
2	UNESCAP	India	Delhi	25.70	2	UNESCAP	India	Delhi	36.06
3	UNESCAP	China	Shanghai	23.74	3	UNESCAP	China	Shanghai	30.75
4	UNECLAC	Brazil	São Paulo	21.07	4	UNESCAP	India	Mumbai	27.80
5	UNESCAP	India	Mumbai	21.04	5	UNESCAP	China	Beijing	27.71
6	UNECLAC	Mexico	Mexico City	21.00	6	UNESCAP	Bangladesh	Dhaka	27.37
7	UNESCAP	China	Beijing	20.38	7	UNESCAP	Pakistan	Karachi	24.84
8	UNESCAP	Japan	Osaka	20.24	8	UNECA	Egypt	Cairo	24.50
9	UNECA	Egypt	Cairo	18.77	9	UNECA	Nigeria	Lagos	24.24
10	UNECE	USA	New York	18.59	10	UNECLAC	Mexico	Mexico City	23.86

Source: DESA, 2014

As stated above, currently the urban population in Latin America is larger, in percentage terms, than the world average. The urban population, as a proportion of the total, in the region rose dramatically between 1950 and 1995, as a result of the import substitution policy and the absence of reform in the countryside. This trend continued until the end of the twentieth century, by which time Latin America had overtaken the most developed regions in terms of urban population. Today, with about 80 per cent of its population residing in cities (Figure 2.11), Latin America has the most urbanized population of any region in the developing world (UNECLAC, 2014b).

Figure 2.11 World, Latin America, developed and developing regions: Urban population estimates and projections, 1950–2050



Source: UNECLAC, 2014

It should also be noted that, since the middle of the last century, there has been a move in developed countries towards suburbanization and counter-urbanization. This trend was accommodated by the development of a more adequate transportation infrastructure. Suburbanization began in earnest in the 1950s in the United States of America, following the construction of the interstate highway system and private vehicles being more affordable for middle class families. In the 1990s, another trend emerged ('ex-urbanization'), when higher income urban dwellers started to move out of the inner cities and suburbs to high-end housing in the countryside. In addition to these changes, there have been also changes in the education levels, the income levels/inequality as well as changes in the geo-spatial distribution of the populations due to, for example, population movement towards the coastal areas. All these trends have been influencing transport needs and patterns, and related energy use and greenhouse gas emission patterns (e.g. Dodson and Sipe, 2006).

2.3 Environmental Trends and Implications for Inland Transport

The transport sector is instrumental in many economic and social functions. At the same time, transport infrastructure/services have a significant environmental footprint at different spatio-temporal scales. Transport can even affect the global climate through its substantial emissions (see below) as well as be affected by the Climate Variability and Change (see also Chapter 7).

Global Climate Variability and Change is controlled by the planet's heat inflows and outflows and its storage dynamics in the various constituents of the earth's system. There is now sufficient evidence to suggest a long-term, increasing temperature trend, with the global average air temperature having increased by about 0.8 °C since the 1850s and the upper 75 m of ocean increasing by 0.11 °C per decade over the last 40 years (IPCC, 2013). Atmospheric temperature increases of between 1.0 and 3.7 °C have been projected for 2100, depending on the scenario. Precipitation has also changed, but in a more complex manner, with some regions becoming wetter and others dryer; such trends are predicted to remain steady or even increase in pace in the future (IPCC, 2013). One of the most damaging side-effects of the temperature increases is rising mean sea levels, due to ocean thermal expansion, the melting of the Greenland and Antarctic ice sheets and the glacier and ice caps, the glacio-isostatic adjustment and changes in the terrestrial water storage (Hanna et al., 2013). Since the 1860s, sea levels have risen by about 0.2 m, with satellite information showing a progressive increase rate (to up to 3.1 mm/yr^{-1}) since the 1990s (Church and White, 2011).

Changes in the average climate conditions can also lead to fluctuations in the frequency, intensity, spatial coverage, duration, and timing of extreme weather and climate events, which can, in turn, modify the distributions of future climatic conditions. Extreme events (e.g. storms and storm surges, floods, droughts and heat waves), as well as changes in the patterns of particular climatic systems such as the monsoons (SREX, 2012), can have more severe impacts on transport than changes in the mean variables when concentrated in smaller areas over a limited period. One of the clearest trends appears to be the increasing frequency and intensity of heavy downpours. Climate models project the continuation of this trend; for example, the 1 in 20 year (heaviest) downpours of North America have been projected to occur every 4 to 15 years by 2100, depending on the location (Karl et al., 2009). River floods also appear to present significant hazards and evidence suggests increases in the frequency and intensity of heat waves—of extended periods of abnormally hot weather, as well as of severe droughts in some regions (EEA 2012; UNECE, 2013).

The above changes may severely impact transport infrastructure, hubs and services. Coastal flooding will have significant impacts on coastal transport infrastructures, by rendering them unusable for the duration of the flood and significantly damaging terminals, intermodal facilities, freight villages, cargo, storage areas and energy infrastructure (Brown et al., 2014) and, thus, disrupting intermodal supply chains and transport connectivity for longer periods. Ports, which form key-nodes in international transport networks by linking international supply-chains, will be particularly affected, due mostly to the long life nature of their key infrastructure, their exposed coastal and/or estuarine location, and their dependence on trade, shipping and inland transport that are also vulnerable to climate change (Becker et al., 2013).

Precipitation changes may result in changes to the movement of water courses, which in turn, affect roadways, railways, and rail and coach terminals. Direct damages during the event are probable, necessitating emergency responses and affecting the structural integrity and maintenance of roads, rail lines, bridges, tunnels, drainage systems, telecommunication and traffic management systems. Increases in the number of heavy precipitation events and floods will cause more accidents due to vehicle, road and rail track damage and poor visibility as well as delays and traffic disruptions. Inland waterways can suffer navigation suspensions, silting, changes in river morphology and damages of banks and flood protection systems. Extreme winds can damage coastal and estuarine railways, destroy agricultural crops and stress industrial facilities and, thus, indirectly affect the transport industry, damage road and railway infrastructure (through e.g. wind-generated debris) and strain road and rail operations. Heat waves may also have substantial impacts on transport infrastructure and services, by stressing water supplies and food storage and energy systems, damaging roads, deforming rail tracks and damaging track foundations as well as by causing lengthy delays through speed restrictions (UNECE, 2013).

One of the major causes of the observed climatic changes is considered to be the increasing atmospheric concentrations of GreenHouse Gases (GHG), e.g. water vapour, carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), which absorb heat reflected back from the Earth's surface and, thus, increase the Earth's heat storage (IPCC, 2013). Since the industrial revolution, atmospheric concentrations of the GHGs have been steadily increasing—higher now than they have been for some million years. For example, in early May 2013, CO_2 concentration surpassed the 400 ppm (parts per million) milestone for the first time since, probably, the mid-Pliocene Warm Period (3.3 to 3.0 million years before the present era) (IPCC, 2013). Climatic changes can be amplified by reinforcing feedbacks—climate change-driven processes that can induce further global warming. For example, previously inert carbon reservoirs (e.g. the tropical peatlands and the vast CH_4 stores of the Arctic permafrost) can be mobilized by increasing temperatures and release more CO_2 and/or CH_4 into the atmosphere. The rapid reduction in the spatial coverage of Arctic Ocean ice, particularly during summer, may also affect climate since sea ice reflects most of the incoming sun radiation back into the atmosphere in contrast to sea water; an ice-free Arctic Ocean will absorb more sun radiation, reinforce global warming and increase 'tipping' risks (Lenton et al., 2008; SREX, 2012; IPCC, 2013; Lenton, 2013).

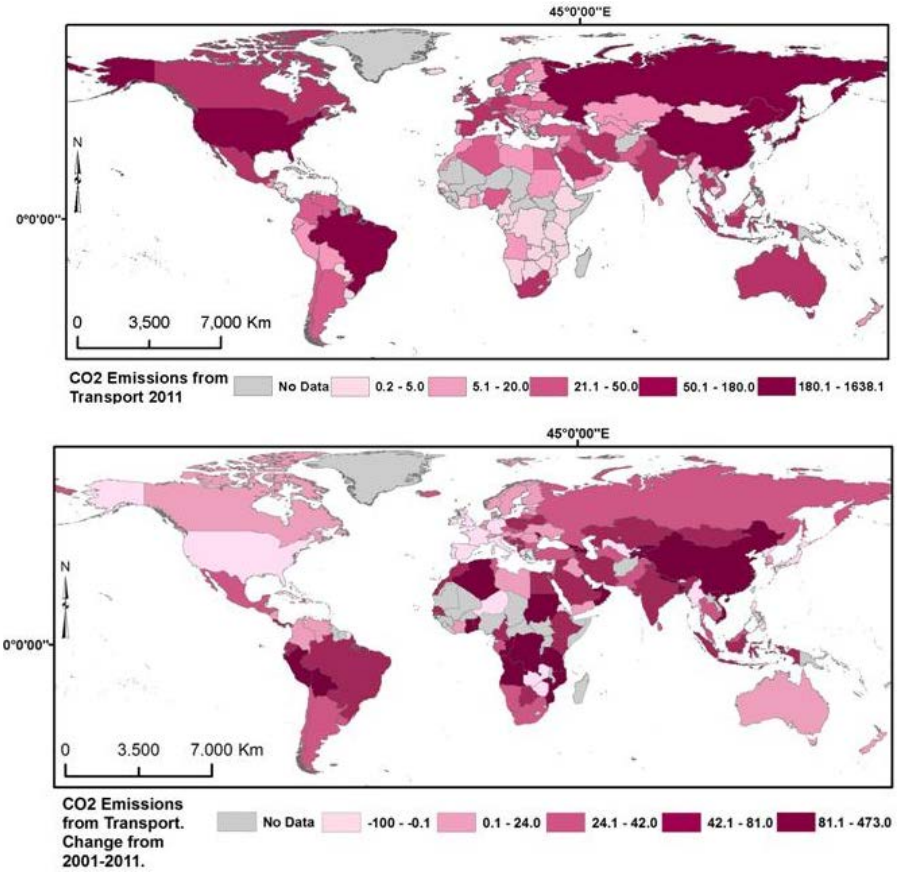
The transport sector is one of the major contributors of CO_2 emissions as well as a major energy consumer. Therefore, in order to assess transport sector sustainability, it is necessary to assess its trends and projections concerning carbon emissions and energy use.

2.3.1 Global and Regional Trends in Carbon Emissions

The expansion of global trade due to changes (including fragmentation) in production patterns has resulted in increases in the global CO_2 emissions, with the transport sector being a significant source of such emissions; the international trading of goods generates emissions that are 50 per cent higher, on average, than those generated by locally-traded goods (United Nations, 2013). It is expected that the expansion of and changes in the consumption patterns in emerging economies will exacerbate the already significant environmental challenges that have been originally imposed by unsustainable consumption patterns in the developed countries (DESA, 2013).

Presently, CO_2 transport emissions show a significant spatial variations. The highest emissions are found in the United States of America, the Russian Federation, China, Japan and Brazil, with Western Europe, Australia and India also associated with high transport emissions (Figure 2.12(a)). In comparison, Africa and the central Asia are characterized by low transport-generated emissions. The fastest growing CO_2 emissions are found in China, certain African countries, Eastern Europe, India and in the western Latin America (Figure 2.12(b)). In the UNECE region, CO_2 transport related emissions increased by 23 per cent in the period 1990–2008, but with large variations; in several member States emissions have more than doubled, whereas in others, emissions have decreased as, for example, in Germany (UNECE, 2012).

Figure 2.12 (a) CO_2 emissions (in million metric tonnes) from transport (2011)
(b) Changes in the CO_2 emissions, 2001–2011 (see also ANNEX Table A.1)

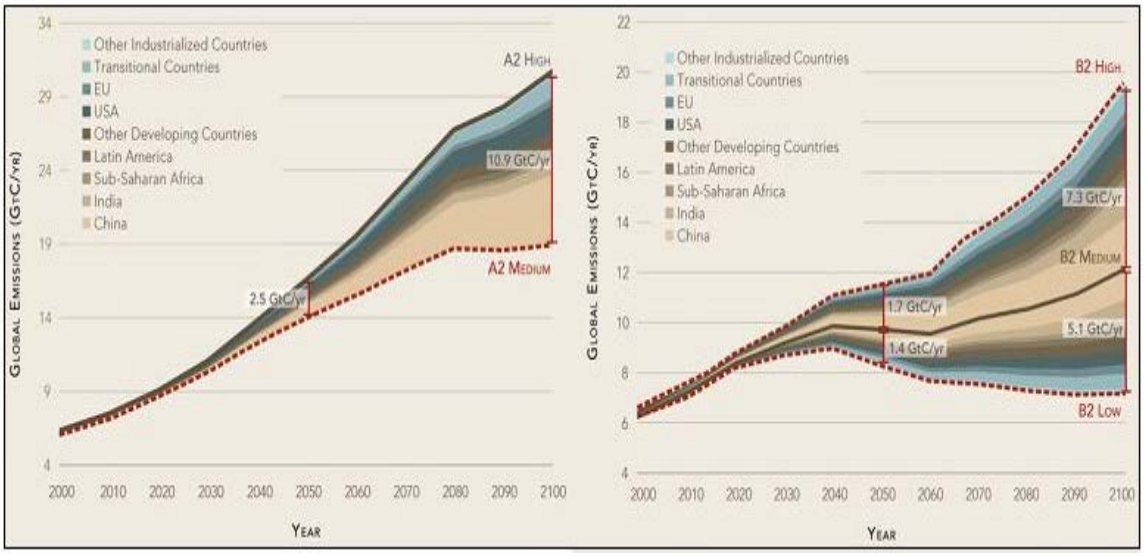


Source: *World Bank*
Note: *The information relates to emissions from the combustion of fuel for all transport activities, regardless of the mode (except for international marine bunkers and international aviation). It includes domestic aviation and navigation, road, rail and pipeline transport, and corresponds to IPCC Source/Sink Category 1 A 3.*

Analysis of the historical data suggests that population growth has been one of the significant drivers of carbon emission growth over the past several decades, with urbanization, ageing, and changes in household size of importance. A recent model on future projections (O'Neill et al., 2010) has suggested that changes in population composition can significantly influence carbon emissions in particular regions, notwithstanding the effects of changes in population size. It has been suggested that ageing, which can influence labour supply and productivity, may reduce long-term emissions by up to 20 per cent, particularly in industrialized countries—whereas urbanization may increase emissions by more than 25 per cent, particularly in developing regions. Nevertheless, there are other studies which suggest that urban living, as it generally becomes more energy and transport-efficient, may actually result in carbon emission decreases (Dodman, 2009; Clark, 2013).

O'Neill, et al. (2010) also suggest that if the population was to follow the low path rather than the medium in the Special Report on Emissions Scenarios (SRES) B2 scenario (Figure 2.13), emissions may significantly decrease with global reductions of 1.4 GtC/year in 2050 and 5.1 GtC/year in 2100 being projected. However, if population growth was, rather to follow the high projection, global emissions would increase by 1.7 GtC/year in 2050 and 7.3 GtC/year in 2100. Regionally, the most substantial changes are projected to be in the developing countries, although the contribution from the industrialized countries will also be substantial; a positive change in American population growth will have a pronounced effect on carbon emissions, despite its small contribution to global population growth, due to the relatively high per capita emissions implied in the B2 scenario. For the IPCC SRES A2 scenario, projections at the global level are even larger in absolute terms (Figure 2.12).

Figure 2.13 Projected global totals and regional differences for CO_2 emissions (in GtC per year)



Source: O'Neill et al., 2010
Note: Solid lines: Global totals; Coloured bands: Regional differences

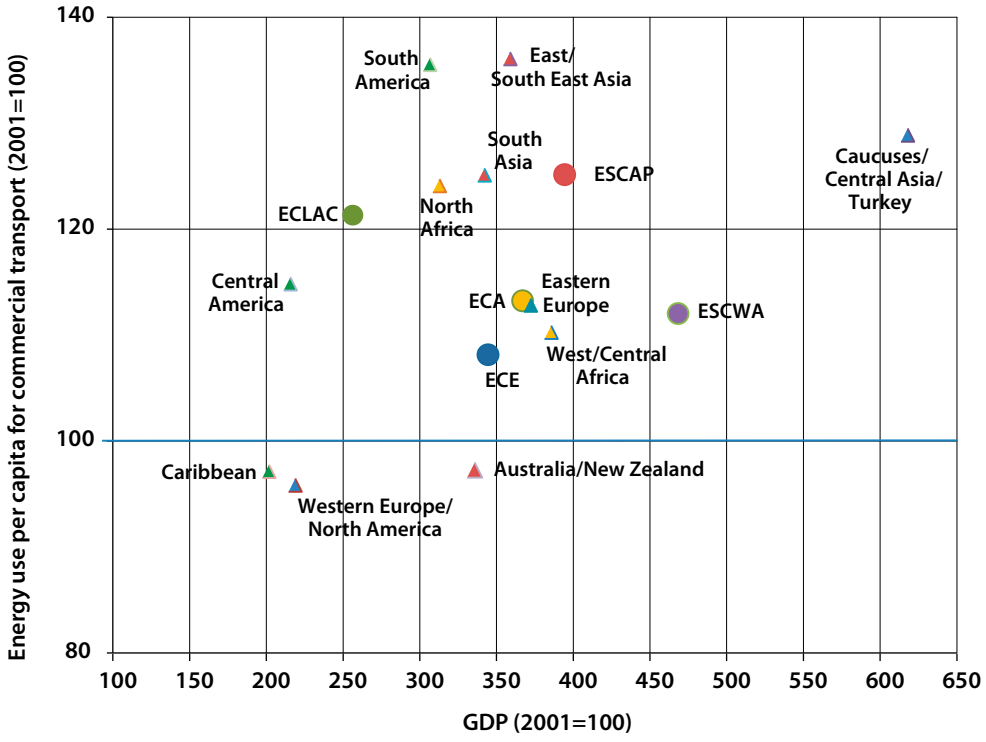
The coloured bands indicate the contribution of each region to the difference between global scenarios. Solid lines shows emissions in the baseline scenario, and dashed lines show emissions in variants with alternative demographic assumptions. All scenarios include the effects of changes in population composition by household age, size, and urbanisation. Economic and technological assumptions are based on the IPCC A2 (left) and B2 (right) scenarios.

2.3.2. Global and Regional Trends in Energy Consumption

The transportation sector is a very substantial consumer of end-use energy, accounting for about 26 per cent of the total world-delivered energy consumption and 55 per cent of the total liquid fuel consumption in 2010 (EIA, 2013). In the period 2001–2011, energy use increased in most countries, with some exceptions. A comparison between the development of energy use and (nominal) GDP (Figure 2.14) shows that energy use has growth slower than nominal GDP growth, with some regions showing an actual decrease of energy consumption (a full 'decoupling' between energy consumption and economic growth) during this period.

Energy consumption is projected to increase substantially in the following decades (EIA, 2013). The development of energy use will control the sustainability of the transportation sector. Oil prices were projected to be consistently high in the next decades[20], in response to dwindling oil resources and a strong increase in demand for transportation fuels, particularly in the emerging non-OECD[21] economies (Figure 2.14). In these economies, income growth and demand for personal mobility (private motorization) together with rapid urbanization, is likely to induce a strong growth in transportation energy use, especially if contrary to past projections the price of oil remains low.

Figure 2.14 Development of the energy use per capita for commercial transport in different regions, 2001–2011 (in Tonnes of Oil Equivalent (TOE))



Source: *World Bank, http://data.worldbank.org/indicator/NY.GDP.MKTP.CD*
Note: *It refers to primary energy use, before transformation to end-use fuels (indigenous production plus imports and stock use, minus exports and fuels supplied to ships and aircraft engaged in international transport)*

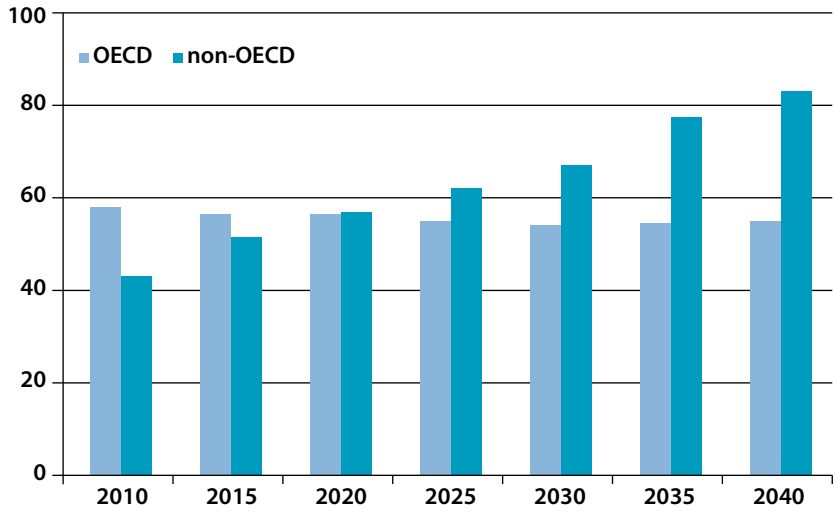
[20] Nevertheless, oil consumption as reflected by oil prices can also be volatile, depending on the economic cycle and geo-political circumstances. For example, the crude oil price (per barrel) in mid-January 2015 was 50 per cent lower than in January 2014. See www.nasdaq.com/markets/crude-oil.aspx?timeframe=1y

[21] OECD member countries (as of 1 September 2012) are Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States.

According to recent projections (EIA, 2013), non-OECD transportation energy use will grow by 2.2 per cent annually in the period 2010–2040. China will lead the projected global growth in the demand for transportation fuels, which is projected to more than triple its consumption from 8 in 2010 to 26 quadrillion Btu[22] in 2040, an energy consumption that will be similar to that of the United States of America (EIA, 2013). The projected growth in energy demand in the sector will require an increased uptake of renewable energy based fuels and innovative solutions for their competitive application.

A recent study (Gujba et al., 2013) on the life cycle impacts and costs of the passenger transport sector in Nigeria for 2003–2030 has found that in a Business As Usual (BAU) scenario, the life cycle environmental impacts will double, despite a projected 35 per cent increase in fuel/vehicle efficiency; at the same time, fuel costs at the sectorial level will increase threefold, from US$ 3.4 billion/year in 2003 to US$ 9.7 billion/year in 2030. Increasing the use of public transport (buses) could reduce environmental impacts by 15–20 per cent and fuel costs by 25–30 per cent relative to the BAU scenario, whereas high economic growth with increased car ownership/private motorization and decline of public transport would increase environmental impacts and fuel costs by 16 and 26 per cent, respectively.

Figure 2.15 Projected global trends in transportation energy consumption in OECD and non-OECD countries, 2010–2040 (in quadrillion Btu)



Source: EIA, 2013

High oil prices, together with the 2008–2009 financial crisis, had a more profound impact on OECD economies than on non-OECD economies. Energy use for transportation in OECD countries declined by 2 per cent in 2008, followed by a further decrease of 3.1 per cent in 2009, before recovering in 2010 (about 0.8 per cent growth). Slower economic and population growths are likely to drive a slow growth in OECD transportation energy demand in the short to mid-term future. In addition, demand for transportation fuels in OECD countries will be constrained by policies aimed at strong energy efficiency improvements in the transportation sector. Recent studies suggest that in the period 2010–2040, transportation energy use in OECD countries will decline by an average of 0.1 per cent annually. Whereas, at the global level, transportation energy use is projected to increase by 1.1 per cent annually, driven by the high transportation growth projected for non-OECD countries—in these countries, transportation energy use will increase by about 2.3 per cent per year (EIA, 2013).

[22] One quadrillion (1 x 1015) Btu (British thermal units) is equivalent to about 180,136,000 boe (barrels of oil equivalent)

In the UNECE region, liquid fuel consumption per capita in the transport sector increased by 12 per cent in the period 1993–2008. Consumption peaked in 2007, when per capita consumption was 0.965 TOE. In 2008, Luxembourg and the United States of America were the highest per capita consumers while Tajikistan the lowest (UNECE, 2012).

In the UNECLAC region, the transport sector's energy demand represented 27 per cent, 31 per cent and 35 per cent, in 1990, 2000 and 2010 respectively, of total supply (simple non-weighted averages) and was the largest single energy consumer in many cases. Its relative weight in the energy matrix is a function, on the one hand, of the configuration of the transport sector's own energy demand, level of activity, modes of transport used, the size of the vehicle fleet, etc., and, on the other hand, the relative weight of other sectors, especially the electricity-generating and industrial sectors, which are equally large energy consumers in some countries (Kreuzer and Wilmsmeier, eds., 2014).

The Latin American countries can be divided into three groups: (a) low-consumption countries, which display varying patterns but in which, with the exception of the Dominican Republic , the transport sector has increased its level of energy consumption significantly; (b) intermediate-consumption countries (consumption levels between 2,000 and 20,000 ktoe in 2010), in which consumption levels also increased, but less sharply (Chile, Colombia, Ecuador, Guatemala, Peru and the Bolivarian Republic of Venezuela); and (c) high-consumption countries in which the sector's energy use rose steeply (Brazil and Mexico) (Kreuzer and Wilmsmeier, eds, 2014). The absolute and relative intensities of energy use by the transport sector in the Latin American countries are determined by the exogenous factors of levels of economic activity, income levels and population growth and by the sector-specific factors of the distribution of modes of transport and their efficiency in a broad sense—which includes the technologies embedded in the equipment in used, the level of use (load factors), the condition of the railway system and others. Key issues in Latin America and the Caribbean are the rapid expansion of the vehicle fleet, particularly of vehicles used for personal transportation at a time when the roadway network has not kept pace with that expansion has turned mobility into a challenge and a high-priority issue in terms of comfort, transit times and air pollution for the governments of many cities. This is especially so in Latin America. Another evident trend in Latin America is the rising use of diesel fuel by automobiles, chiefly because the price of diesel is usually lower than petrol and because the use of sport utility vehicles is increasing when most of these vehicles are diesel-fuelled.

The total petrol and diesel oil consumption in road transport in 2012 in the UNESCWA region reached about 391 million tons of oil equivalents. Although national proportions vary, the transport sector accounts for 30 per cent of total regional fuel consumption. The use of fuel in transport sector is as high as 50 per cent of total consumption in Iraq, while at the lower end it is 19 per cent in Oman and in the United Arab Emirates. The transport sector in the UNESCWA region relies on oil and oil products as its primary source of energy. Hence, oil and oil-based products supplied 98.4 per cent of energy consumed in the transport sector in 2011. [23] Natural gas use in the transport sector represents a small fraction, 1.6 per cent (2011) of the total energy mix. The total GHG emissions associated to the transport sector account for 22 per cent of the total CO_2 emitted; 85 per cent of which is attributed to inland transportation.[24]

[23] www.iea.org/statistics/statisticssearch/report/?country=Oman&product=balances&year=2011

[24] Environment 2007 – International Conference on Integrated Sustainable Energy Resources in the Arid Regions, 28 January to 1 February 2007, Abu Dhabi.

2.4. Challenges

In the near to mid-term future, the transportation sector will face significant challenges. Continuation of the current trends in the economic growth, which has been consistently higher in developing countries than in the developed world, is likely to influence transportation patterns, particularly if such trends couple with increases in the developing countries' consumption volumes and patterns. Nevertheless, increasing income inequalities might also affect demand/consumption and, thus, the transportation sector. In addition, changes in the global populations' size, age structure, household size, as well as increasing urbanization could have significant impacts on inland transport, as they are also likely to influence transportation patterns and volumes. For example, road (highway) travel in the European countries is expected to grow slowly due to changes in the population age structure: as the average age increases, the number of licensed drivers and the average amount of highway travel per capita will probably decline in areas with already high motorization levels. At the same time, the fast-paced economic growth and socio-demographic changes in the developing countries are likely to increase uncertainties in the long-term development of the transportation sector, due to a greater flexibility in capital investment and the associated infrastructure/services development.

In the next decades, the nexus between transportation, energy and carbon emissions will continue to pose challenges for the transport sector. Transportation energy demand is projected to increase in the next decades due to the increasing private motorization of non-OECD countries and the increasing freight transport in both developing and developed economies (EIA, 2013). At the same time, improvements in energy efficiency are likely to moderate future energy transportation demand in OECD economies. Adaptation of more stringent fuel economy standards (e.g. EC, 2012a) will probably curb growth in transportation energy use in the developed economies, as may specially-targeted financial instruments. For example, many European countries have increased fuel consumption taxes on motor vehicles to encourage fuel conservation. Although such taxes vary widely, diesel fuel is generally treated more favourably and is generally 20–30 per cent more efficient than petrol in equivalent vehicles (see also Chapter 7).

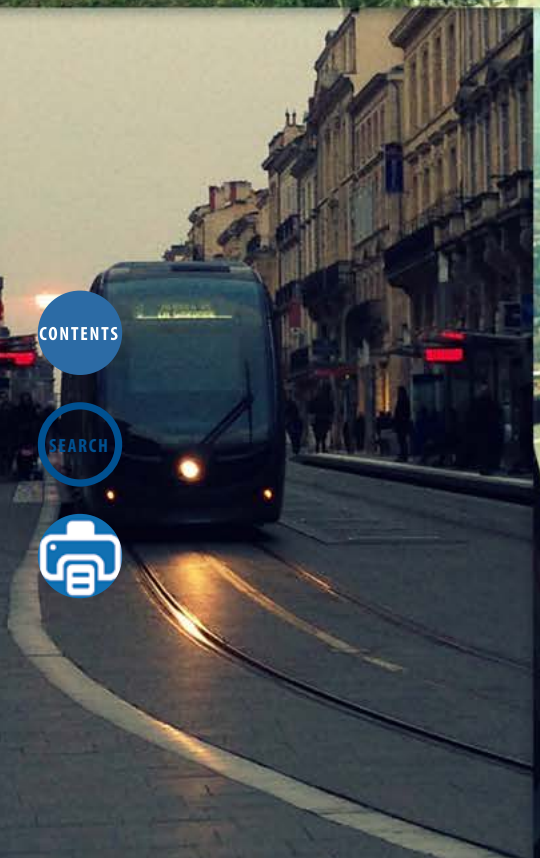
Also, individuals/households with different income levels show differential effects in energy use and income; this also further increases social inequality. It seems that income inequality is also an obstacle to the use of new technology (e.g. electric vehicles), and can therefore be an obstacle to sustainable energy use (Andrich et al., 2013).

It has been suggested that global oil supplies will only meet demand until global oil production peaks; this could cause a global energy gap to develop, which would have to be bridged by unconventional and renewable energy sources (e.g. Salameh, 2003) and/or reduced demand. With transportation, there is a scope for continued research and development to further improve car energy efficiency. A recent study (Daly and Ó Gallachóir, 2012) modelled future car stock and policy and measures related to Ireland's transport energy demand in the period up to 2030. Modelled policies/measures involved deployment targets for electric and compressed natural gas vehicles, European Union (EU) regulations on improved vehicle efficiency and implementation of national bio-fuel obligations as well as encouraging modal shifts and reduced travel demand. The results indicated a possible improvement of 32 per cent in car stock efficiency and a 22 per cent reduction in private car CO_2 emissions relative to 2009 levels, and a 7.8 per cent renewable energy share of road and rail transport.

It must be noted that decarbonisation targets have already been set in some areas. For example, the EU Roadmap 2050 specifies an 80 per cent GHG emissions reduction target by 2050. Simulation of alternative EU decarbonisation pathways under technological limitations and climate policy delays (Capros et al., 2014) has shown that (a) the EU emissions reduction target is feasible within currently known technological options and at low cost (lower than 1 per cent of GDP in the period 2015–2050) and (b) delay on emission reduction action until 2030 will have significant adverse effects on energy system costs.

Decoupling carbon emissions from transport activities is urgent. It could be driven by, for example, alternative transportation options in urban areas. However, a key uncertainty is the effectiveness of future policies on shaping transportation demand – the effectiveness of policies that promote novel energy-efficiency technologies and their timely uptake, the introduction of alternative-fuel vehicles and more efficient land-use planning. Finally, the sustainability of the transportation sector will also depend on its ability to adapt to the projected climatic changes and its resilience to climatic extremes (UNECE, 2013).

It must be noted that climate change and energy security are two of the key global policy issues of our time. At the same time, although the transportation sector is a substantial energy consumer, about 55 per cent of the total liquid fuel consumption (EIA, 2013), it is also the sector which has achieved considerable emission reductions. Nonetheless, substantial further progress in warranted in the future. Action will be required at all levels of governance, from international to local, on behalf of the regulator, as well as of businesses and users.



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3. Accessibility

In transport, accessibility refers to the peoples' ability to reach goods, services, activities and destinations from a given location, using the available transportation system. Many factors affect accessibility, including the transport needs and abilities of individuals, the quality of the transport options, the connectivity of the various links and modes, the land use patterns, and the quality/costs of alternative solutions (Litman, 2012). Transport accessibility impacts immensely on both the economy and human development, as improved accessibility to transport can facilitate the achievement of many economic, social and environmental objectives.

This chapter will provide an overview of indicators relevant for transport accessibility from the global, regional and national perspectives, defining current accessibility to transport for individuals and households, as well as for accessing international markets. The indicators help to identify and define challenges standing in the way of securing transport accessibility, a selection of which are presented in the second part of the chapter along with examples of best practices implemented to overcome regional and national challenges.

3.1 Transport Accessibility: Individuals and Households

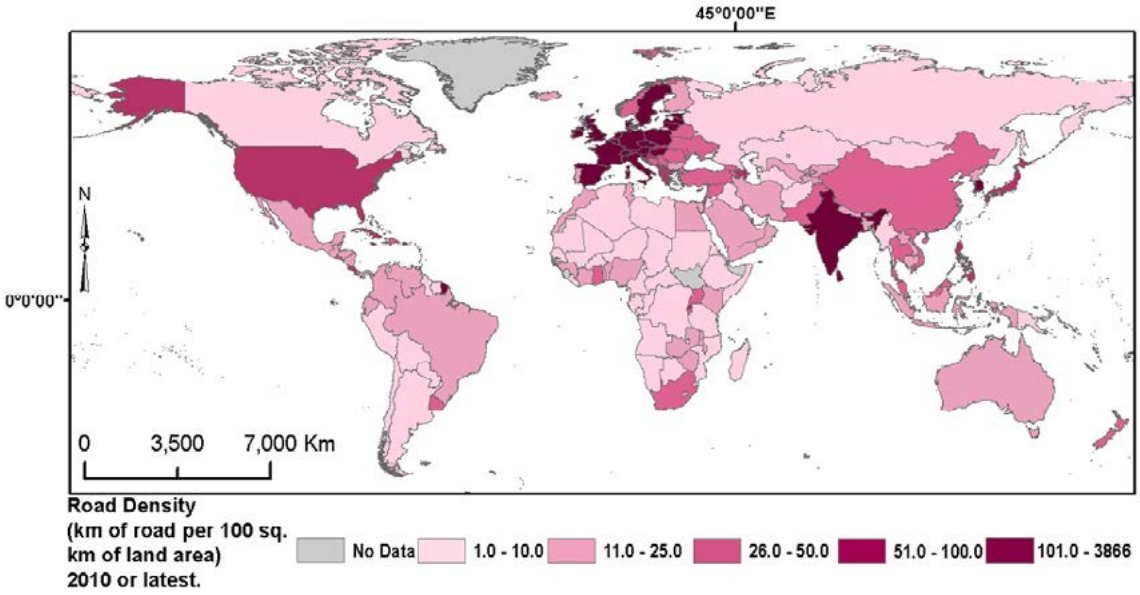
In inland transport, individual/household accessibility can be evaluated on the basis of several indicators, including the transportation infrastructure density, the integration of the transport and land-use systems, the level of urban development and the individual travel requirements, choices and habits (e.g. Morris et al., 1979). There is no single way to evaluate accessibility, as different planning choices require different methods to account for different scales, modes and user perspectives. For example, neighbourhood transport planning requires 'walkability' analysis, while regional transport planning requires a thorough analysis of private car, bus/coach and rail travel options. In addition, the evaluation of accessibility depends also on income; accessibility should be evaluated differently for lower-income populations and for wealthier/business travellers.

	National accessibility ⇨ High mobility ⇨ Access to education, food, health and employment ⇨ Social inclusion, individual economic development and reduced inequality
Key challenges	• Rural accessibility is a challenge in all regions; • Rapid urbanization worldwide calls for redesigning urban mobility conditions; • Insufficient access to public transport in many urban areas; • Walking and cycling are often rendered impossible or unsafe due to the lack of appropriate sidewalks and cycling lanes; • Transport infrastructure quality is unsatisfactory in several countries; • Persons with reduced mobility require appropriate infrastructure; • Congestion is an increasing challenge in urban and suburban areas.
Role of the United Nations	• Provide intergovernmental platforms for sharing of best practices, such as the Inland Transport Committee, THE PEP; • Promote legal instruments for multilateral harmonization of classifications of transport infrastructure for road, rail, inland waterway and intermodal transport, such as AGR, ACG, AGTC, AGN; • Provide statistical and analytical information that assists governments in recognizing and handling national accessibility of transport; • Assist in the promotion of public transport and capacity-building.

3.1.1 Accessibility Factors

Most of the social and economic functions of society require transport and, thus, accessible transport is a precondition for social and economic sustainability. Improvement of local transport infrastructure in, for example, rural areas can increase social inclusion of rural populations as well as their competitiveness and economic development.

Figure 3.1 Road density by kilometre of road /100 km2(2010 or latest available year)



Source: World Bank

Assessments of national transport accessibility are complex exercises, as accessibility depends not only on the economic but also on geographic and demographic characteristics. Nevertheless, the infrastructure density of the transport network (Figure 3.1), although a simple indicator, can still provide a first assessment of national transport accessibility. It is, however, important to recognize the limitations of this indicator. Construction of more roads and rail lines may improve network density, but may not necessarily provide the optimal accessibility solution. For example, traffic congestion in urban areas can lead to low transport accessibility, despite the large density of roads and the other transport infrastructure.

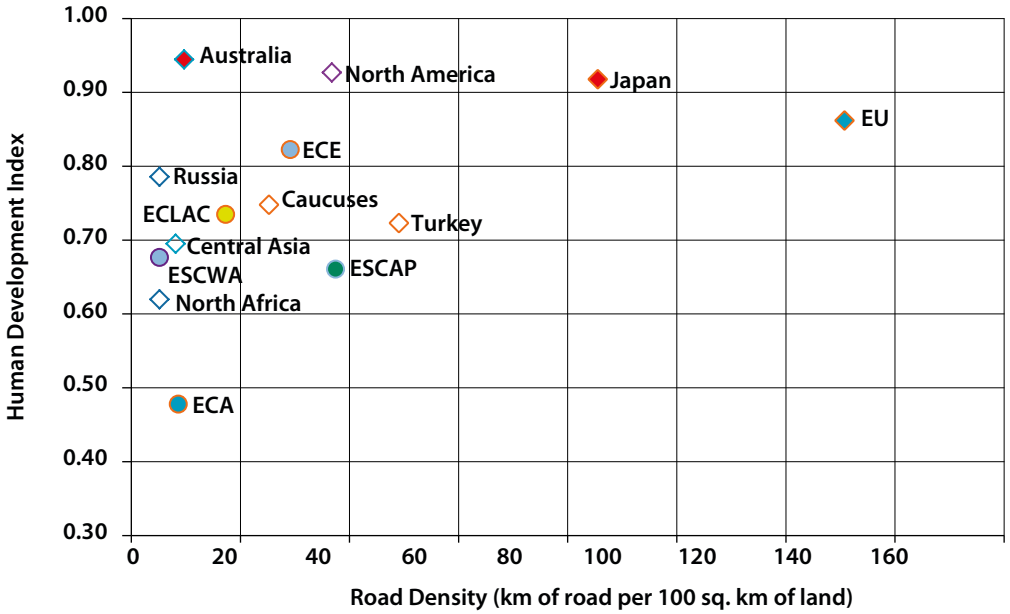
On a global scale, the highest density of roads (in road km/100 km^2) is found in developed countries, with certain industrializing countries (e.g. China) catching up fast. Nevertheless, the data show that road density might reflect also the area and population of the country[25], its physiography and demography (see, for example, the relatively low road density in Canada, Australia, Norway and Finland and the Russian Federation), as well as various other factors related to social and economic development. It is interesting to note that although an increasing trend of road density with the Human Development Index (HDI)[26] might be discerned at the national level (Figure 3.2), there is not, however, a strong correlation. Several

[25] However, statistical analysis (Table A2) has shown that there is neither significant correlation between land area nor between population and road density.

[26] The Human Development Index (HDI-UNDP) is a composite statistical parameter that contains information on life expectancy, education and economic indices of the countries and is used to rank them into tiers of human development. It sets a minimum and a maximum for each dimension, called goalposts, and then assesses country standing in relation to these goalposts (expressed as a value between 0 and 1). Further information is available at http://hdr.undp.org/en/statistics/hdi.

countries exhibiting high HDIs are associated with relatively low road densities, suggesting a strong influence by other factors, e.g. the physiography and demography (e.g. Canada, Russian Federation and the United States of America).

Figure 3.2 Road density and the Human Development Index by different countries and regions



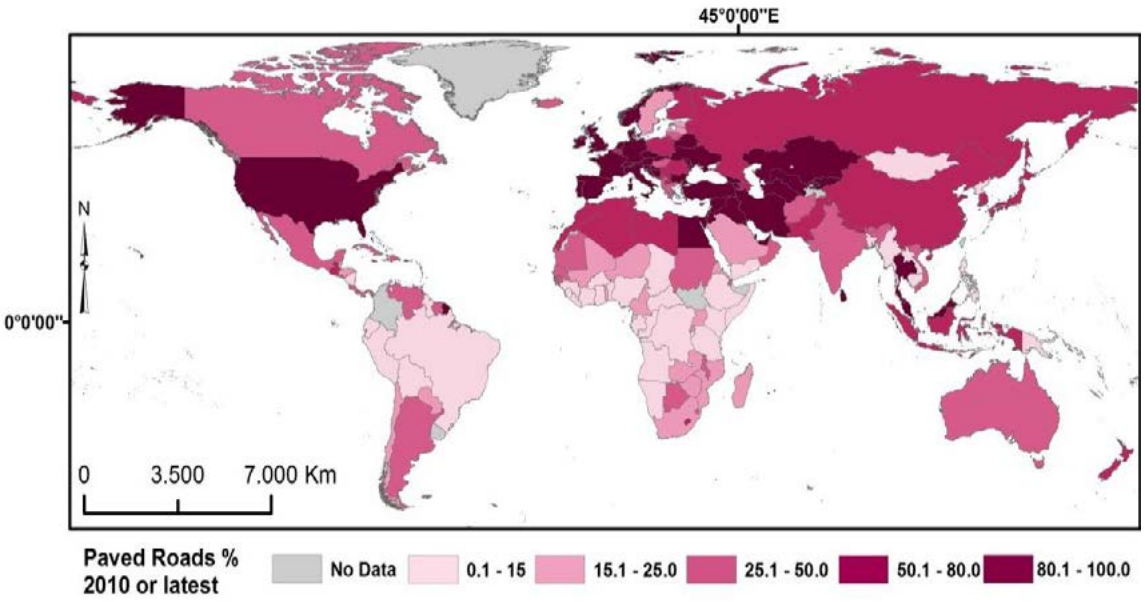
Source: *HDI - http://hdr.undp.org/en/content/table-1-human-development-index-and-its-components; Road density - http://data.worldbank.org/indicator/IS.ROD.DNST.K2*

Note: *Road Density (km of road per 100 sq. km of land area). Data from 2010 or the most recent available year.*

First assessments of national road quality can be made on the basis of the proportion of the paved road network relative to the total (Figure 3.3). Again, a similar pattern is observed, with the countries of North America and Europe being those with the highest proportions of paved roads. There are, however, some notable exceptions, as certain Asian and African countries also exhibit large paved road percentages, whereas Sweden, on the other hand, is characterised by a relatively small proportion of hard-surface roads. It is important to note that as the road type/quality is mostly determined by needs and costs, many regions are made accessible through non-paved roads which can be constructed at a considerably lower cost than hard-surface roads.

In rural areas, social inclusion and individual development is dependent on the presence of an adequate inland transport network, i.e. the presence of roads or railways that can facilitate the required social and economic functions efficiently and safely. Nevertheless, accessibility is a concern not only in rural areas. Urban areas also face transport challenges, due to the ever-increasing transport needs and to their already intensive land use, which further constrains transport infrastructure development. Further urbanization may lead to traffic congestion and, thus, increased air pollution, to traffic noise and nuisance as well as to a scarcity of parking spaces. For example, rapid private motorization has resulted in reduced availability and higher costs of parking spaces in Chinese cities, and presents a major urban transport challenge. Management of the situation requires intervention by city authorities that are not necessarily institutionally prepared for efficient planning, regulation and management of private car parking facilities (e.g. Wang and Yuan, 2013).

Figure 3.3 Percentage of paved roads relative to total road length (2010 or latest available data)



Source: World Bank

The mobility of groups with special needs can also be challenging. Children and young individuals require special attention, as adequate transport access to educational institutions is crucial for their development. At the same time, elderly and/or disabled individuals also have specific transport requirements. Estimates of the World Health Organization for the previous decade indicate that about 2.9 per cent of the global population was severely disabled and about 12.4 per cent was moderately disabled. The social inclusion of these groups requires reasonable access to health institutions and cultural and social activities and, therefore, increased requirements for transport accessibility (UNECE, 2012).

3.1.2 Regional Trends

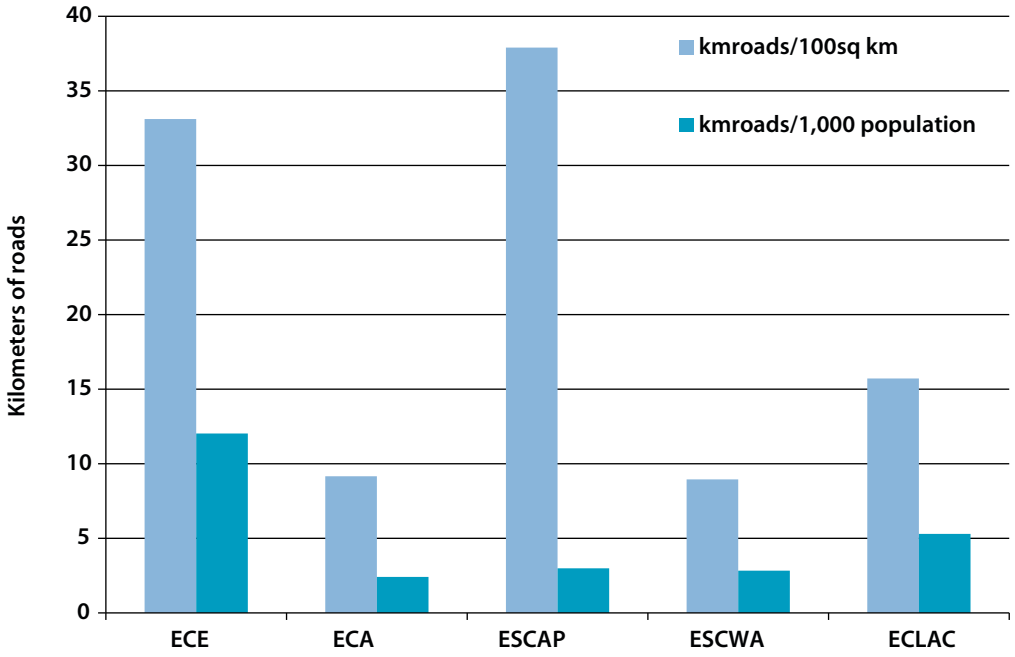
Road, Railway and Inland Waterway Density[27]

Most African and, to a lesser extent, Asian and Latin American countries are characterised by low road densities per unit of land area (Figures 3.1 and 3.2); such road density distribution, coupled with the relatively large rural populations, explains the low Rural Access Index (RAI)[28] in these countries (Figure 3.6). Figure 3.4 plots a regional comparison of km of road per 100 km2 and km of road per 1,000 inhabitants.

[27] National road density data source: http://data.worldbank.org/indicator/IS.ROD.DNST.K2

[28] RAI is an index measuring the proportion of rural population living within 2 km (typically equivalent to a walk of 20-25 minutes) of an 'all-season road', relatively to the total rural population. An 'all-season road' is a road that is accessible all year round by the prevailing means of rural transport (typically non-four wheel drive pick-ups or trucks); occasional interruptions of short duration during bad weather (e.g. heavy downpours) are accepted, particularly on lightly trafficked roads (Roberts et al., 2006).

Figure 3.4 Kilometres of road per 100 km² of area and per 1,000 inhabitants by regional commission (2011)

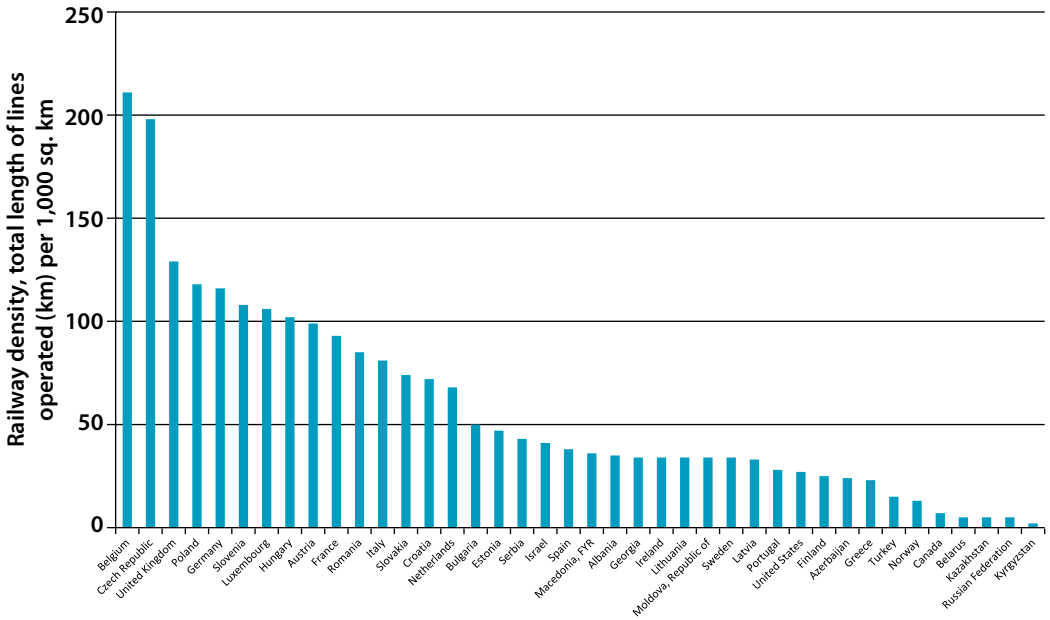


Source: World Bank

Road density per unit of population is variable in the UNECE region. Sweden has the highest road density (56 km of roads per 1,000 inhabitants), followed by Estonia (41 km per 1,000 inhabitants) and Iceland (39 km per 1,000 inhabitants). There are considerable differences within the UNESCWA region in terms of road density, both in the per capita and spatial dimensions. The proportion of paved roads is above 50 per cent in all countries with available data (2010). Road density in Asia and the Pacific continues to increase, but remains low in comparison to more developed regions of the world. From 2005 to 2011, the road spatial density in Asia and the Pacific increased from 25 to 38 km of road per 100 km² of land area, an increase of 50.1 per cent compared to a global growth of 10 per cent over the same period. However, the spatial density remains low compared to EU-28 countries at 134 km per 100 km² (2011), or the United States of America at 67 km per 100 km² (2011).

Canada has the highest per capita railway density among UNECE member States (1.7 km of railway lines per 1,000 inhabitants). In terms of spatial density, the highest rail density in the UNECE region is found in Belgium and the Czech Republic while the lowest is recorded in Kyrgyzstan (Figure 3.6). Some UNECLAC countries, like Argentina and Uruguay exhibit high levels of rail density, as measured by the ratio of total railway lengths to the national territory (17 and 12 km/1,000 km², respectively) (Sánchez and Tomassian, 2012). But even these levels are significantly lower than the average for Western Europe (48 km/1,000 km²) or for the United States of America (20 km/1,000 km²).

Figure 3.5 Rail density in the UNECE region (2012 or latest available year)



Source: UNECE

The UNESCWA region has one of the lowest density rail networks in the world. Transport of goods and passengers has proven ineffective in many Arab countries. Railways in Jordan and Tunisia are operation for the haul of phosphates at a financial loss, which has prohibited investments for improving service. Even in cases where the railway is used for passenger traffic, such as Egypt, substantial losses are incurred. Even so, the only cost-effective rail transportation in the region is in the Moroccan and Syrian contexts. The railway density in these two countries is 4.7 and 11.6 km/1,000 km^2. The percentage of freight transported by rail in the Arab region represented 5 per cent of the total freight calculated by weight hauled in the 1990s and dropped further to 2.4 per cent in 2005.

Railway density in UNESCAP has not progressed historically; however, increased Government investment in railways continues to improve the overall availability and quality of rail services. Railway density in the region remained at 6.5 km per 1,000 km^2 in 2010. This is low compared with railway density in North America and in Europe. However, the increased investment in railways by Governments in the region reflects concerns for the carbon footprint of the transport sector and the need to make greater use of the capabilities of the intermodal transport. [29]

The density of inland navigation waterways is typically less than 200 m per 1,000 inhabitants in the UNECE region with a few exceptions; for instance, the Netherlands has almost 400 m per 1,000 inhabitants (UNECE, 2012). The UNECLAC region is characterized by a significant potential for inland navigation, however, the average share of this mode of transport in passenger and cargo transport remains, in most of the cases, very modest (Sánchez and Tomassian, 2012).

[29] www.unescap.org/stat/data/syb2013/h.2-transport.asp

Private motorization[30]

Private motorization varies considerably from country to country in the UNECE region. The highest motorization rates are in small countries, with Malta (596 passenger cars per 1,000 inhabitants), Iceland (646 passenger cars per 1,000 inhabitants) and Luxembourg (664 passenger cars per 1,000 inhabitants); these three countries top the 2011 European list. Twenty-four of the 41 UNECE countries for which data are available show motorization levels of 400 to 600 vehicles per 1,000 inhabitants.

The numbers are drastically different on the African continent, which has the lowest average motorization rates of all continents. Out of 45 African countries with available data, only eleven have motorization levels above 100 vehicles per 1,000 inhabitants, out of which only Libya surpassed the 200 vehicles threshold (2007 data), while thirteen countries have motorization levels below 10 vehicles per 1,000 inhabitants. In 2010, the car ownership rate for the UNESCAP region was much lower than the global average, but the ownership rate in its high-income economies (405 per 1,000 people) was similar to that of Europe (434 per 1,000 people), but lower than that of North America (606 per 1,000 people).[31]

The total number of vehicles (excluding motorcycles) in the UNESCWA region in 2008 was about 26.7 million, with an average annual growth rate of 4.2 per cent between 1997 and 2008, exceeding at the time, predicted annual growth rates of 2.8 per cent for developing countries. Passenger cars in the region represent about 60 per cent of the total road transport fleet. Considerable diversity is found in the structure of the transport sector of UNESCWA countries. In 2008, the regional motorization rate was 91 vehicles per 1,000 inhabitants, with variation of 555 in Qatar, to 36 in Egypt and 19 in the Sudan.

Urban Accessibility

As mentioned at the beginning of this chapter, accessibility refers to the opportunity of citizens to reach goods, services, activities (jobs, education, healthcare, recreation, etc.) and destinations from a given starting location, using the available transportation system (infrastructure and modes). Accessibility in a particular urban setting depends highly on the synergy and interaction of the existing urban layout, transport infrastructure, public transport system, urban population size and density, private motorization rates and the existing transport modal share. While no two urban agglomerations are alike, they are all based on one or another form of urban layout and transport system, and various combinations of the two, facilitating different levels of accessibility for their citizens. Cities can be densely populated, compact and walkable or public transport based, or sprawling and car oriented. These different types of cities exist all over the world, at various different levels of development (Rode et al., 2014).

A key indicator of sustainable mobility in an urban setting is the degree to which a city as a whole and the goods, services and activities pursued by its citizens are accessible to all of them. Accessibility is central to the concept of achieving more sustainable urban transport and improving the sustainability of cities. From the perspective of accessibility, enhancing urban mobility transcends the improvement of infrastructure and transport systems merely for the sake of achieving greater speeds, effectiveness and efficiency of transport systems. Rather than enabling a simple means to reach destinations, transport systems' improvements should aim at ensuring equitable access for citizens to reach desired destinations (services, healthcare, recreation) and access opportunities (employment, education), regardless of

[30] Data source unless otherwise indicated: http://data.worldbank.org/indicator/IS.VEH.NVEH.P3

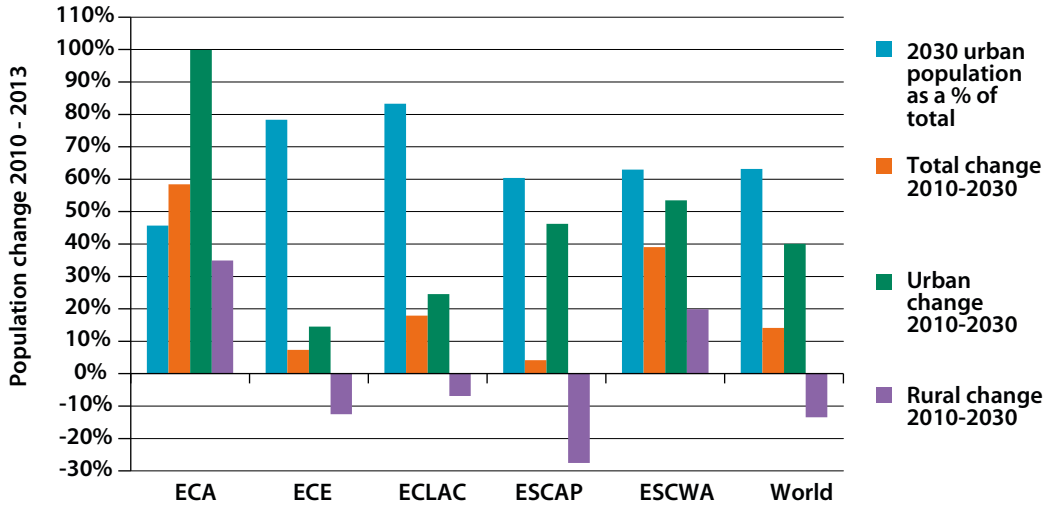
[31] www.unescap.org/stat/data/syb2013/h.2-transport.asp

individual wealth, age, gender or possible health conditions resulting in reduced mobility. Thus, equitable mobility is not only a matter of developing transport infrastructure and services, but of overcoming social, economic, political and physical constraints to peoples' movement (UN-Habitat, 2013).

Urbanization

Available data (UN-Habitat, 2013) demonstrates that we can depend on the urbanization trend, increasingly present since the industrial revolution, to continue in the foreseeable future, particularly, in the coming years in Asia and Africa. The global urban population rose above 50 per cent of the total population in 2008. In 2010, it reached 52 per cent and it is projected that 63.2 per cent of the global population will be living in cities in 2030. The trend of increasing urbanization during the next 15 years will be led by strong population growth in cities of the UNECA region, the total population of which will double compared to 2010 levels (Figure 3.6) during the period, increasing urban population share in the region from 36 per cent in 2010 to 46 per cent in 2030.

Figure 3.6 Regional urban population changes, 2010–2030

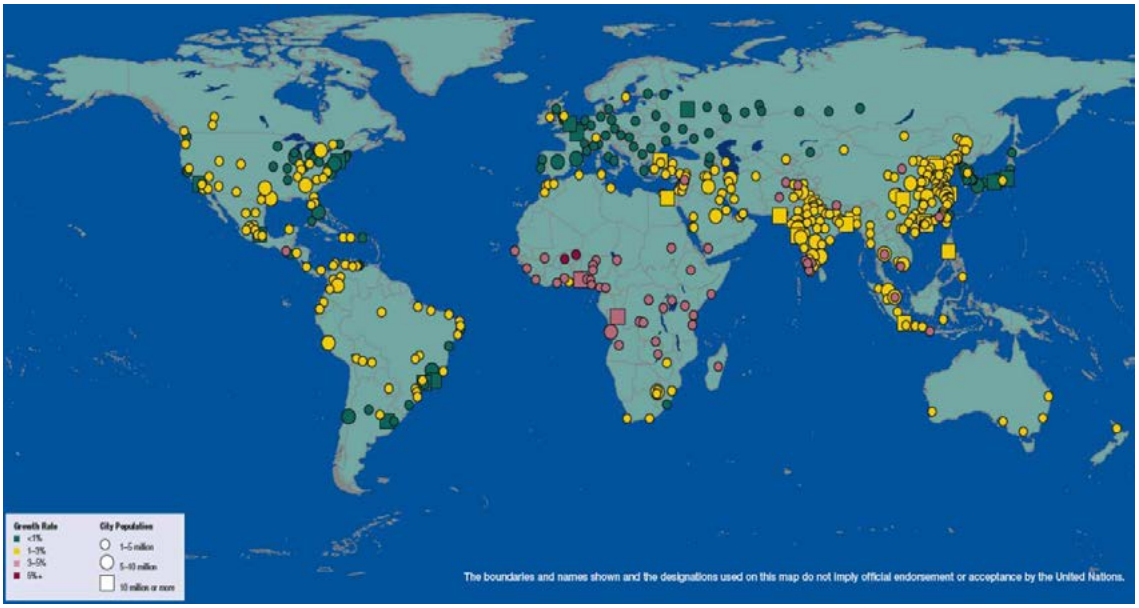


Source: UN-Habitat, 2013

Strong urban population growth is also expected in UNESCWA and UNESCAP cities, which will expand by 54 per cent and 46 per cent respectively compared to 2010 populations, reaching 63 per cent of total population in the UNESCWA region, and 60 per cent of total population in the UNESCAP region by 2030. Urban population growth in the UNECE and UNECLAC regions will not be as pronounced in the next 15 years, growing by 7 per cent and 18 per cent respectively, however these two regions are already, and by a significant margin, ahead of the rest of the world in terms of the urban to rural population ratio. In 2010 the proportion of total population living in cities was 73 per cent in the UNECE region (projected at 78 per cent by 2030) and 79 per cent in the UNECLAC region (projected at 83 per cent by 2030).

Although urbanization is certainly a global trend, projections for rate of urbanization for 2030 are very diverse among members of individual United Nations regional commissions. In UNECA countries, projected 2030 urbanization rates are between 17.5 per cent and 90 per cent, while they are between 30.7 and 89.2 per cent in the UNECE region. In UNECLAC countries, the projected rates vary between 56.6 and 95.5 per cent, UNESCAP between 17 per cent and 96.8 per cent, and between 39.2 and 99.7 per cent in UNESCWA States.

Figure 3.7 Urban agglomeration population growth projections, 2015–2030



Source: DESA, 2014

In cities, the average population growth rates at the global level during the period 2015-2030 (Figure 3.7) are expected to be moderate in comparison with the previous two decades (DESA, 2014), during which dozens of cities across the globe, and particularly in the UNESCAP region, experienced average annual population increases of above 5 per cent. In the next fifteen years, the majority of European cities with more than one million inhabitants will grow by less than 1 per cent annually; in UNESCAP, UNECLAC and North America most such cities are projected to grow between 1 per cent and 3 per cent annually, while stronger growth of above 3 per cent annually is expected to persist in the UNECA region. The consequence of such trends is that 19 of the 20 fastest growing urban agglomerations with current (2015) populations above one million inhabitants are found in the UNECA region (DESA, 2014), as shown in Table 3.1.

This projected scope and speed of population growth will induce pressure on city leaderships to secure development of urban infrastructure and transport systems that are able to cater to the economic and social needs of a rapidly growing and changing population structure, without compromising the environment. This task is particularly urgent as the greatest population growth will be in cities in developing countries where significant urban transport challenges already exist (see section 3.3.1 below).

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Table 3.1 Fastest growing urban agglomerations, 2015-2030

Rank	Region	Country	Urban Agglomeration	Population 2015	Average annual growth rate 2015-2030 (percentage)	Population 2030	Total growth 2015-2030 (percentage)
1	UNECA	Niger	Niamey	1 089 589	5.16	2 363 230	117
2	UNECA	Burkina Faso	Ouagadougou	2 741 128	5.06	5 853 943	114
3	UNECA	Tanzania	Dar es Salaam	5 115 670	4.96	10 759 575	110
4	UNECA	Mali	Bamako	2 515 000	4.88	5 231 087	108
5	UNECA	Uganda	Kampala	1 935 654	4.74	3 939 070	104
6	UNECA	Nigeria	Abuja	2 440 242	4.66	4 912 792	101
7	UNECA	Zambia	Lusaka	2 179 470	4.63	4 364 817	100
8	UNECA	Angola	Huambo	1 269 211	4.62	2 536 751	100
9	UNECA	Somalia	Mogadishu	2 137 839	4.46	4 176 110	95
10	UNECA	Nigeria	Port Harcourt	2 343 309	4.44	4 562 459	95
11	UNECA	Madagascar	Antananarivo	2 609 744	4.43	5 072 578	94
12	UNECA	Nigeria	Onitsha	1 109 287	4.40	2 146 972	94
13	UNECA	Angola	Luanda	5 506 000	4.26	10 428 756	89
14	UNECA	Chad	N'Djaména	1 260 146	4.15	2 346 978	86
15	UNECA	Nigeria	Lagos	13 122 829	4.09	24 239 435	85
16	UNECA	Kenya	Nairobi	3 914 791	4.01	7 140 320	82
17	UNECA	Ethiopia	Addis Ababa	3 237 525	3.95	5 850 804	81
18	UNECA	Rwanda	Kigali	1 256 994	3.93	2 267 541	80
19	UNECA	Kenya	Mombasa	1 103 703	3.87	1 973 488	79
20	UNESCAP	Indonesia	Batam	1 390 546	3.87	2 485 897	79

Source: DESA, 2014

Urban Mobility

As cities and their populations are constantly growing, new mobility and accessibility challenges arise relative to the individual concepts of urban planning and expansion implemented across the globe. Such challenges are particularly pronounced in developing countries where strong migration to urban areas and increased private motorization fuelled by strong economic growth, are outpacing infrastructure development and the expansion and modernization of public transport systems.

Chile, Eight years of successful Free-Flow Tolling

Over the last two decades, the Chilean government has developed a plan of concessions under the Build, Operate and Transfer (BOT) model and has transferred the role of the investor in the construction of public infrastructure (particularly on the main road network) to the private sector. Private groups are accountable for the investments to build, equip the roads, operate and maintain them. Investment and maintenance costs are recovered by applying a 'user pays' approach and collecting toll fees for the concession period.

In 2005, the capital city of Chile, Santiago pioneered the development of concession-interoperable and multi-lane free-flow urban highways. This network crosses the city from North to South (Autopista Central), from East to West (Costanera Norte), while also covering the North-western (Vespucio Norte) and Southern (Vespucio Sur) ring road surrounding the busy metropolitan area of 7 million people. The urban highway network was also extended to the San Cristobal Tunnel connecting the downtown and the Northern areas of the city. Another concession (AMB) was awarded operation of a fast route to the Santiago International Airport. In 2014, the Ministry of Public Works contracted the Spanish group OHL for the Vespucio Oriente motorway completing a ring road linking Vespucio Norte and Vespucio Sur.

In this context, interoperability enables any customer of one of these concessions to use one single electronic identification On Board Unit (OBU) for all electronically operated concessions, and to receive only one single invoice at the end of the month with the accumulated toll fees (1 provider/1 contract/1 invoice principle). Interoperability further enables access to newly installed multi-lane free-flow networks and to new developments, such as parking or traffic management.

The Ministry of Public Works ensured interoperability by establishing a well-structured legal and technical framework and a central database for the National Record of OBU Users (RNUT) as well as by using the DSRC CEN-278 standard as common electronic transaction protocol based on the Chilean ST1 norm.

Between 2003 and 2013, the applied scheme for the Metropolitan Area of the city was able to manage an near doubling of the population from 925,000 to 1,695,000 vehicles. The initial investment of 1,500 million US dollars by road concessionaires had an important impact on the local economy and proved attractive for further investments. The multi-lane free-flow system— implemented and technically maintained by the Austrian company Kapsch—has not only increased user convenience with a number of add-on services, but has also freed the urban space of the previous infrastructure toll plazas. The changes contributed to road safety and to travel time savings of up to 50 per cent, as well as considerable reductions in petrol consumption and negative externalities such as air pollution and noise.

Government institutions and planning processes should emphasize accessibility over mobility. The process of achieving more sustainable urban transportation systems, designed with the principle of accessibility at their core, depends on the participation of all stakeholders in cities: the authorities, the private sector and the citizens, within the principles of democracy. A successful process will depend on effective governance of land use and transportation, where new housing and commercial planning will entail simultaneous transportation systems design, careful neighbourhood design, strategic infrastructure investments, and fair, efficient and stable funding (Kennedy et al., 2005; UN-Habitat, 2013).

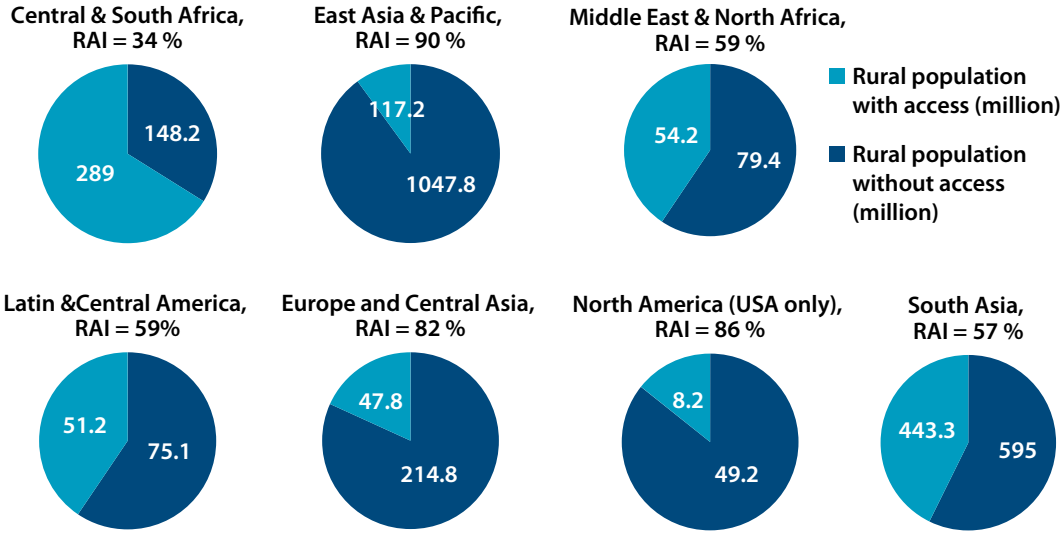
Given the range of factors such as diverse urbanization rates, variety in existing urban layouts, existing modal splits, different governance structures and resource availability worldwide, one universal optimal formula cannot be applied to secure sustainable urban mobility and accessibility for citizens of different urban agglomerations. Compact, mixed-use cities with high quality infrastructure, combined with policy measures that facilitate inclusion of all stakeholders in decision-making processes, along with charging the true social cost of using private motorized vehicles to secure an increased modal share of sustainable modes—are components of sound strategies for achieving of sustainable urban mobility in cities.

Rural accessibility

Rural accessibility varies worldwide (Figure 3.8). RAI estimates (Roberts et al., 2006) have shown that about 900 million rural dwellers lack adequate access to transport systems, with the index being lower in developing countries and, particularly, the countries of South Asia (RAI = 57 per cent) and Sub-Saharan Africa (RAI = 34 per cent). A correlation appears between the RAI and various social factors such as poverty, maternal mortality and

gender equity, indicating that improved transport accessibility for individuals can impact major development goals, such as poverty reduction. For example, the improvement of rural accessibility in Viet Nam has been associated with significant poverty reduction (UNECE, 2012).

Figure 3.8 Rural populations in the different regions, living within 2 km of an all-season road (2004 data)



Source: Roberts et al. 2006

In the past decades, rural accessibility considerably improved in the UNECE region (UNECE, 2012). Nevertheless, significant challenges still exist. Improved accessibility, especially in the rural areas, is important for economic and social sustainability. However, given the broad scope of rural area economies in transition of the region, improving transport infrastructure is a particular challenge with a scarcity of public funds, the relatively low financial return on transport infrastructure investment and a considerable environmental footprint resulting thereof. There are, for example, about 39,000 settlements (i.e. about 10 per cent of the total population) in the Russian Federation that access the transport network only by non-paved roads. Thus, as a considerable proportion of this population risks losing links to the transport network during the annual periods of high precipitation. Ensuring transport access of these people has been among the main objectives of the Russian Federation's transport strategy up to 2030 (UNECE, 2012).

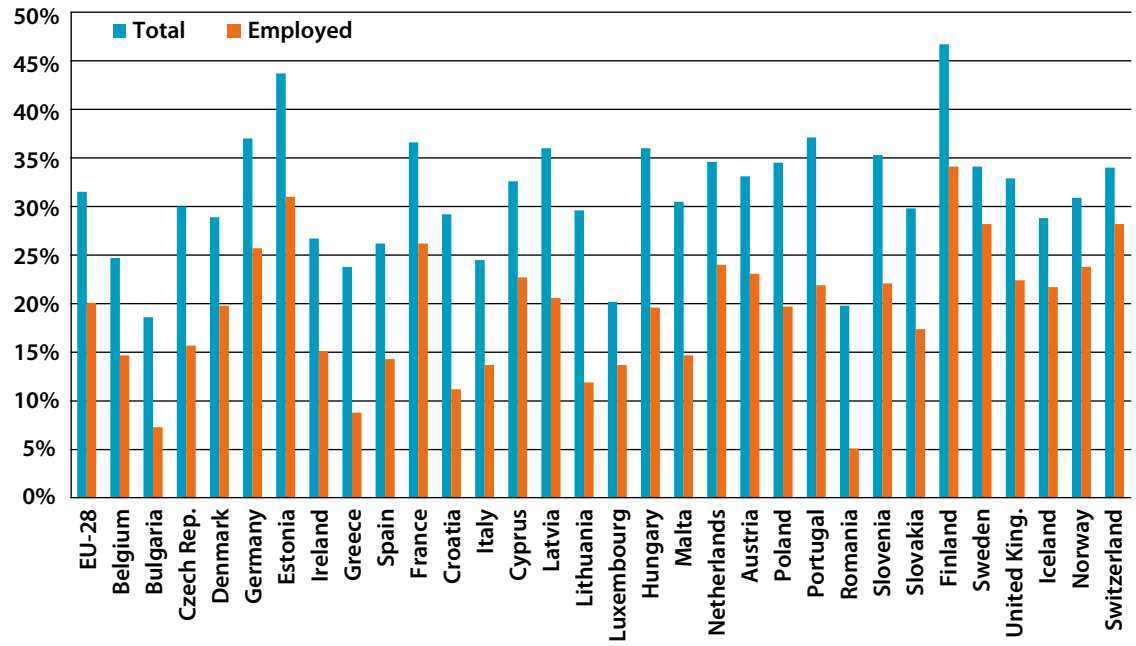
A number of achievements in integrating road networks and sustaining rural transportation at the regional and national levels were attained in UNESCWA countries in the past decade. Between 2008 and 2009, Jordan developed road networks, extended roads to rural areas and linked provinces by building bridges and tunnels, in addition to maintaining, rehabilitating and asphalting roads linking remote areas. In a 5-year plan, 2007–2011, the Government of Qatar implemented 32 projects to build new roads, bridges and tunnels, as well as to carry out maintenance on existing roads, with a total value of US$8.24 billion. At the beginning of 2008, ten major projects were launched in villages and remote towns for the purpose of establishing an integrated road network with modern infrastructure (US$101.6 million). Egypt raised road construction investments from US$73.3 million in 2003 to about US$366.3 million in 2008, and road maintenance investments from US$36.6 million to US$146.5 million for the same years. As a result, the length of the network that serves remote and poor areas increased by about 2,640 km during the period 2003–2008. Finally,

Palestine allocated US$70 million in 2009 for rehabilitation of old roads and construction of new, mainly agricultural roads.

Accessibility of vulnerable population groups

Population ageing (see section 2.2) can affect transport accessibility. Similarly, individuals with long term illnesses and/or poor health also have particular needs that must be considered in the planning/design of the future transportation systems. This is especially important in areas of recent war/conflict where not only transport infrastructure damages occurred, but the number of people with long term health issues and special needs has also increased. Figure 3.9 shows the share of population with long term health problems in the EU-27 member States for 2012. It appears that very substantial proportions of both the total and the employed EU-28 populations are burdened with a long-term health problem. Interestingly, we note the high proportion of employed people with long-standing health problems in some countries, which indicates that health problems do not necessarily imply exclusion from the labour market; it also suggests that, at least for those countries, the existing transport infrastructure and services can facilitate the social and economic inclusion of individuals with health problems.

Figure 3.9 Share of the population with long-term illnesses or health problems in EU-28 member States in 2012

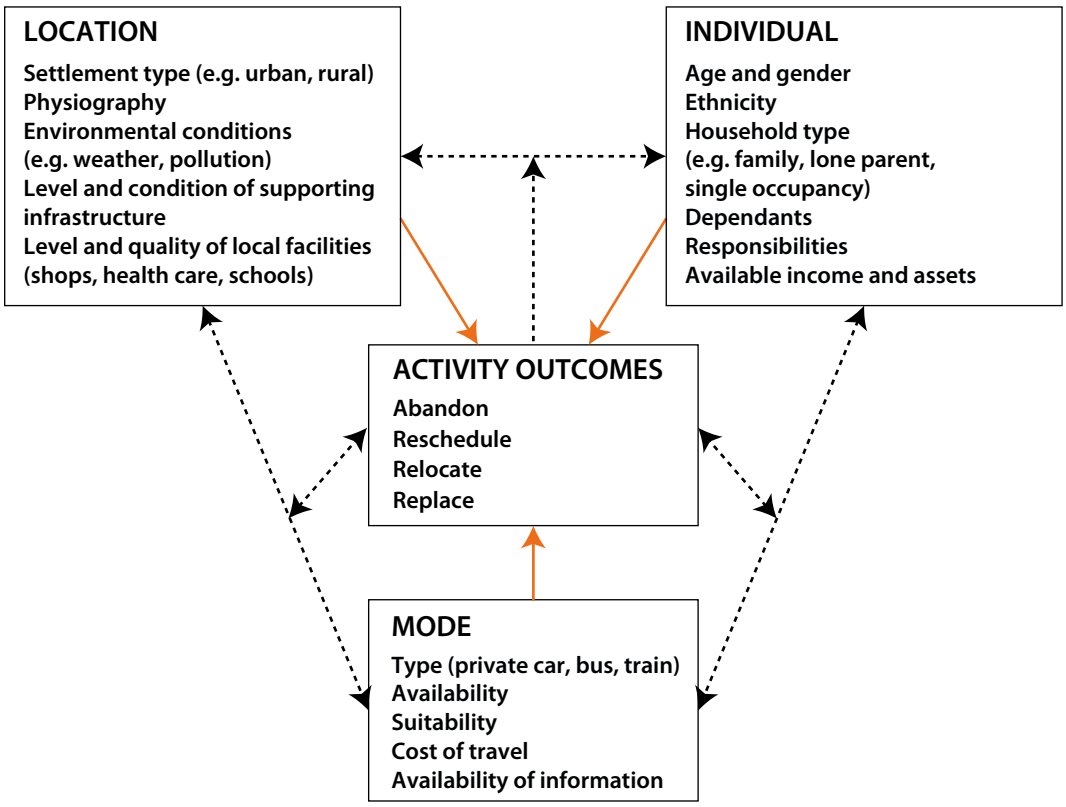


Source: Eurostat

In general, contemporary train coaches and buses are, more or less, accessible to nearly all users, whereas terminals and interchanges in, for example, the mature, large transportation systems of old metropolitan areas are usually less well equipped; this presents operators with extensive and costly challenges. Ferrari et al. (2013) found that 50 per cent of the most frequently monitored journeys in London may become 50 per cent longer due to wheelchair accessibility constraints. Nevertheless, total travel times could be significantly reduced if network-approach methodologies were implemented to rank stations in order to minimise

the divergence between accessible and non-accessible routes. Such studies highlight the potential of 'smart card' data analysis in providing operators with maximum value for their infrastructure investments. It appears that the growing mobility needs of the elderly and people with disabilities, combined with diminishing public finances requires investment prioritisation in areas that could provide the greatest benefits to users. The factors, and their interactions, affecting transport accessibility for individuals, as well potential policy/activity outcomes (abandon, reschedule, relocate and replace) are summarised in Figure 3.10.

Figure 3.10 Factors affecting individual transport accessibility and their interactions



Source: *Lucas, 2010*
Note: *It should be noted that these operate in the context of the wider economic and legislative framework (e.g. employment opportunities, pricing mechanisms, local and national regulatory system and transport policies).*

Local Accessibility (Social Exclusion Unit, UK 2003)

An in-depth analysis of the effects of local accessibility on social exclusion was carried out in the United Kingdom in 2003 and led to a number of striking findings:

- Lack of transportation was a barrier to employment for 38 per cent of jobseekers.
- Over a 12-month period, 1.4 million individuals did not seek medical help because of transport problems.
- Among people without access to a car, 16 per cent had difficulties accessing supermarkets, compared to 6 per cent in the total population; 18 per cent without a car had difficulties seeing friends and relatives compared to 8 per cent in the total population.
- 45 per cent said that the most serious transport problem was inadequate public transport.

To deal with these issues, national and local initiatives were created, including new funding for rural and urban bus services, a 'Wheels to Work Scheme' to support access to work, and integration of routes and the ticket system.

3.2 Transport Accessibility: Access to International Markets

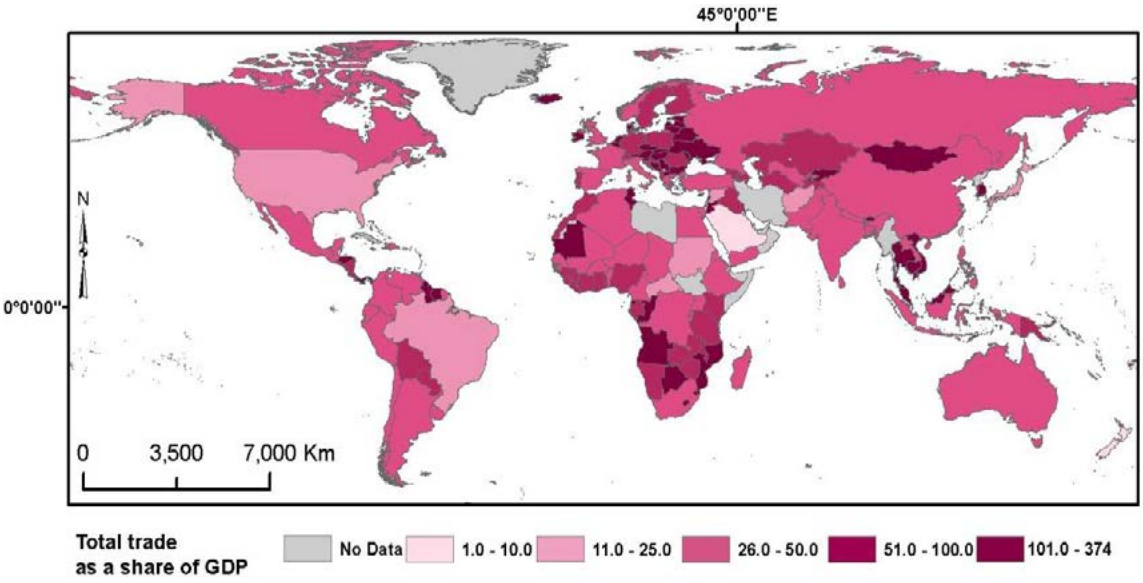
International transport links are the most important facilitator of global trade and a prerequisite for economic development. Participation in global supply chains is essential for attracting foreign investment and enterprises as well as human capital. Foreign trade is especially important for small, landlocked and sea-locked economies, which are also dependent on hinterland and/or sea connections and border crossings. Emerging land and sea-locked economies require particular attention, as their geography constrains trade and economic development.

International accessibility ⇨ Participate in global trade ⇨ Increased competitiveness ⇨ Economic development	
Key challenges	• Underdeveloped international transport links are undermining national and regional competitiveness; • The burden of crossing borders is high in parts of South-eastern Europe, the Caucasus, Central and East Asia, countries of the UNESCWA region and Africa; • Landlocked countries are particularly disadvantaged with respect to international trade; • Linking continents requires global harmonization of transport competitiveness.
Role of the United Nations	• Provide platforms of cooperation to connect regions and continents through internationally harmonized inland infrastructures, e.g. TEM, TER, EATL; • Provides assistance in identifying bottlenecks, missing links and quality of service in infrastructure networks; • Promote trade and transport facilitation legal instruments and practical solutions, such as the Harmonization Convention, the TIR Convention, CTU Code; • Assist in improving transport competitiveness.

3.2.1 Accessibility factors

Figure 3.11 shows the total foreign trade (imports plus exports) as a percentage of (nominal) GDP. In some countries total foreign trade appears to be the dominant economic activity (e.g. Africa and Southeast Asia), indicating a great dependence on international trade. In these countries, domestic production and/or demand are limited, creating a significant need for foreign trade.

Figure 3.11 Total international trade (the sum of exports and imports of goods and services) as a share of GDP, 2005–2012 (in 2015 United States dollars)



Source: World Bank

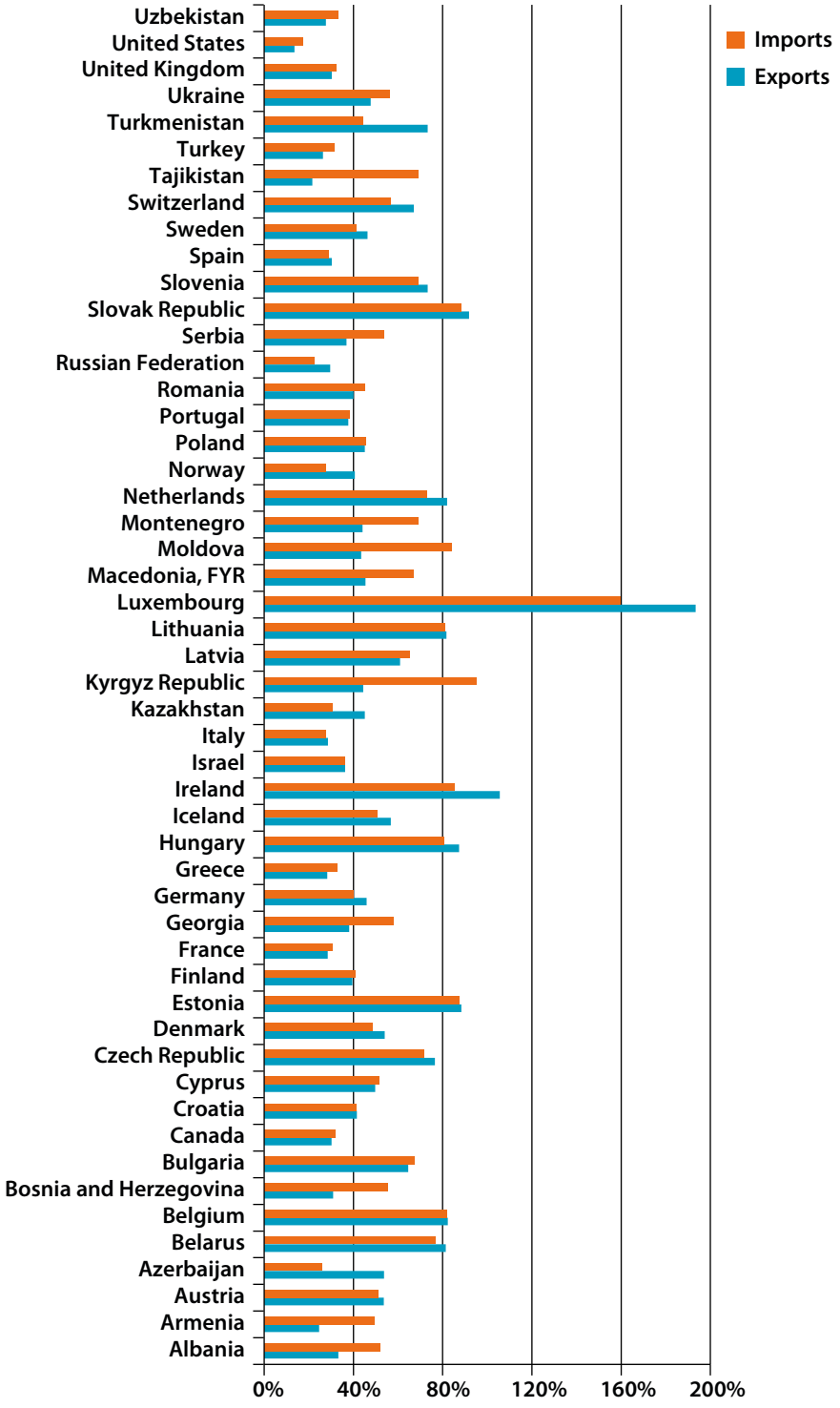
Inefficient transport links can hamper both export and import by leading to increases in the final price of goods and services; thus efficient and reliable international links are essential for economic growth, particularly in the case of developing and/or landlocked economies. At the same time, a scope exists for such countries to facilitate increases in domestic trade, which may 'unlock' their socioeconomic potential; these increases should be underlined by an increase in inland transport infrastructure investment (see also Chapter 4).

International trade is a significant constituent of many UNECE member State economies (Figure 3.12). However, no particular pattern emerges, as the statement is valid for both developed economies of the Western Europe (e.g. Luxemburg) and economies in transition. In several UNESCWA countries, Bahrain, Iraq, Jordan and United Arab Emirates total foreign trade is larger than GDP, indicating their dependence on engaging in international trade patterns.

These trends can be also recognized in the global distribution of inland freight transport volumes (Figure 3.13). Inland freight transport tends to involve higher volumes in developed and/or large countries, where the dependence on international trade (which is mostly facilitated by maritime and/or air transport) is lower than that of the smaller and/or land and sea-locked countries.

In the EU, road transport, although more flexible than the other transport modes, lags behind maritime and air transport. In terms of value (imports and exports), maritime transport has been by far the most important transport mode. In September 2010, freight with a worth of €128 billion was transported by sea, €57 billion by air and €43 billion by road. In terms of inland transport volume, as shown in table 3.2, roads are the dominant transport mode for goods in the EU.

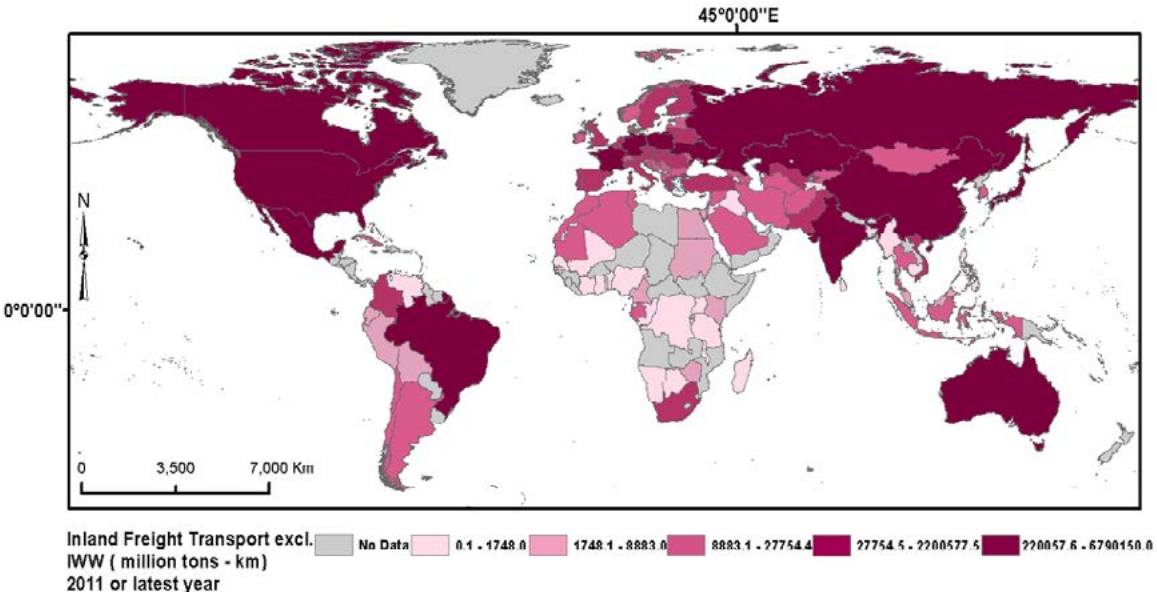
Figure 3.12 Foreign trade of goods and services as a share of GDP (2012) in UNECE member States (where data exists)



Source: World Bank [32]

[32] Source: http://data.worldbank.org/indicator/NE.EXP.GNFS.ZS; http://data.worldbank.org/indicator/NE.IMP.GNFS.ZS

Figure 3.13 Inland freight transport, excluding Inland Waterway Transport



Source: *World Bank* [33]
Note: *The data includes goods transported by railway (metric tons times km travelled) and goods transported by road (millions of metric tons times km travelled)*

Table 3.2 Modal split of freight transport volume in selected regions and countries

FREIGHT TRANSPORT					
	CHINA	EU-28	JAPAN	RUSSIAN FEDERATION	UNITED STAGES OF AMERICA
billion tkm	2012	2012	2012	2012	2011
Road	5953.5	1692.6	210.0	249	2038.9
Rail	2918.7	407.2	20.5	2222	2649.2***
Inland waterways	2829.6	150.		61	464.7
Oil pipeline	317.7**	114.8		2453	968.6
Sea	5341.2	1401.*	177.6	45	263.1

*(domestic / intra EU-28); ** oil and gas pipelines; *** Class I rail.

Source: *adapted from EC, 2014*

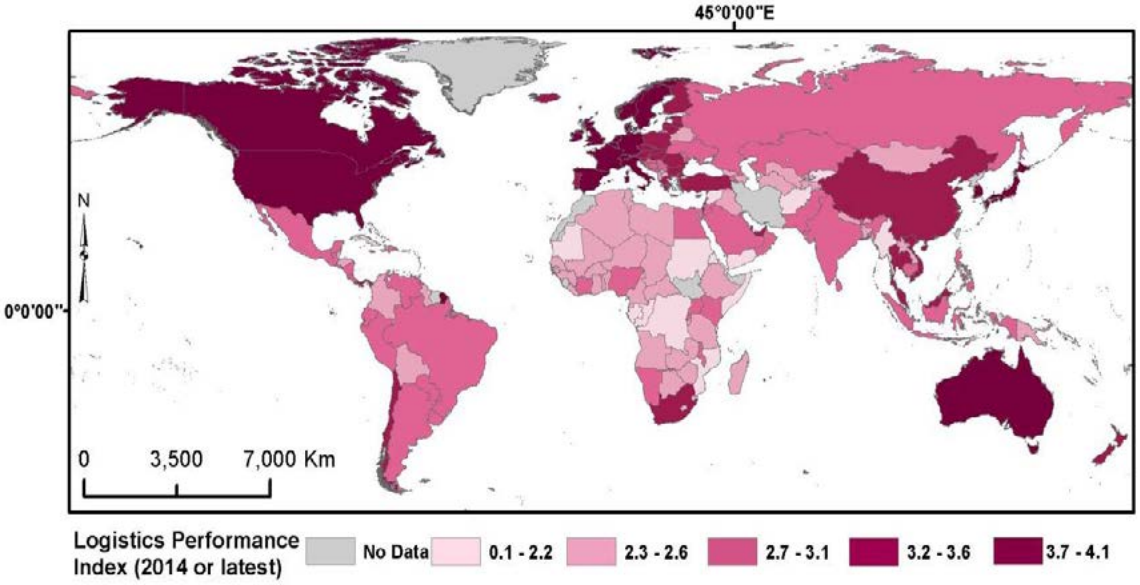
Intraregional trade has always been less important in intra-Latin American trade than in Europe (i.e. within the European Union), but since the foundation of the Latin American Integration Association intraregional trade in South America in particular had more than doubled its shares up to the year 2000. The total intraregional trade in South America amounted to 85.4 billion current US dollars in 2010. The total value of intraregional trade has, therefore, increased 2.9 times since 2000. The volume of trade (tons) in the region increased from 60 million tons in 2000, reaching a level of 64 million tons in 2010. Over 75 per cent of the overall trade of Brazil, Chile, Colombia and Peru was with markets outside the region in 2010. Bolivia, Paraguay and Uruguay have the greatest share of intraregional trade in terms of value in 2010. Maritime transport remains the most important mode in terms of volume and value in intraregional trade, with a share of 60.1 per cent (volume) and 46.1 per cent (value) respectively, followed by road transport with 34.6 per cent (volume) and 41.8 per

[33] http://data.worldbank.org/indicator/IS.RRS.GOOD.MT.K6; http://data.worldbank.org/indicator/IS.ROD.GOOD.MT.K6

cent (value). Air freight transport is only of relevance in terms of value, at 8.8 per cent (value) of all intraregional trade. [34]

International trade also depends on the efficiency and reliability of border crossings. Border controls including customs can be costly and time and resource consuming. Figure 3.14 provides data on the efficiency of border crossing, based on the World Bank's Logistics Performance Index (LPI). It appears that a dedicated effort is required to improve efficiency across the board, as many countries (mostly in South-eastern Europe, the Caucasus, Central and East Asia and Africa) show below average scores. Such border crossing inefficiency may hamper economic development by making business less attractive. In comparison, the relatively high LPIs of most EU countries demonstrate the usefulness of international cooperation in the form of agreements and other practices.

Figure 3.14 Global distribution of the Logistics Performance Index 35 (1-low to 5-high)



Source: World Bank [36]

The cost of land transport in the UNESCWA region is relatively low in comparison to the rest of the world due to low fuel prices and cheap labour. Even the unofficial costs of goods transportation by land are low in comparison to other regions. However, these low costs are countered by the long delays at borders which increase the overall costs. A recent survey of costs, time and distance on international corridors in the Arab region between 2012 and 2013, indicated that trucks average 48 per cent of the trip time at the border in the League of Arab States (LAS) corridor—includes Iraq, Jordan, Kuwait, Lebanon, Oman, Libya, Qatar, Saudi Arabia, Syria and Yemen.

[34] Wilmsmeier, G. and Guidry, L. (2013). The Evolution of Modal Split for Goods Transport in South America. Bulletin FAL Issue 325, no. 9/2013, ECLAC, Santiago, Chile.

[35] The Logistics Performance Index of the World Bank assesses the efficiency of the customs clearance process.

[36] Information from a large number of World Bank surveys, conducted in partnership with academic and international institutions and private companies/individuals engaged in international logistics; the 2009 surveys included more than 5,000 country assessments by nearly 1,000 international freight forwarders. Respondents rated the speed, simplicity and predictability of a custom clearance process from 1 (very low) to 5 (very high). Respondent scores are averaged across all respondents. Further details on the survey methodology can be found in Arvis et al. (2010).

Table 3.3 shows that the average speed of trucks on the LAS corridor is around 12 km/h, a low speed compared to 15km/h for the Economic Cooperation Organization (ECO) corridor through Afghanistan, Azerbaijan, Kazakhstan, Kyrgyzstan, the Islamic Republic of Iran, Tajikistan, Turkey and Turkmenistan.

Table 3.3 Comparison of transport in countries of the League of Arab States and countries of the Economic Cooperation Organization

	LAS (NELTI[37] 4)	ECO (NELTI 3)
Average Speed per trip	11.8 km/h	14.6 km/h
Average Distance per day	283 km	352 km
Average wait/queue at borders	48 per cent of total time trip	17 per cent of total time trip
Average Unofficial payment	24 USD	718 USD

Source: IDB-AULT-IRU, 2013

3.3 Challenges and Best Practices for Transport Accessibility

3.3.1 Individuals and Households

In passenger transport, improved accessibility promotes mobility and, thus, better access to education, food, health and employment. A decade ago, a study of the impacts of low transport accessibility was carried out in the United Kingdom (Social Exclusion Unit, 2003). The study found that: (a) lack of transportation was an employment barrier for 38 per cent of jobseekers; (b) 1.4 million individuals did not seek medical assistance due to transport access problems, over a 12-month period; (c) among people without access to a private car, 16 per cent had difficulties accessing a supermarket (compared to 6 per cent of the total population) and 18 per cent had difficulties meeting friends and relatives (compared to 8 per cent in the total population); and (d) 45 per cent of the respondents said that, in their opinion, the most serious transport problem was the inadequate public transport. National and local initiatives were developed to deal with these issues, including increased funding for rural and urban bus services, integration of routes and new ticketing systems, as well as a transport schemes to support access to work (UNECE, 2012).

Improving accessibility is a challenging task. In rural areas, investment for expanding/upgrading the transport network is scarce, whereas, at the same time, expanding rural transport networks might have significant environmental impacts. In urban areas, the lack of space constrains expansion of and/or structural changes in the transport network; moreover, the environmental and health impacts of an expanding urban transport network may be very significant. Traffic congestion is an increasing problem, particularly for fast industrializing non-OECD countries. For example, many urban areas in Malaysia are frequently faced with severe traffic congestions and associated efficiency losses (idle road time), particularly in areas where increased private motorization couples with constraints in traffic capacity and limited space availability for further transport network expansion. In such cases, the promotion of public transport and/or alternative transport modes appears to be the only sustainable solution (Chee and Fernandez, 2013).

[37] IRU New Eurasian Land Transport Initiatives

Establishing and operating a community bus service in Sri Lanka[38]

In 1998, a pilot project was implemented in Sri Lanka to assess the feasibility and capacity of a village community to manage its own community bus service. The bus service is still in operation, despite the project implementing agency withdrawing its support about six years after the service was established. One of the indirect impacts of the project was an improvement of a rural access road, which resulted in a number of similar rural transport projects which drew on the experiences of this project.

The target group of the project, the 3,500 (at project start) inhabitants of Kosgala, Kitulpe and Halpe villages, is situated 13 km north-west and 6 km south of the closest major settlements where they can access markets for their agricultural products, purchase consumer goods and access health, education, police or postal service. In 1996, the only public transport available for reaching the major settlements was a 4-6 km walk away.

The outcome of the project secured the following benefits for the inhabitants of the three beneficiary communities:

- *Access to education*

  Students and teachers have a regular and timely bus service facilitating access to regular and extracurricular education activities.
- *Access to healthcare*

  Inhabitants have dependable and scheduled transportation to access clinics and seek medical assistance or in order to visit hospitalised family members.
- *Meeting economic and other daily needs*

  Easier access to markets where the target population engages in trade and procurement of goods. Shop keepers enjoy savings in cost and time spent on public transportation, and transport goods with greater ease. As the population no longer needs to walk 4-6 kilometres to reach public transport, the surplus time is used, instead, for leisure or additional production, leading to an improved quality of life for residents of the three villages.
- *Improved road quality as an added value and decreased cost of hired private transport as a result of market mechanisms*

Similarly, a rapid decline in bus and rail use in many Chinese metropolitan areas due to large-scale suburbanization has driven a rapid expansion of private motorization, leading to higher traffic congestion and air pollution, and reduced traffic safety. Presently, many Chinese cities consider using the concept of Transit-Oriented Development (TOD) to lead urban growth into a more sustainable pathway. A recent study in Dalian (a coastal city of a population over 6 million and a long tradition in official TOD public transport planning), indicates that before pursuing TOD policies, other Chinese cities should meet some critical conditions—such as pedestrian-friendly urban design, high quality transit services and good transport governance (Mu and De Jong, 2012).

The diagnosis and prognosis for the long-term sustainability of urban transport depends on the region. In West Africa, 'paratransit'[39] in its various shapes constitutes a strong transport component, which, however, is difficult to regulate/organize. Designing sustainable schemes for fixed-route mass public transport is hampered in a significant part of the West African urban populations by the gap between public transport costs and income levels. In comparison, there have been large investments in mass public transport systems in the North African urban areas (Godard, 2013).

In some South African cities, public transport transformation projects have been initiated which in most cases ultimately envisage replacing 'paratransit' operations with formal transport systems. Complex and lengthy negotiations with existing operators as well as budget constraints are likely to delay or even block any total transformation. As a result, South African cities are likely to depend on a 'hybrid' public transport system that combines both formal and 'paratransit' operators for decades (Ferro et al., 2013).

[38] Further information about the project can be found in "*Transport and Communications Bulletin for the Asia and the Pacific*" no. 84, 2014

[39] Paratransit is an alternative mode of flexible passenger transportation without fixed routes or schedules, normally using minibuses and or taxi sharing. Paratransit services can be operated by public transit agencies, community groups, non-profit organizations, and private companies or operators.

A widely-accepted notion in both developing and developed economies is that the distribution/location of the mass-transport (transit) infrastructure controls the distribution of publicly funded benefits to urban populations. An equitable distribution would require policies that target substantially improving transport accessibility and travel times for the socially and economically disadvantaged sections of the population (see e.g. Foth et al., 2013).

Generally, improving transport accessibility and consequently, achieving sustainable transport, requires the implementation of innovative/creative policies and solutions. It appears that it could be beneficial if the focus of such policies would shift from plans/projects responding to the existing trends (reactive approach), to plans/projects attempting to modify those trends so that they can be addressed in a more innovative, efficient and cost-effective manner (pro-active approach). In this context, there have been efforts to identify challenges, try new approaches and share experiences, ideas and 'best practices' (see e.g. Mitric, 2013).

Rural Ambulance Services in India: States of Karnataka and Tamil Nadu[40]

The National Rural Health Mission in India funded a nationwide initiative to support a rural ambulance service – the "Dial 108 service". This was largely adopted from a not-for-profit organization, the Emergency Medical Research Institute which had initiated 108 services early on. The aim is to extend universal access to basic and advanced life support services to those living in rural areas.

One of the key objectives is to reduce maternal, infant, and child mortality by transporting those who need emergency medical attention within the 'Golden Hour'. Emergency Response Services transports pregnant women, infants, children, trauma (accidents, cardiac arrest and others) and other patients, and provides referral transport (inter-facility transfer).

As a result of the programme, the annual child and maternal mortality rates decreased by between 4 and 11 per cent in the two States, thus contributing towards efforts dedicated to achieving progress in MDG indicators.

The case study demonstrates the usefulness of the Public-Private Partnership model in merging technology, management, skill-building, funds and political will, and offers useful suggestions for setting up low-cost emergency medical transportation services for the rural population, which can also serve urban areas, both in India and in other countries.

One of the tasks at hand to address the problem is the recording and analysis of up-to-date information directly relevant to transport accessibility (e.g. road and rail density, time series of freight and passenger transport volumes, distribution and efficiency of intermodal nodes, the Rural Access Index). The exercise should be undertaken at the international level, using common, user-friendly platforms and analysis tools. Moreover, there is a necessity for new initiatives that study new approaches, both from the theoretical perspective and as case studies. At the same time, regions/countries that do not perform well in the traditional accessibility indicators (e.g. the RAI) should assisted in upgrading their systems to achieve an acceptable level; otherwise, these regions/countries will be left behind in the race to improve human development.

There are numerous examples of good practices associated with increasing the transport accessibility of individuals with special needs. For instance, the Linz's (Austria) 'barrier-free travel (Ungehindert mobil) for individuals with special needs' project created a transport system friendly to individuals with special needs by a widespread installation of wheelchair ramps, designated spaces in public transport and ground markings to assist individuals with impaired vision, and the availability of public transport maps and timetables in Braille. In another example, an adequately equipped and staffed waiting room for people with impaired hearing was set up in the main train station of Düsseldorf (Germany) in 2007 (UNECE, 2012). Analysis of the challenges and efficiency of such efforts, as well as the dissemination of the lessons learned can provide valuable insights into the different approaches to improve transport accessibility.

[40] Further information about the project can be found in "*Transport and Communications Bulletin for the Asia and the Pacific*" no. 84, 2014

World Bank support in Armenia - 'Lifeline Roads Improvement Project'

The project was initiated in July 2013 with financing of US$ 146.6 million from the World Bank. The World Bank also advised on road construction standards, the improvement of road safety, the enhancement of the sustainability of road financing and management, the adoption of new road designs, maintenance technologies and approaches. A US$ 40 million loan was also provided to rehabilitate 190 km of roads in rural Armenia, where low rural access hinders the transport of crops to markets, thus resulting, in some cases of a loss of at least 40 per cent of the harvest. The project also directly impacted employment, as its total job impact (direct and indirect) has been estimated to be 19,000 person-months of employment equivalent.
www.worldbank.org/en/country/armenia

It appears that issues related to transport accessibility for individuals are of paramount importance for the sustainability of transport and require a multi-level approach. As a first step, relevant, up-to-date information should be collated in a user and analysis-friendly format at the international level, involving as many countries as possible. In the UNECE region, the UNECE statistical platform—which provides information about national transport infrastructure and allows countries to compare/evaluate relevant development, identify problems, raise awareness and share ideas and practices—could be utilised/expanded and linked with other relevant transport information platforms to meet this challenge. It should be also noted that cross-cutting issues, such as transport, environment and health, should be considered as well (see e.g. The Transport, Health and Environment Pan-European Programme – THE PEP[41]), as they are likely to have large impacts on the assessment and planning options of transport accessibility.

3.3.2 Access to International Markets

International transport accessibility is a key factor for the attractiveness of an economy. It facilitates a more efficient and cost-effective movement of goods and people, increases competitiveness and attracts human and economic resources, leading to the achievement of a 'critical mass' of business activities and knowledge. Nevertheless, accessibility to international markets presents its own challenges in addition to those mentioned above.

Firstly, improved connectivity through 'strategic long-distance links' should be considered and planned. These links, which can promote cooperation, trade and engagement in an international economic environment and allow for exchanges of ideas/practices, should also involve integration of transport modes that could enable connectivity/intermodality between the different inland transport modes. Furthermore, the international nature of the strategic long distance links requires international infrastructure agreements covering all inland transport modes, such as road, rail, inland waterways as well as combined transport. Such agreements reinforce relationships between international trade partners through coordinated plans for the construction/development of international transport infrastructure, built under compatible technical standards.

Several important international inland transport infrastructure agreements are in place in Europe: such as the 1975 European Agreement on Main International Traffic Arteries (AGR), the 1985 European Agreement on Main International Railway Lines (AGC) and its Protocol, the 1991 European Agreement on Important International Combined Transport Lines and Related Installations (AGTC) and its Inland Waterways Protocol, and the 1996 European Agreement on Main Inland Waterways of International Importance (AGN) (UNECE, 2012). UNECE administers these international agreements, UNECE as well as carrying out supplementary, subregional infrastructure projects in collaboration with participating

[41] See www.thepep.org/en/publications/THEPEP.assessment.en.pdf)

countries: the Trans-European North-South Motorway (TEM) project[42], the Trans-European Railway (TER) project[43] and the Euro-Asian Transport Links (EATL) project[44]. The main objectives are facilitating road traffic in Europe as well as developing an efficient international road, railway and combined transport system in the UNECE region. The TEM and TER projects form the backbone of the Pan-European Road Corridors and are linked to the Trans-European Transport Network-TEN-T projects of EU.[45] EATL is a joint undertaking between UNECE and UNESCAP with designated national focal points from 18 participating countries[46]; its main objective has been to identify main Euro-Asian road and rail routes for priority development and a large number of projects have been already evaluated/ prioritized in many participating countries.

BelToll – Belarus' electronic toll collection system
Built and operated by Kapsch, the Belarusian toll collection system boosts the country's attractiveness for international transit

The *Magistrale* no. 1 (M1) is the strategically most important road in the country of Belarus. As part of the E30 expressway, the stretch – of approximately 560 kilometres between Brest in the western part of the country and Orscha in the east – has been expanded into a highway. M1 links two key economic areas: the European Union and the Russian Federation. The fully electronic toll collection system of M1 enables smooth traffic flow along the route – and subsequently on other Belarusian roads. The toll collection is entirely automatic, and functions without any disruption of traffic or stopping of vehicles. Moreover, the collected revenues can be used for maintenance, modernization and expansion of the road network.

The most attractive route between Europe and the Russian Federation

The transit road through Belarus has become the most attractive route for transport between Europe and Russian Federation. With alternative routes being approximately 1,000 kilometres longer, the passage through Belarus saves time and contributes to a reduction in CO_2 emissions. Since Belarus is a member of a customs union with the Russian Federation and Kazakhstan, there are further logistical advantages. The reduction in transit time and fuel costs underscores the attractiveness of M1 in comparison to alternative routes – on which tolls are also collected.

These advantages are also reflected in the road's utilization. Around half of the traffic on the M1 is attributed to transit. The largest share of the vehicles comes from the Russian Federation (12 per cent), Ukraine (10 per cent), Poland (10 per cent) and Lithuania (7 per cent). Around 80 per cent of all vehicles have a total weight of more than 3.5 tons and only around 16 per cent weigh less than 3.5 tons. Five per cent of the tolls collected are attributable to buses. In summary, more than 200,000 vehicles have been registered by BelToll since its launch in July 2013.

A proven system

The BelToll system is based on a proven technology that is used in countries all over the world. In Europe alone, eight of the national "multi-lane free-flow" (MLFF) toll collection systems are already in daily use. The system consists of an On Board Unit (OBU) placed inside the vehicle which provides communications with the road-side infrastructure via DSRC (Dedicated Short Range Communication, or "microwaves" as commonly called). The vehicles pass through the toll collection points, and fees are calculated and charged automatically. Ninety such check points already exist in Belarus alone – found along its most important highways. Including M1, the network has a total length of 1,189 kilometres. Fifty-two customer service centres throughout the country provide road use contracts, lease out OBUs in return for deposits, and top up customer's credits. In Belarus, the launch was accompanied by a major information campaign, which is partly responsible for BelToll's high acceptance level in the country.

Financing and additional jobs

The BelToll system was commissioned in July 2013. The majority of the revenues flow into modernization and safety measures for the toll roads. This has an immediately visible impact. What is less obvious, but of great significance for the economic development of the country, is the fact that BelToll has created new jobs in Belarus. All of the approximately 150 employees are Belarusian citizens.
www.beltoll.by/

[42] See www.unece.org/trans/main/tem/tem.html

[43] See www.unece.org/trans/main/ter/ter.html

[44] See www.unece.org/trans/main/eatl.html

[45] See http://ec.europa.eu/transport/themes/infrastructure/index_en.htm. For the state of the TEN-T Priority Projects see http://tentea.ec.europa.eu/en/ten-t_projects/30_priority_projects/)

[46] The 18 countries of the Euro-Asian region were: Afghanistan, Armenia, Azerbaijan, Belarus, Bulgaria, China, Georgia, Iran (Islamic Republic of), Kazakhstan, Kyrgyzstan, Republic of Moldova, Romania, Russian Federation, Tajikistan, Turkey, Turkmenistan, Ukraine and Uzbekistan. At a later stage, Greece also joined the initiative.

In the UNECLAC region, several regional integration initiatives deal with the issue of transport infrastructure integration. Of particular interest is the Initiative for the Integration of Regional Infrastructure in South America (IIRSA), which since 2000 has coordinated the development of transport, energy and telecommunications infrastructure in the region. It has now become the technical arm of UNASUR—the Union of South American Nations, an intergovernmental organization that integrates the regional agreements, including the Common Market of the South (MERCOSUR) and the Andean Community of Nations. In December 2012, the total number of transport projects in the UNASUR/COSIPLAN/IIRSA portfolio was 474, with highway projects accounting for the largest share at 47.5 per cent, while multimodal projects accounted for the smallest share with 3 per cent (Sánchez and Tomassian, 2012).

Towards national and regional public policies on sustainable transport: Promoting integrated and sustainable policies on logistics and mobility in Latin America and the Caribbean

The fragmented and unimodal approach of national transport policies, characterized by an excessive focus on specific infrastructure projects and by a lack of a sustainable long term vision of the transport sector, are, to a large degree, behind the existing transport challenges in the region of Latin America and the Caribbean.

Improving and modernizing public policies dealing with freight and passenger transport issues is, therefore, an indispensable step in identifying and implementing concrete solutions which effectively address the gaps in terms of existing infrastructure and quality of its services in the context of globalized economy and the region's sustainable development goals.

Modern national and regional transport policies should be based on the advanced concepts of logistics for freight transport and of mobility for the transport of passengers. They also need to incorporate — from the start — some fundamental principles, to govern all policymaking steps, from determining the policy objectives to proposing, implementing and evaluating specific programmes, plans and actions.

One such principle is that of sustainability, i.e. striking the balance between the social, environmental, economic and institutional dimensions of sustainability. Another essential principle is that of integrality, which implies aligning the goals of transport sector with the national development goals, considering all technological and modal solutions available and ensuring the stakeholder's involvement in the development and implementation of the transport policies. The latter element is essential for accurately identifying and effectively resolving the causes behind inefficient transport services, high transport costs for goods and passengers and well as negative social and environmental externalities of the transport operations.

In this context, a major part of the analytical work of UNECLAC and technical assistance is dedicated to promoting the concept of 'integrated and sustainable policies on logistics and mobility', helping Governments and regional integration mechanisms reach a balanced approach to the logistics and mobility needs and respect the fundamental goals and principles of sustainable development. This work is mandated by the Presidential (under the Tuxtla Mechanism for Dialogue and Coordination) and Ministerial meetings in the Central American, Mesoamerican and South American region. Bringing together the efforts of researchers, practitioners and policymakers in the transport sector, it is expected to result in a regional strategy for logistics and mobility, marking a major step in making the transport sector more sustainable and in progressing towards the region's economic integration.


XII Cumbre
Mecanismo de Diálogo y Concertación de Tuxtla
COLOMBIA

XII CUMBRE DE JEFES DE ESTADO Y DE GOBIERNO DEL MECANISMO DE DIÁLOGO Y CONCERTACIÓN DE TUXTLA

DECLARACIÓN DE CARTAGENA

Los Jefes de Estado y de Gobierno de Colombia, Costa Rica, Guatemala, Honduras y México, así como los Vicepresidentes de Nicaragua, Panamá y República Dominicana, y el Canciller de El Salvador, integrantes del Mecanismo de Diálogo y Concertación de Tuxtla, nos hemos reunido en Cartagena de Indias, Colombia, el 26 de octubre de 2010, para celebrar la XII Reunión Cumbre de este importante foro mesoamericano, con el propósito de consolidar las relaciones entre nuestras naciones.

Convencidos que el Mecanismo de Tuxtla es el foro en el cual podremos avanzar el diálogo político, la cooperación económica, técnica y científica, y la cohesión social entre nuestras naciones,

Considerando que el objetivo primordial es alcanzar el bienestar de nuestros pueblos, a través del fortalecimiento de la democracia y la cooperación en la región mesoamericana,

Reafirmando que la democracia constituye un derecho y un valor fundamental compartido que contribuye a la estabilidad, la paz y el desarrollo de los Estados, y que su plena vigencia es esencial para la consolidación del estado de derecho y el desarrollo político, económico y social de los pueblos,

Conscientes de la necesidad de contar con políticas ambientales comunes y posiciones concertadas de cara a los grandes desafíos que en este contexto enfrenta la región y a escala global bajo un enfoque de responsabilidades históricas, comunes y diferenciadas,

Preocupados por amenazas y desafíos como la delincuencia organizada transnacional, el tráfico ilícito de armas, municiones y explosivos, el problema mundial de las drogas, el lavado de dinero, la corrupción, el terrorismo, la trata de personas, el tráfico ilícito de migrantes, el secuestro y la extorsión en general, incluyendo el de la población migrante, las pandillas delictivas y los delitos cibernéticos; peligros que generan un impacto negativo sobre la seguridad pública, la calidad de vida de la población, la gobernabilidad democrática, la estabilidad, el fortalecimiento institucional y el desarrollo económico y social de la región,

In 1999, a consensus was reached among UNESCWA member countries on the need to develop an Integrated Transport System in the Arab Mashreq (ITSAM), which aims to facilitate trade and transport between the countries of the region, in view of enhancing regional integration. The chief goals of ITSAM include reducing transportation costs, enhancing the exchange of trade and tourism in the region and facilitating multimodal transport. The Agreement on International Roads in the Arab Mashreq was developed under the umbrella of ITSAM and mainly aims at identifying an international road network which links the Arab Mashreq countries. It was adopted on 10 May 2001 and entered into force on 19 October 2003. It is worth noting that this Agreement is the first United Nations Treaty to

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be negotiated in UNESCWA. According to provisions of the Agreement, the length of the international road network is expected to reach 35,900 km. One of the direct advantages of the Agreement is that it has put in place a regional numbering system with sufficient flexibility to include potential members. As of 2013, the Agreement had been ratified by 13 UNESCWA member States. Based on national reports from 11 of the 13 ratifying countries, implementation was estimated at around 70 per cent at the end of 2012.

Also in ITSAM, the Agreement on International Railways in the Arab Mashreq aims at identifying an international railway network to link countries of the Arab Mashreq Region. It was adopted on 14 April 2003 and entered into force on 23 May 2005. The Agreement has been ratified by 11 countries in the region. Based on provisions of the Agreement, the length of the international railway network is expected to reach 20,896 km. UNESCWA countries have implemented the provisions of the Agreement with varying degrees of compliance. The rate of implementation averaged at over 70 per cent according to feedback collected in national reports received by the end of 2012. In individual countries, Yemen for example has 100 per cent implementation whereas Egypt has only executed 7 per cent of what was agreed.

Such initiatives are very significant in promoting international transport accessibility and, ultimately, transport sustainability. Nevertheless, additional efforts are required, particularly concerning the collation/analysis of spatial data (in Spatial Data Infrastructures), the strengthening of national capacities, the identification of network bottlenecks and missing links[47], as well as assessments of the criticality, sensitivity and resilience of indispensable components of the transport system (e.g. bridges and tunnels), and the sharing of experiences and 'best practices' (e.g. UNECE, 2012; UNECE, 2013).

Secondly, administrative bottlenecks, such as 'border crossings', may cause significant socioeconomic losses and affect the efficiency of logistics systems. As shown by the distribution of LPI (Figure 3.14), certain improvements are necessary in many regions. International agreements and cooperation are required together with the adoption of widely accepted/trusted uniform standards, in order to promptly identify goods and facilitate faster border and customs clearing. Increasing border efficiency can unlock the trade potential and enhance growth.

eTIR Pilot: Going Paperless

UNECE and IRU are partnering on the eTIR Pilot project, as a result of significant progress made in fully computerising the TIR process. eTIR Pilot is the paperless version of the TIR Carnet procedure. Guaranteeing Associations issue electronic TIR Carnets upon request to authorised TIR holders online, allowing them to send TIR Electronic Pre-Declaration (TIR-EPDs). This allows Customs authorities to assess risks in advance with enhanced IT risk management features for increased security and enforcement, thus expediting controls and substantially reducing border waiting times and transport costs. Applicable globally, including for intermodal transport, eTIR Pilot will be operational on one corridor between two (as yet undetermined) countries and four of their Customs offices to ultimately expand geographically, towards a permanent solution for all countries over the coming years, as it demonstrates its full feasibility.

Multilateral agreements on transport and border crossing facilitate international mobility of freight, vehicles and their drivers. The International Convention on the Harmonization of Frontier Controls of Goods (Harmonization Convention) aims to reduce the number and duration of all types of controls: for example, health reasons (medico-sanitary, veterinary, phytosanitary) or technical standard's reasons. It is applicable to all goods in import, export or

[47] See also www.unece.org/trans/ministerialitc70/search?q=bottlenecks

in transit in the 57 Contracting Parties. [48] The Customs Convention on the International Transport of Goods under Cover of TIR Carnets (*TIR* Convention), originally agreed upon for European transport, has been gradually expanded to other regions, including Central Asia, the Middle East, North Africa and Latin America. It applies to goods carried by road vehicles or containers, provided that a portion of the journey is undertaken by road. [49] Automation of the procedures is under way with, for example, the *e-TIR* project[50] which will facilitate customs-to-customs information exchange, as well as, establish an information management system, contribute to the improvement of goods transit operations and the security of the international supply chain. Other important Agreements include the Customs Convention on Containers[51] of 1972, the Convention on Customs Treatment of Pool Containers used in International Transport[52] of 1994 and the 1992 Customs Convention on the Temporary Importation of Commercial Road Vehicles (Carnet de Passage) [53] of 1956. Access to international markets also means that the international carriage of goods proceeds in safe, secure and pollution preventive conditions that are acceptable to all signatory countries; this is the main objective of certain multilateral agreements such as the European Agreement concerning the International Carriage of Dangerous Goods by Road (see also section 5.4), the Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be Used for such Carriage (see box "Transport of Perishable Foodstuffs" below). In addition, these Agreements contain harmonized requirements accepted by all Contracting Parties and provisions for mutual recognition of certificates, which contribute extensively, to the facilitation of the international transport of such sensitive goods.

In the United Nations, UNECE is a focal point for setting standards, recommendations and best practices for the facilitation of international trade. The Centre for Trade Facilitation and Electronic Business (UN/CEFACT) provides standards for efficiency and security of cross-border trade such as: the UN Layout Key for Trade Documents for the simplification of international trade and transport documents; the UN Trade Data Elements Directory (UNTDED, ISO 7372) for the standardization and simplification of trade data; and the UN Recommendation on establishing a Single Window concept and Recommendations on the use of code lists for trade information.[54] The Centre also develops international standards for the automation of information processing along the supply chains; the UN Electronic Data Interchange for Administration, Commerce and Transport [55] is the leading global standard for data interchange in the customs, transport and logistics sectors. The Centre is developing a set of e-Business standards including UN/CEFACT XML Message specifications[56] and the UN/CEFACT Core Component Library[57] which contains information on data and structures used in e.g. the Data Model of the World Customs Organization (UNECE, 2012).

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[48] Fifty-seven States and the European Union are Contracting Parties to this Convention. The Harmonization Convention of 1982 also establishes commonly agreed requirements for coordinated border management, including modernising amendments such as Annex 8 to the Convention that covers, among others, visa procedures for professional drivers, standardized weighing operations and vehicle weight certification, minimum infrastructure requirements for border crossing points, and provisions for monitoring border crossing performance. See www.unece.org/trans/conventn/harmone.pdf and http://ec.europa.eu/world/agreements/prepareCreateTreatiesWorkspace/treatiesGeneralData.do?step=0&redirect=true&treatyId=509.

[49] Sixty-eight States and the European Union are Contracting Parties to the TIR Convention. More than 40,000 operators are authorized to use the TIR system. The success of the TIR customs transit system is explained by its special features that offer transport operators and customs authorities a simple, flexible, cost-effective and secure customs system for the transport of goods across frontiers. See www.unece.org/tir/welcome.html

[50] See www.unece.org/trans/bcf/etir/welcome.html

[51] See www.unece.org/trans/conventn/ccc_1972e.pdf

[52] See www.unece.org/trans/conventn/poolcon.pdf

[53] See www.unece.org/trans/conventn/impcom-e.pdf

[54] See: www.unece.org/cefact/recommendations/rec_index.htm

[55] See: www.unece.org/trade/untdid/welcome.htm

[56] See: www.unece.org/cefact/xml_schemas/index.htm#2009B

[57] See: www.unece.org/cefact/codesfortrade/unccl/CCL_index.htm

Transport of Perishable Foodstuffs (refrigerated transport)

The Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be Used for such Carriage (ATP) intends to ensure that deep-frozen and chilled foodstuffs are transported efficiently, safely and hygienically and do not pose a danger to human health. It also helps countries avoid the wastage of food through spoilage caused by poor temperature control during carriage.

The ATP Agreement provides common standards for temperature-controlled transport equipment such as road vehicles, railway wagons and sea containers (for sea journeys under 150 km) and the tests to ensure the insulating capacity of the equipment and the effectiveness of thermal appliances. New ATP equipment is required to undergo a test of its K coefficient, to prove that heat losses from the inside to the outside of the body meet the values defined by ATP. All 49 Contracting Parties to the Agreement – including non-UNECE countries (Morocco, Saudi Arabia and Tunisia) – are required to recognize ATP certificates for equipment that conforms to the standards issued by the competent authorities of other Contracting Parties.

The ATP lists the products that can be carried under ATP and sets the warmest possible temperature of the load. Fruit and vegetables unless processed are, as yet, outside the scope of ATP.

ATP applies if the point at which the goods are loaded and unloaded are in two different States and the point at which they are unloaded is situated in the territory of a Contracting Party. In other words it applies even if the State where the goods are loaded is not a Contracting Party. Some countries also use ATP as the basis for their domestic legislation for temperature-controlled transport.

The Inland Transport Committee Working Party on the Transport of Perishable Foodstuffs (WP.11) serviced by UNECE is the body that ensures that the technical requirements of ATP are updated to take account of technological progress or new political concerns and proposes amendments to Contracting Parties to that effect. For example, the transport of chilled and deep-frozen foodstuffs has an impact on global warming on a number of levels. Firstly, the containers or refrigerated vehicles are insulated using foams. The refrigerated and chilled-transport industry is searching for new insulating foams and blowing agents that are both safe for the ozone layer and highly effective. Secondly, energy efficiency is a major concern because of the costs of fuel and the harmful emissions released. In order to save energy, it is essential to measure fuel consumption. In this regard, the WP.11 has added to the ATP Handbook details of a procedure for determining the fuel consumption of vehicle-powered refrigeration units. Thirdly, the insulating capacity of isothermal transport equipment (K value) has a direct influence on the final CO_2 emissions of a thermal engine since a reduction in this capacity must be compensated by a direct increase in the working time of the engine. The influence of ageing on thermal capacity is a subject of frequent discussion by WP.11. The ATP defines the method that should be used when measuring this thermal capacity.

Energy-labelling schemes or minimum-efficiency standards already exist for many appliances such as domestic refrigerators or supermarket display cabinets. These schemes have been shown to push the market towards more energy-efficient products. Proposals have been made to extend these schemes to the refrigerated transport industry.

WP.11 keeps abreast of all developments in this field and discusses how environmental aspects can be incorporated into the ATP so that it continues to meet the challenge of sustainable development.

Thirdly, there are particular challenges involving landlocked countries, where border crossing issues may have significant effects. As maritime transport is the dominant mode for international transport, the access of landlocked countries to international market depends on efficient border crossings, in addition to the improvements in inland transport infrastructure, in order to engage in international trade. In these cases, seaport-hinterland connections are particularly important, as inefficient hinterland links may lead to increased supply chain costs and adverse environmental impacts (e.g. Roso et al., 2008; UNECE, 2010). Regional and subregional cooperation in developing efficient international transport links could significantly improve accessibility.

There are several examples of plans/programmes than have increased international transport accessibility. One example of subregional cooperation of landlocked Central Asian countries is the Special Programme for the Economies of Central Asia (SPECA) Project Working Group on Transport and Border Crossing (PWG-TBC). Since 1998, Central Asian countries, with the support of UN UNECE and UNESCAP, have established a subregional working group for transport infrastructure development and facilitation of border crossing and transit procedures. The SPECA PWG-TBC priority programme areas are defined to promote transport cooperation and support economic development in the SPECA subregion.[58]

[58] Additional information can be found at www.unece.org/trans/main/speca/speca_about.html

Others include the optimal routing from Austria to Hamburg, the Bosphorus Europe Express, the rail freight corridors of the European Union, the Uzen–Gyzylgaya–Bereket–Etrek–Gurgen railway, the Beijing-Hamburg rail service, and the Canada's Asia-Pacific Gateway and Corridor Initiative (for more details on these plans/programmes, see UNECE, 2012). Experiences from such programmes can be used to identify good practices.

3.4 Concluding Remarks

Transport system performance is often evaluated on the basis of infrastructure density and travel speeds and, thus, favours faster modes and quantitative improvements over slower modes and qualitative improvements such as increased passenger convenience and comfort. Simultaneously, traditional transport statistics frequently overlook important transport components, such as the short and non-commuting trips and the non-motorized stages of motorized trips. Such premises may result in policies and systems that undervalue/ignore alternative options in improving accessibility.

Generally, traditional evaluation and planning practices reflect traffic-based (vehicle movement) and/or mobility-based (people and freight movement) analysis and are associated with solutions favouring the accommodation/improvement of an ever-increasing flow of freight and passengers; this is despite the diminishing benefits and increasing costs of the ever-expanding transportation networks and freight and passenger traffic (e.g. Litman, 2012). Such solutions also tend to promote road transport over other forms of transport accessibility, with little consideration for the promotion of alternative transport modes, improved mobility management, intermodality, better and swifter information provision for transport users and more efficient land use.

A paradigm shift in transportation planning/management has been proposed — one that would move the focus from mobility-oriented analysis, i.e. the evaluation of the transport system performance on the basis of the quantity of transportation — to accessibility-oriented analysis that places people at the centre of the transportation system and considers additional options, such as the introduction/improvement of alternative transport modes, intermodality, incentives to change travel behaviour and more efficient land use (Cambridge Systematics, 2010; Litman, 2012).

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4. Affordability: Affordable Mobility for Individuals and Societies

Transport is critical for a well-functioning society; it facilitates production and distribution of goods as well as human mobility allowing people to take part in social and economic activities and access basic services, such as health and education. At the same time, it costs money and, thus, transport accessibility is controlled by the costs (and returns) of the passenger and freight transport services as well as by the sustainability of the investments associated with the upgrading and/or planning and construction of transportation infrastructure. This chapter takes a closer look at transport affordability—another crucial dimension of sustainable transport—provides an overview of factors that impact transport affordability for individuals and societies, discusses challenges and perspectives at the global and regional level, and highlights a number of best practice cases from different regions of the world.

4.1 Transport Affordability for Individuals and Households

Transport affordability refers to the financial ability of people and societies to access adequate transport services without compromising their ability to purchase other basic goods and services, such as food, housing, education and health. It can be assessed from several perspectives, for example, the level of private motorization; the costs of owning, driving and parking private vehicles; as well as the quality and cost of alternative transport modes such as public transport and cycling.

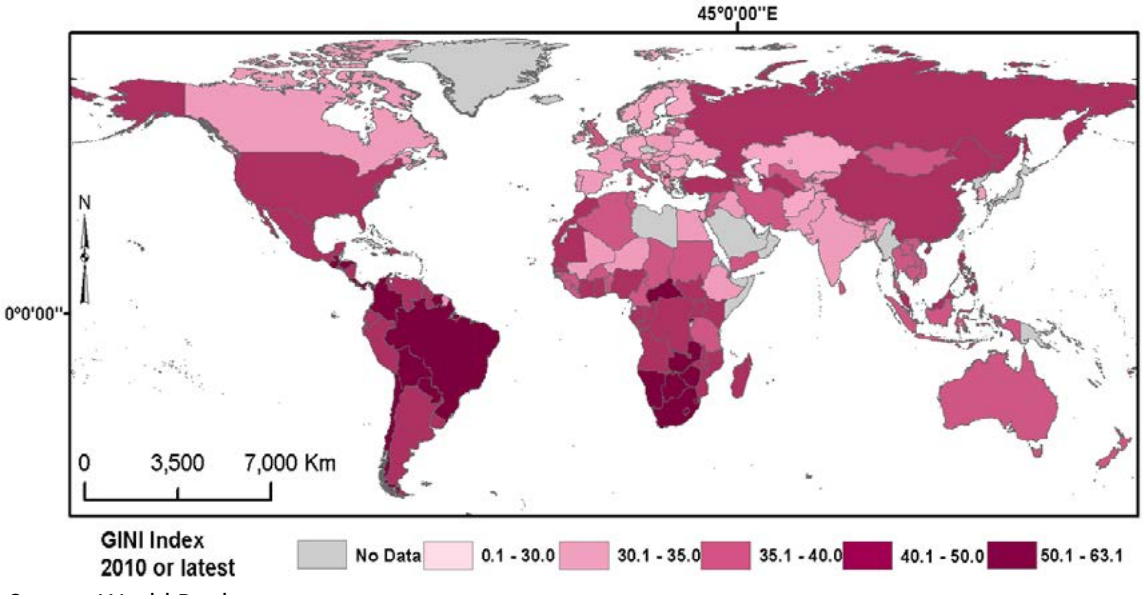
A clear relationship exists between income and transport affordability: individuals/households with high incomes can spend more on transportation to achieve adequate mobility which, in turn, can provide them with improved market access and economic opportunities and, ultimately, with a higher income potential. In comparison, individuals/households who cannot afford adequate mobility may be marginalised both economically and socially. Lower income individuals/households tend to also be more heavily impacted by changes in the cost of public transport services, since they tend to be more frequent users than individuals/households with higher incomes. At the same time, private motorization exposes users to fuel price volatility, is resource-intensive and requires costly infrastructure.

Affordable access ⇨ Better mobility ⇨ Better opportunities for work and social services	
Key challenges	• National and local government capacity to offer affordable public transport is diminished by lack of availability of public funds • High income inequality is an omnipresent issue in all regions • Transport expenses represent a high proportion of household expenditures of the middle class and even more of the poor • Low-income groups are particularly dependent on the availability of public transport
Role of the United Nations	• Promote intergovernmental platforms for sharing of best practices, such as the Inland Transport Committee (ITC) • Provide statistical and analytical information that assists governments to recognize and deal with affordability of transport for individuals

4.1.1 Affordability Factors

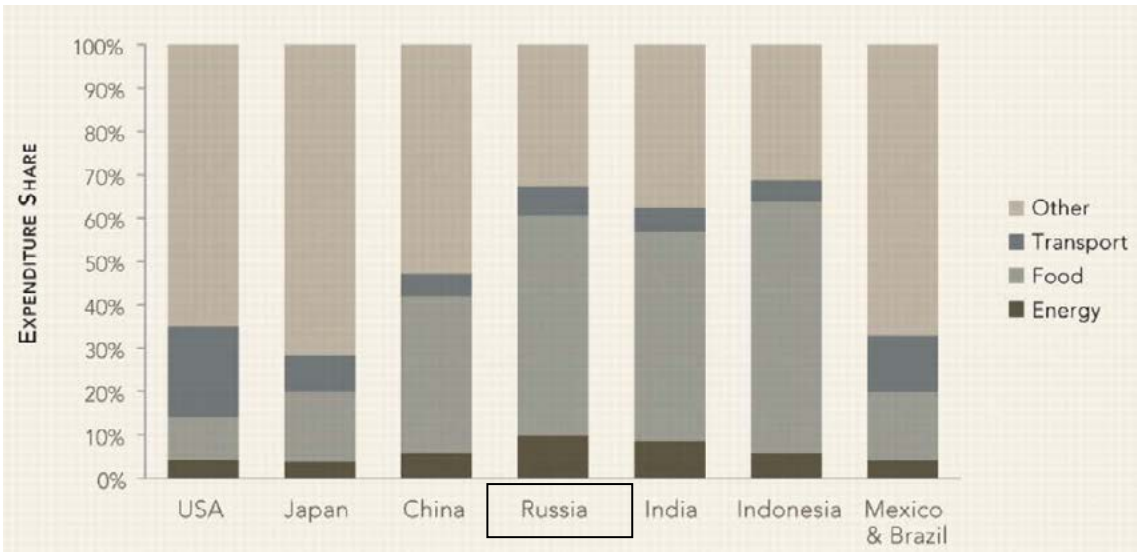
The affordability of transport services depends on income and pricing. Generally, transport services tend to be more affordable for the citizens of countries with relatively low income inequalities compared with those of countries with high income inequalities. In this context, the global distribution of the Gini index, which measures the deviation from a perfectly equal distribution of income or consumption expenditure among individuals/ households within an economy, can provide an initial assessment of transport affordability at a global level (Figure 4.1).

Figure 4.1 Global distribution of the Gini index (2010 or latest available data)



Source: *World Bank*
Note: *a Gini index of a 0 represents perfect equality, whereas an index of a 100 implies absolute inequality.*

Figure 4.2 Simulated shares of household expenditures, 2010

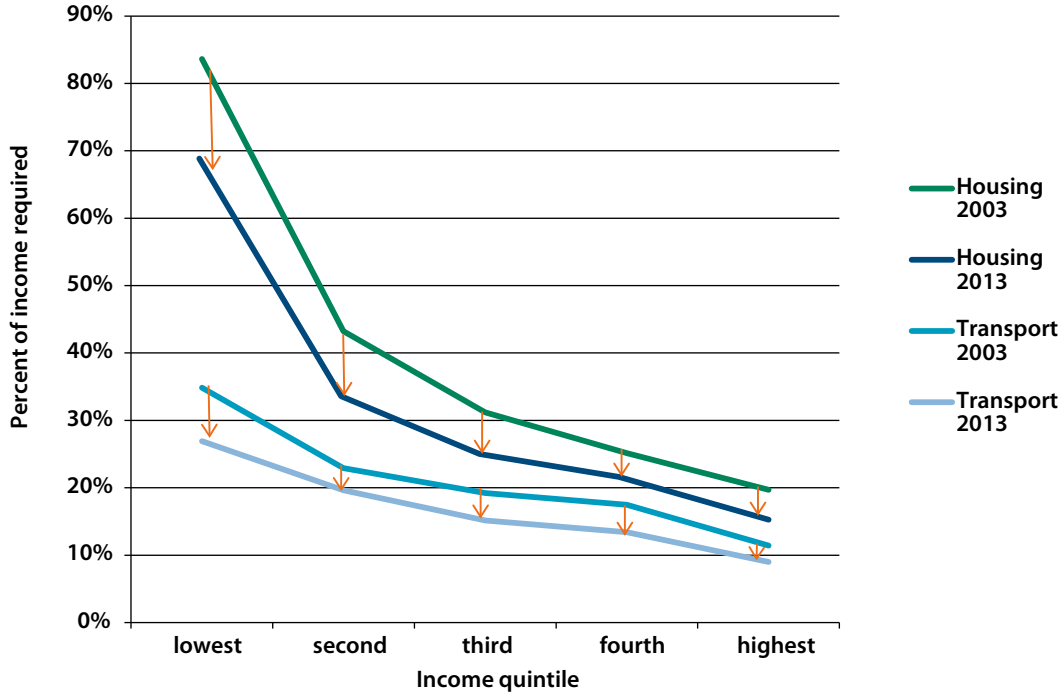


Source: *O'Neill et al., 2010*

The index appears to be high in many regions, particularly in Africa, Latin America and parts of Asia, whereas in Europe and North America income inequality appears to be less pronounced. Other determinants for individuals/households include the pricing of other basic goods and services, rural or urban individuals/households location, the presence of adequate/affordable public transport services, and the existence of transport policies, plans and schemes that support transport affordability for the poorer population (e.g. transport subsidies). Figure 4.2 shows the household expenditure share of four categories of basic goods and services in different countries. It appears that transport costs command a larger share of expenditure in countries where the expenditure share of, for example, food is low.

Individual and social factors also influence transport affordability. Generally, individuals/households with low incomes spend a much greater share of their income on food than those with higher incomes (O'Neill et al., 2010); they also tend to spend a greater share of their income on transportation (Figure 4.3). Commuters have greater transportation requirements than people working close to home, whereas elderly people and/or people with special needs require more expensive transportation services. Transportation affordability also depends on planning. For instance, current transport planning tends to favour private motorization at the expense of more affordable transport modes (e.g. walking, cycling and public transit) and does not sufficiently consider efficient land use, i.e. of the development of affordable housing in accessible locations (e.g. Welch, 2013).

Figure 4.3 Housing and transport expenditures by income quintile on the basis of United States of America household budget data, 2003 and 2013/2014



Source: United States Bureau of Labor Statistics [59, 60]

[59] The report of 2003 is available at www.bls.gov/cex/csxann03.pdf

[60] July 2013–June 2014 available at www.bls.gov/news.release/cesmy.nr0.htm

Transport affordability depends also on location which is controlled by different factors in urban or in rural settings. Generally, rural areas are less dense and, thus, rural households tend to depend more on private motorization. McCann (2000) found that households in less dense areas devote on average more than 20 per cent of their expenditure to transportation; in comparison, households in communities with more efficient land use spend less than 17 per cent on transportation.

In past decades, demand for passenger travel has developed roughly in line with per capita GDP and population growth, but evidence now suggests a weakening of this relationship in advanced economies. Private motorization (car) travel volumes in some countries have stopped growing, despite continued GDP growth. Van Dender and Clever (2012) suggested that such trends could be the result of many interacting factors, such as ageing populations, movement to urban centres where more transit options are available and particular policy interventions, such as carbon emissions mitigation and traffic congestion management.

In urban settings, transport can be provided by various transport modes. In recent decades, however, urban transport planning has largely favoured private motorization over mass public transport systems and/or alternative transport modes. This has been particularly the case in suburban settings, where transport is mainly provided by private motorization (Dodson and Sipe, 2006; Lau, 2011). Studies of the transportation costs in metropolitan areas of the United States of America have found that transportation costs average 19 per cent of the total household expenditure, ranging from about 10 per cent in multi-modal communities to about 25 per cent in communities that are dependent on private motorization (e.g. Lipman, 2006). It follows that improving mass public transport systems can improve transport affordability in many urban areas.

Nonetheless, mass public transport presents challenges. Firstly, public transportation is highly subsidized. The presence of public subsidies may affect user willingness to pay for public transport services and, thus, may affect (reduce) fare revenues. A recent empirical study (Drevs et al., 2014) found that public transportation companies and financing institutions should be transparent about the existence and level of subsidies in order to allow crowding-in effects in the willingness to pay for public transportation. Secondly, improvements in transport accessibility in urban and suburban settings do not necessarily translate into improved affordability. For example, the Singapore Government has invested heavily in a world-class mass transport system (hub and spoke network) that has improved accessibility and reduced travel times between the new towns/suburbs and the city centre. The same is true in and around London where the public transport network is very extensive and offers high frequency albeit with high fares and expensive parking facilities at interchanges. To alleviate this, a number of employers provide their staff with interest free annual season ticket loans to cover the cost of public transportation. The cost is then repaid through the employee's monthly salary. Lau (2011) found that concessions should be offered to encourage the use of networks by low income citizens.

Finally, it should be noted that the general economic environment could also affect transport affordability. In Greece, the economic crisis that started in late 2008 and is still in progress, has led to a particularly harsh austerity programme (under the joint auspices of the International Monetary Fund (IMF), the European Union and the European Central Bank) aimed at primary budget surpluses. The programme has dramatically increased fuel taxes (about 82 per cent for unleaded petrol and 31 per cent for diesel) which has, along with high oil prices and the decline in GDP, had serious impacts on road traffic demand and transport affordability (Musso et al., 2013).

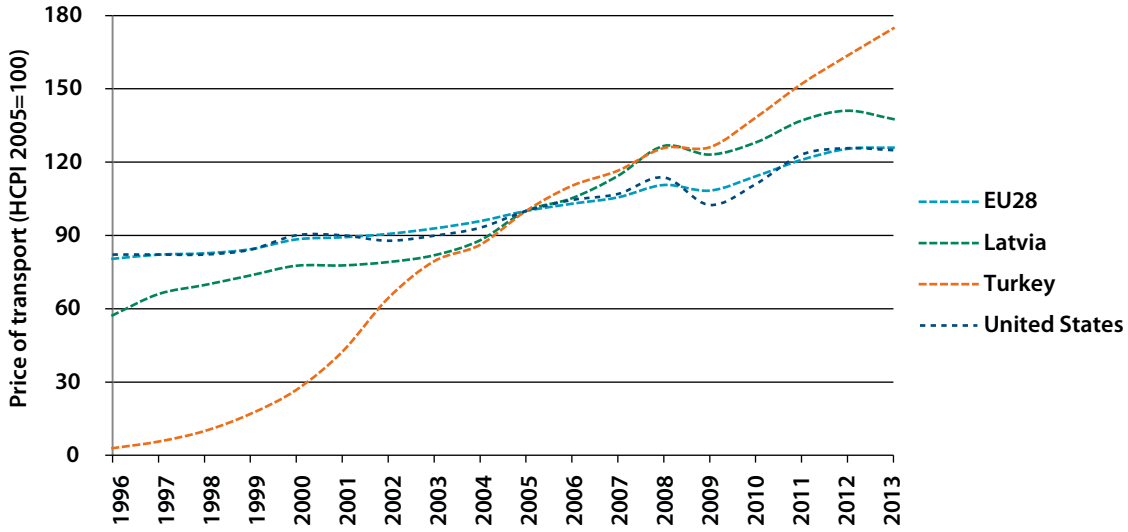
By 2013, the impact of these circumstances on the Athenian public transport system lead to decreased State subsidies for public transport (50 per cent), increased fare prices (40 per cent), a decrease in passenger volume (26 per cent) and an increase in fare evasion (42 per cent). In order to address the mounting challenges, the Athenian transport authority took numerous measures, including a full corporate rebranding, development of a mobile ticketing system, introduction of reduced fare prices and new products (5-day ticket, 3/6-month travel card) and various of public outreach actions. The measures lead to an increase in passenger volume, a first since 2008, of 1.4 per cent in 2014.

4.1.2 Trends

Figure 4.4 shows the development of the transport price index (Harmonized ***Index*** of Consumer Price (HICP))[61] for selected UNECE areas in the period 1996–2013. It appears that although the EU-28 member States (on average) and the United States of America have experienced slow development in transport prices, other countries have had much higher increases.

However, when the rate of transport price increase in, for example, the EU-28 countries is compared against the inflation (e.g. Figure 4.5), it becomes clear that transport has become more expensive in real terms during this period. In contrast, although the annual rate of increase of transport prices in, for example, Turkey has been significant, the higher rate of inflation during the same period (30 per cent annual average) suggests that transport has become cheaper in real terms.

Figure 4.4 Development of the price of transport in selected countries, 1996-2013



Source: Eurostat [62]

In the EU, passenger transport prices rose faster (at 3.6 per cent annually) than the rate of inflation (2.1 per cent annually) in the period 2003–2013 (data adjusted for new members States from 2004, 2007 and 2013). The highest average annual price increases (3.8 per cent) were recorded for railway, followed by road and air transport services, with 3.7 and 3.3 per cent, respectively. In the same period, the costs of private motorization increased at lower

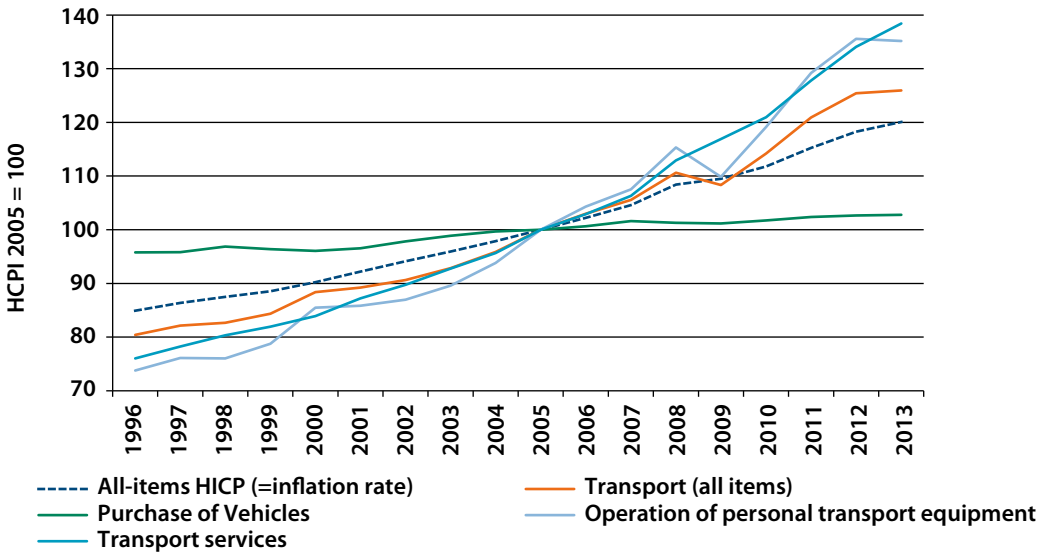
[61] The Harmonized Indices of Consumer Prices (HICPs) are a set of European Union Consumer Price Indices calculated according to a harmonized approach and a single set of definitions. The HICP was a response to provide a comparable measure of consumer price inflation in the European Union.

[62] http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=prc_hicp_midx&lang=en

rates; purchasing costs of vehicles grew on average by only 0.5 per cent annually, whereas operational expenses (e.g. fuel, maintenance and spare parts) increased on average by 3.4 per cent per year between 2003 and 2013 (Figure 4.5).

It appears that private motorization (purchase, operation, maintenance, fuel) costs have increased at a lower average rate than those of public transport services and less than the overall inflation rate. This may have had significant effects on the choice of travel mode.

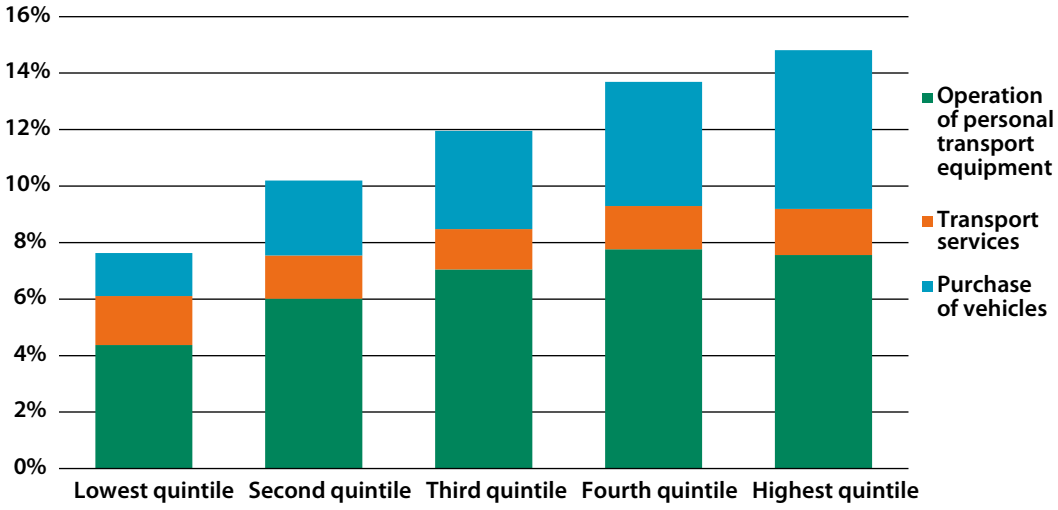
Figure 4.5 Annual Harmonized Index of Consumer Prices for transport in the European Union (Harmonized Index of Consumer Prices (HICP) 2005 = 100)



Source: Eurostat

In terms of transport expenditure across income levels, an EU-household survey has revealed some interesting characteristics (Figure 4.6). Expenditure on private transport (purchase and operational costs) has been found to increase with income, with the share of transport expenditure compared to the total consumption being about 93 per cent higher in the highest income quintile than in the first lowest income quintile (15 percentage point increase in difference compared with 2005 survey (UNECE, 2012).

Figure 4.6 Household spending on transport according to the income class in the European Union, 2010

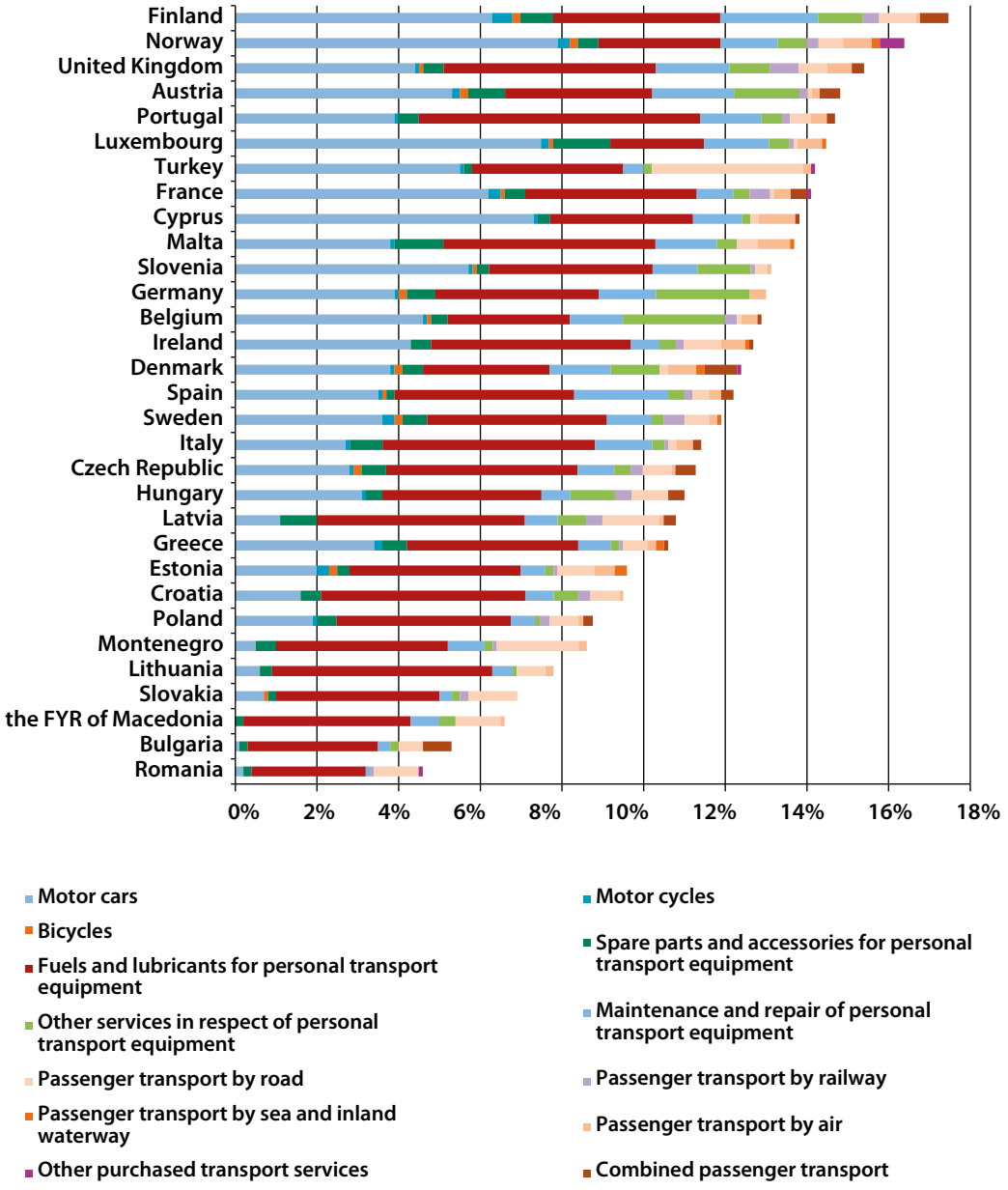


Source: Eurostat [63]

[63] http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=hbs_str_t223&lang=en

In the UNECE region, a survey involving 31 member States (Figure 4.7) found that Finnish households spend on average 17.5 per cent of their total expenditure (consumption) on transport, the highest proportion in the region. In comparison, Romanian households spend on average 4.6 per cent of their total expenditure on transport, the lowest share in all surveyed countries. Such differences can be attributed mostly to differences in private motorisation (purchase of vehicles, fuel and maintenance costs).

Figure 4.7 Average expenditure on transport, as a percentage of expenditure in 31 UNECE member States, 2012



Source: UNECE and Eurostat

An EU survey of household expenditure on transport spending by household location, has revealed that transport spending differs only slightly between rural and urban areas. Households in densely populated urban areas spend on average about 11.7 per cent of their total consumption on transport, whereas rural areas spend about 13 per cent. In rural areas, households spend more on private motorization and less on public transport services. In terms of age, households where the reference person is older than 60 years have been found to spend, on average, 7.7 per cent on transport, whereas households where the reference person is younger than 30 years spend about 12 per cent (UNECE, 2012).

In Latin America, the data compiled by the World Bank and Development Bank of Latin America, and analysed by UNECLAC shows a significant variation in the importance of household spending on public transport. In some cases, like Sao Paolo and Rio de Janerio, the proportion reaches 30 per cent of the minimum salary, while in other cities (like San Jose, Buenos Aires, Caracas and Mexico City), the cost of 50 bus trips does not exceed 7 per cent of the minimal salary. In the context of the economic inequality of the regions, these data and the additional information, gathered by UNECLAC in a household survey, shows that the spending on the public transport represents the second largest component of household spending, superseded only by energy expenditures. The significance of the public transport expenditures diminishes with an increase in household income, while spending on private transport increases (UNECLAC, 2014, forthcoming).

4.2 Transport Affordability for Societies

All available trends and projections on passenger and freight volumes suggest a strong future growth, particularly, in the non-OECD regions (see also Chapter 2 in this publication). The expected growth in freight and passenger transport will require the planning and construction of new transportation infrastructure as well as the establishment of sustainable funding mechanisms for the transport sector (e.g. OECD/ITF, 2013).

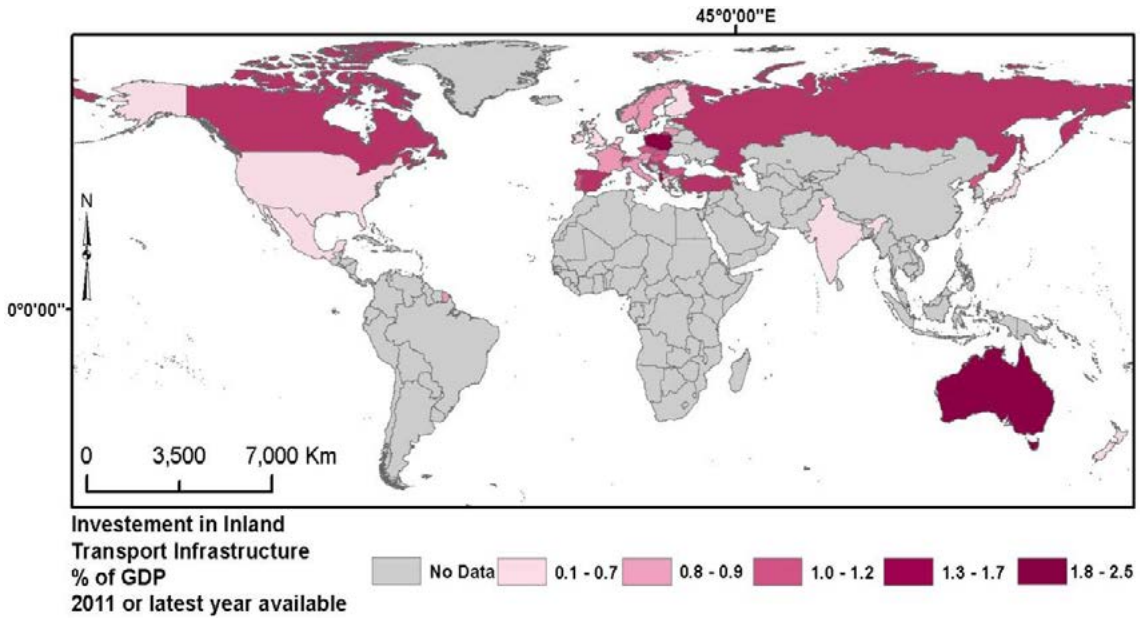
Efficient, safe and environmentally sustainable transport infrastructure costs money and, despite recent improvements, transport networks in many regions still suffer from the under-investment of the previous decades. At the same time, infrastructure development is generally planned and financed within national budgets given macroeconomic constraints, and in competition with other needs such as education, health, housing or security. The 2008 financial crisis and its aftermath increased pressures on national budgets and reduced public funding for transport infrastructure development, making private sector funding flows much more important (e.g. OECD/ITF, 2013).

Long term planning ⇨ Prioritizing transport projects ⇨ Share of transport investmentand service support in GDP ⇨	**Social affordability**
Key challenges	• Pressure on transport infrastructure capacity • Public funds are scarce; more rigorous assessment of feasibility is warranted (no "white-elephant" investments!) • Transport projects are long term and politically less interesting
Role of the United Nations	• Provide guidance on reforms aiming at efficient financing of infrastructure and public transport services, including the use of Public Private Partnerships • Provide a common framework for socio-economic cost-benefit analysis • Provide a harmonized methodology for transport infrastructure planning

4.2.1 The global situation

Investment in inland transport infrastructure varies considerably. In many developed countries, transport infrastructure investment has amounted to less than 1 per cent of their GDP in 2011; in comparison, Australia, Canada and the Russian Federation have spent a considerably larger share of their GDP on transport infrastructure (Figure 4.8).

Figure 4.8 Investment in inland transport infrastructure as a share of GDP (2011 or latest available year)

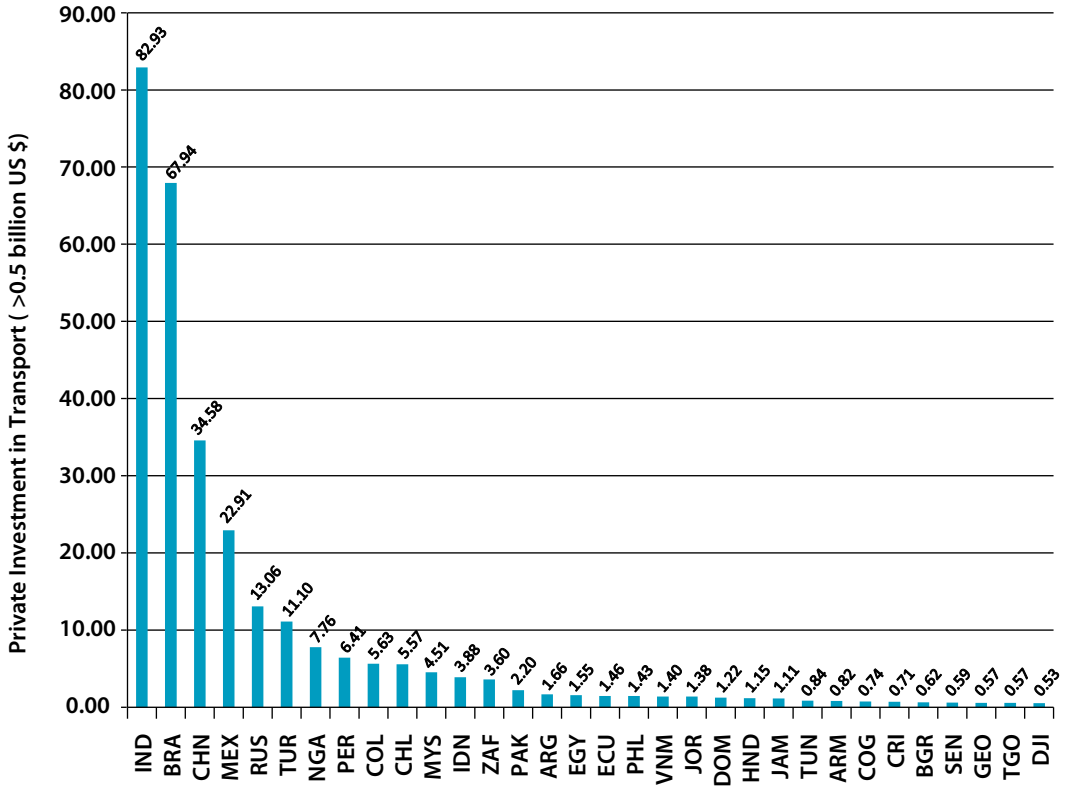


Source: OECD

Private funding in transport infrastructure development has become increasingly popular as a concept, although its attractiveness should also be based on pre-investment economic impact evaluations, similar to those used as prioritization instruments in public transport investments (UNECE, 2012). In general, private transport infrastructure investments have been moderate in recent years, with the large majority of countries investing less than US$ 0.5 billion, aggregated, during the period 2003-2013. Notable exceptions are mostly in non-OECD countries with Brazil and India showing the highest private investment in transport infrastructure (Figure 4.9).

Particular challenges in infrastructure development needs are associated with the growing medium-sized cities in developing countries. The World Bank analysed urban transport problems in developing and transitional economies and recommended (in 2002) a framework for national and city authorities in its urban transport strategy 'Cities on the Move'. However, although a recent assessment of the implementation of the 2002 recommendations has shown progress in some areas (e.g. in mass public transport analysis and investment, some environmental policies), the performance of the private sector in meeting infrastructure and public transport supply deficiencies has not been deemed adequate (Gwilliam, 2013).

Figure 4.9 Private investment in transport infrastructure (movable assets/small projects excluded) in the countries showing an aggregate (2003-2013) investment higher than US$ 0.5 billion (in billions of United States dollars)



Source: World Bank

Over the last decade, the World Bank committed about US$ 7.5 billion in loans for urban transport projects to its client countries, mostly for public transport modes. Efforts were made to introduce private operators and competition into all public sectors and to tighten weakly regulated, 'informal' public transport markets. Notable objectives for many projects have been the improvement of transport services, the affordability for low-income passengers, the attraction of new passengers, the reduction of negative environmental impacts, and the complementary reform of relevant policies and institutions. Nevertheless, it appears that there should also have been a higher consideration for the sustainability of urban road traffic involving congestion easing, modal shift prioritization and the generation of sustainable revenues (Mitric, 2013).

Significant private investment has also come from Public-Private Partnerships (PPP). The European PPP Expertise Centre (EPEC) [64] is an initiative involving the European Investment Bank, the European Commission and European Union member States and candidate countries. It provides annual statistics on PPPs in Europe. In its 2014 publication[65], it showed that the aggregate value of PPP transactions that reached financial closure across Europe (EU-28 plus the Balkans and Turkey) totalled €11.8 billion in the transport sector. Worldwide, the International PPP Centre of Excellence of UNECE is a focal point for standards, recommendations and best practices in PPPs. [66]

[64] www.eib.org/epec/

[65] Market Update – Review of European PPP Market in 2014 (EPEC, 2015)

[66] www.unece.org/ceci/ppp.html

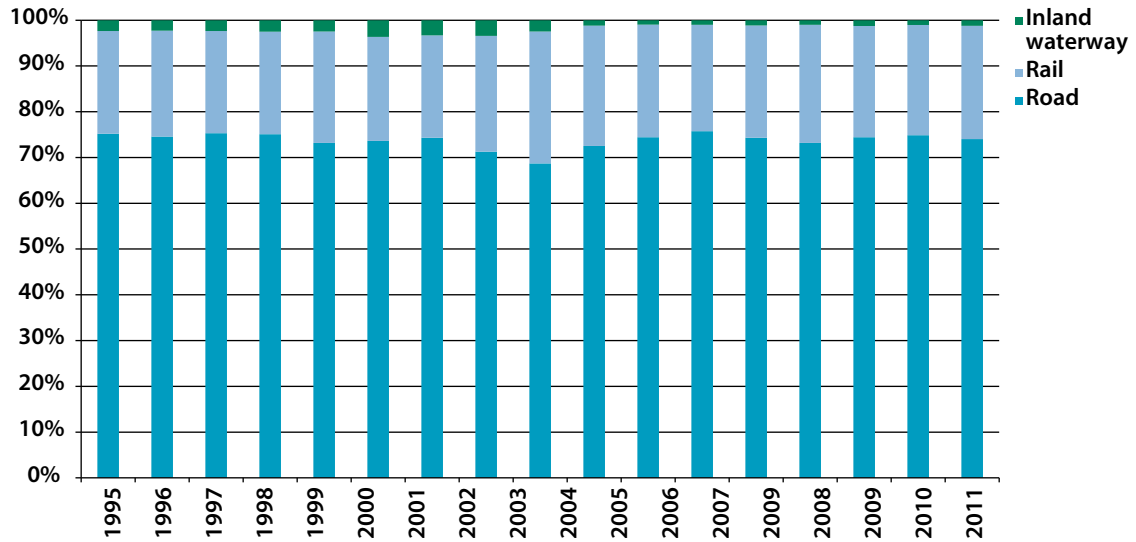
Finally, it should be noted that collective behaviours may also affect transport affordability, with direct effects on trade. For example, modern supply chains tend to favour medium-sized or large producers who are already engaged in export; this can price out the transport markets of small enterprises with very significant economic effects on regions where production is dominated by such enterprises. A possible solution could be increased cooperation among small/medium businesses and/or farmers and trade brokering which can negotiate freights and freight caps more effectively. [67]

4.2.2 Regional trends

Over the last two decades, inland transport infrastructure investment has been approximately 0.8 to 0.9 per cent of the GDP in most developed Western European countries. Notable exceptions were Greece, Portugal, Spain and Switzerland with investments of 1.6 to 2.0 per cent of GDP until 2007. In comparison, inland transport infrastructure investment in Central and Eastern European countries was at 1.0 per cent of GDP until 2002 and at about 2.0 per cent in 2009. Although investment fell to about 1.7 per cent of the GDP in 2010, the trend was at 1.8 per cent in 2011. Rising levels of investment in transition economies reflect efforts to meet rising needs, particularly for road networks.

Road infrastructure has consistently taken the 'lion's share' of the modal distribution of infrastructure investment (Figure 4.10) in most UNECE countries. In 2011, only Austria, Georgia, the Russian Federation and the United Kingdom made larger investments for rail than for road infrastructure.[68] In the EU, the share of investments in inland transport modes with lower environmental impact (rail and inland waterways) also decreased slightly in the period 2000-2009. [69]

Figure 4.10 Investment in road, rail and inland waterway transport as a share of the total inland transport investment in 40 UNECE member States, 1995-2011



Source: OECD

[67] See also www.ppiaf.org/freighttoolkit/node/283 and http://orr.gov.uk/

[68] http://stats.oecd.org/Index.aspx?DataSetCode=ITF_INV-MTN_DATA#

[69] http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Sustainable_development_-_transport

One of the major reasons for the observed trends is probably associated with the planning decisions taken in many regions/countries. For example, Australian cities are highly dependent on private motorization, with private cars being used for most trips.[70] One of the reasons for this dependence might be associated with the transport investment decisions taken in recent decades; many Australian cities have opted for large private toll freeway projects instead of mass public transport projects (Zeibots, 2005). Public transport investment has however, progressed. For example, rail investment in Perth, Australia, obtained through the postponement of major road projects, has managed to redress the overdependence on private motorization in this city (Dodson and Sipe, 2006).

Private sector investment in road and rail transport infrastructure, has increased in recent years (after 2005), particularly in the developing countries (Figures 4.11 and 4.12). In 2011 and 2012, private investment (by both the number of projects and by funds) was primarily concentrated in South Asia, with total investment amounting to US$ 37.9 billion (115 projects), a value greater than the sum of all private investment in road and rail since 1995 in the region. In 2013, the major focus of private investment in road and rail infrastructure shifted to Latin America and the Caribbean where 17 road projects, and 3 railway project, with total investment of US$ 16.2 billion (an annual record in value for the region and a 97 per cent increase from 2012 levels).

According to World Bank data, East Asia and the Pacific saw two new road and two new railway projects in 2013, with a total investment of US$ 4.9 billion. Sub-Saharan Africa did not have new projects in either road or railway infrastructure since the 2011 cross-border highway project in Zimbabwe and South Africa (the Beitbridge Border Post), with a total investment of US$ 97 million. Europe and Central Asia have likewise not had a significant private investment in railway infrastructure since 2011 (two projects, US$ 4.3 billion) or road infrastructure since 2012 (two projects, US$ 5.1 billion). Also, no new private sector projects/investments were made in Middle East and North Africa in 2013, the region with the lowest total private investment in railway infrastructure and with no recorded private investments in road infrastructure. [71]

Finally, it should be noted that increasing investment in transport infrastructure should not necessarily increase capacity; funding directed towards improvements in infrastructure resilience and/or safety and security would not increase capacity, but can contribute to the overall sustainability of transport.

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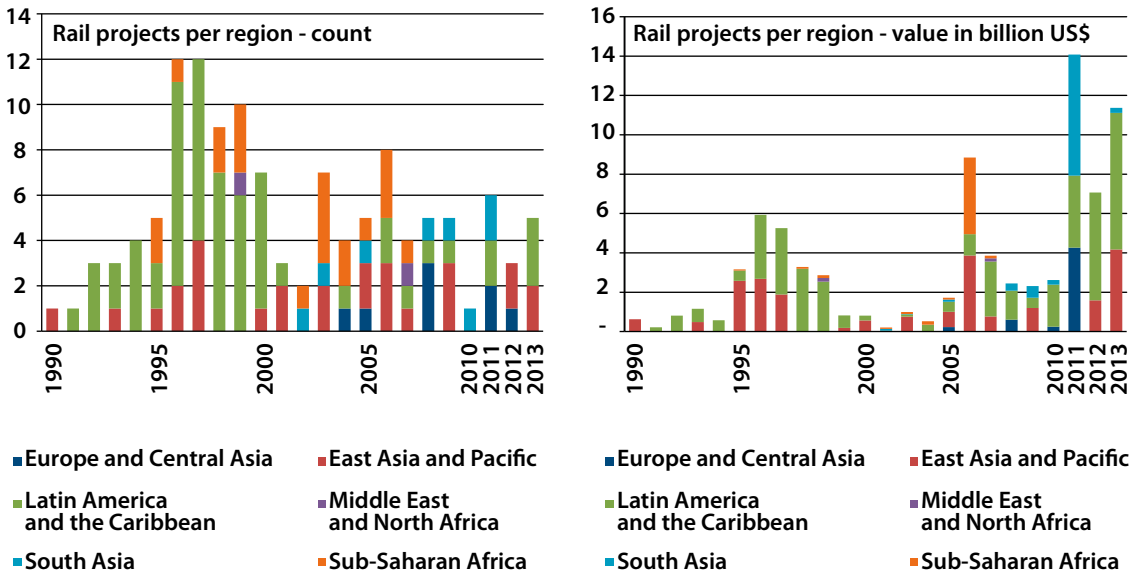
[70] Private motorization dependence is also unevenly distributed within the Australian cities: households located close to central business districts depend less on private motorization for urban travel (about 49 per cent of work journeys) than those located in middle/outer suburbs (about 76 per cent of work journeys) (Dodson and Sipe, 2006).

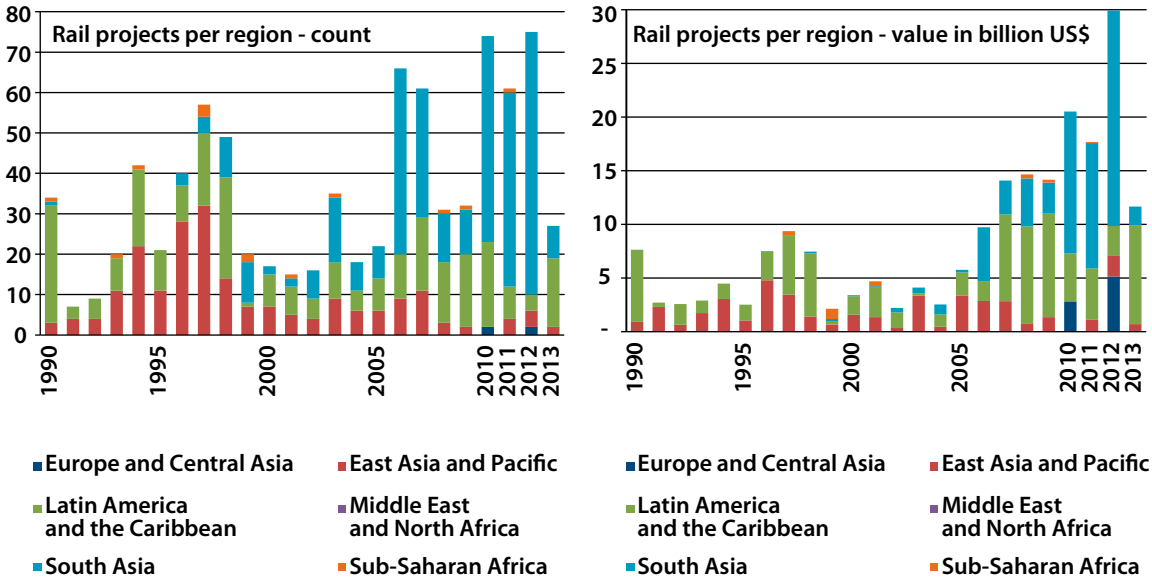
[71] http://ppi.worldbank.org/explore/ppi_exploreSubSector.aspx?SubSectorID=6

Figure 4.11 Number and value of rail transport projects in low and medium income countries with investments from the private sector, 1990-2013



Source: World Bank

Figure 4.12 Number and value of road transport projects in low and middle income countries, 1990-2013



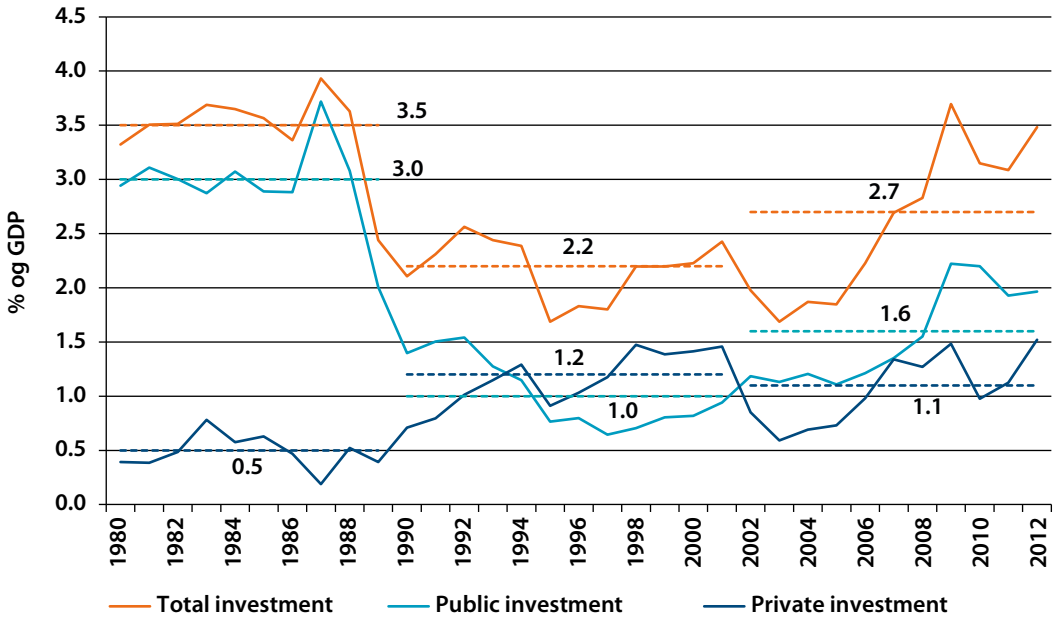
Source: World Bank [72]

In the region of Latin America and the Caribbean, UNECLAC data and analysis show that recent and current levels of public and private investment in infrastructure are not sufficient to provide the infrastructure that the region needs for its sustainable development. According to UNECLAC estimates, the region's countries should invest 6.2 per cent of their GDP annually—some US$ 320 billion—to meet their infrastructure demands in the

[72] http://ppi.worldbank.org/explore/ppi_exploreSubSector.aspx?SubSectorID=7

period 2012-2020.[73] However, according to the recently published Economic Infrastructure Investment in Latin America and the Caribbean Database (EII-LAC-DB)[74] data of 1980-2012, the average 2.7 per cent of GDP allotted to infrastructure investment in the last decade shows that the region is not investing enough. An analysis of the figures in the EII-LAC-DB database reveal a trend towards increasing investment in economic infrastructure during the period 2003-2012, showing that the transport sector has drawn the largest amount of investment since 2005, followed by energy, telecommunications, and water and sanitation (Figure 4.13) (Lardé and Sánchez, 2014; Perrotti and Sanchez, 2011).

Figure 4.13 Investment in infrastructure by sector in Latin America, 1980-2012* (Percentages of GDP)



Source: *Infrastructure Services Unit, Natural Resources and Infrastructure Division, UNECLAC*

Note: * *Data is preliminary.*

4.3 Challenges and Best Practices

4.3.1 Affordability for individuals and households

A key challenge for society is to ensure that individual mobility does not depend on individual income. Low income individuals/households tend to spend less than those with higher incomes and, yet, their transport expenditure is a greater share of their income. At the same time, inland transport services have become relatively more expensive in some regions; this development is worrying, as the mobility (and the social and economic development) of particular groups such as the elderly and people with special needs, who largely depend on public transport services, is likely to be negatively affected.

[73] The figure of 6.2 per cent of GDP comes from applying the investment trajectory to expected infrastructure needs, and assumes that the historic pattern of country investments will be repeated. As such, it is an approximation and not a strict recommendation.

[74] EII-LAC-DB collects and systematizes figures by country and investment origin (public or private) covering the annual investment in four main economic infrastructure sectors (transportation, energy, telecommunications, and water and sanitation).

Spending on transport varies considerably with age. Younger households tend to spend more on transport and, are consequently, more mobile than older households. As the current demographic trends are towards older populations, the risk of the social and economic exclusion of the elderly is increasing; future transport policies should certainly take into consideration this issue. A study on the impact of transport on social exclusion in the G7 countries (Lucas, 2004) found that low private car availability can determine social inclusion in the case of inadequate public transport services. The study also found that nearly every fourth household did not have access to a car in Canada, France, Germany and the United Kingdom (ranging from a low of 21 per cent in Canada to 29 per cent in the United Kingdom). Elderly people, people with special needs, women and ethnic minorities were less likely to have a driver's licence and more likely to live in a household without a private car.

As public transport prices are generally rising (see 4.1.2 Trends), certain initiatives should be established that could increase transport affordability for these particular groups. Public transport is often provided at a price close or, even, below marginal costs in both rural and urban locations (e.g. UNECE, 2012). In these cases, the supply of public transport depends on public subsidies, which in the current economic climate tend to be curtailed in many countries. Finally, it should be noted that transport affordability is largely connected with the affordability of other basic needs, such as housing (Lau, 2011; Welch, 2013).

According to a recent UNECLAC study (Grieco, 2013), urban mobility systems in the region of Latin America and the Caribbean are not routinely designed with the poor as a priority. At best, they are designed with an awareness of issues of transport equity such as affordability or minimal levels of access, but not from the perspective of meeting the routine needs of the poor and thus are not completely in line with the aims to move towards a more sustainable mobility in urban and metropolitan areas. The study considers that 'social sustainability' should be a partner term to 'environmental sustainability' and should be linked with the 'liveability' of cities—reducing carbon emissions makes city living more pleasant. There is a need to relate the transport and poverty discourse to these strategies since the social sustainability concept has been adopted fairly recently by cities, planners and international agencies. It is thus timely to rethink the urban development paradigm in terms of the constraints on mobility as a solution to spatial inequities and inequalities, at the global, regional and local levels.

In this context, it is important to consider the price of public transport and its determination. Public transport pricing are set by operators and usually depends on the type of public transport. In many countries, urban public transport is the responsibility of local authorities, while non-urban public transport is also with the cooperation of the state.[75] For instance, in Croatia the price of road public transport is freely set by the operator, except in urban areas where local authorities can set price ceilings; rail transport prices are also set by the operators, but they must be approved by the Government.

[75] Information from Albania, Armenia, Croatia, Czech Republic, Latvia, Poland and Switzerland in the questionnaire of the predecessor of this publications, December 2010 (UNECE, 2012).

Similar approaches are seen in several UNECE member States. These approaches frequently require agreements between the operators and public authorities, which normally include a Public Service Obligation (PSO).[76] In any case, it will be counterproductive if prices continue to increase at the rates seen at some countries in recent years, even though such increases may have been the result of improvements in infrastructure quality and services.

The analysis and the planning/implementation of effective policies/solutions to increase the affordability of transport services are not straightforward exercises. Concentrated efforts, cooperation and sharing of experiences and 'best' practices at many spatio-temporal scales are required (see also the text box below).

Best practices in improving accessibility for vulnerable groups in the United Kingdom

The social and economic inclusion of the elderly and individuals with special needs depends upon their mobility, which in turn, depends on transport accessibility and affordability.

- The 2008 National Concessionary Travel Scheme introduced in the United Kingdom gives persons with reduced mobility access to free travel on local buses at off-peak times.
- In some areas (e.g. Manchester and the West Midlands) the system has been extended to trains and trams (Passenger Transport Executive Group (PTEG, 2010)). The West Midlands' Passenger Transport Executive has been working with local employment agencies to also improve transport affordability for job-seekers, who often cannot afford to travel for job interviews.
- A project called WorkWise[77] was introduced in Birmingham that provides job-seekers with free travel information, free travel by public transport to job interviews and free travel passes for the first month of work. The scheme has shown positive effects on employment, with 80 per cent of newly employed job-seekers reporting that they would not have succeeded without it.
- Seventy-seven per cent of job-seekers in British cities other than London do not have regular access to a car, van or motorbike and, as such, face significant barriers to work. A report from PTEG (2015) found that these barriers include expensive public transport tickets; poorly connected employment sites; mismatches between working hours and available transport; and limited travel horizons. Seven key policies were recommended to help overcome these obstacles, including: a new funding deal to enable local councils to protect lifeline bus services and connect people to opportunity; more effective powers over bus services for local transport authorities, offering them greater control over where and when buses run and the affordability of fares; a review of the potential for adequate funding for job-seekers nation-wide and apprentice travel concession.

In the United States of America, federal agencies are working towards equal access to quality public transportation for low-income and minority populations. Such efforts require comprehensive and quantitative approaches to assess the accessibility, affordability and quality of transport services at each transit node in a network and plan for effective actions to improve the situation. A defining factor for the affordability of transport in urban areas is the distribution of affordable residential housing, the review of approaches and proposed solutions should take into account the relationship between transport and housing. Results from a recent study in Baltimore (Welch, 2013) showed that developers of affordable housing and transportation planners should work together to find development locations that emphasize transit locations with high connectivity rather than simply reducing transit distances.

In Singapore, current practices involve the improvement of the sustainability, safety and smartness of the transportation system. Sustainability can be improved by policies aimed at the integration of land use and transport planning, adequate transport supply measures, efficient management of travel demand and the incorporation of environment-friendly

[76] In these cases, public authorities tender the servicing of route networks, with the winner having a monopoly in this network with public subsidies if and when required; such subsides are necessary, because profitability of some routes is either absent or so low that the free market cannot provide a service. PSOs also include requirements on minimum frequency, network capacity and ticket pricing.

[77] See www.networkwestmidlands.com/workwise/home_two.aspx

strategies. Safety initiatives should aim at minimizing injuries and incidents for all users, including motorists, public transport passengers, pedestrians and cyclists. The objectives of 'transport smartness' policies should be the improvement of certain transport system qualities, such as real time sensing, fast information processing and decision-making, and automated control/monitoring of travel information and revenue collection. It has been shown that all the above objectives could be adequately facilitated by the adoption of 'smart' technologies (Haque et al., 2013).

4.3.2 Affordability for societies

Many countries are still reeling from the 2008 global financial crisis and government budgets remain restrained. Public financing of transport infrastructure projects has been reduced in most countries, even though large infrastructure projects could have socioeconomic benefits in times of economic downturn. Most transport infrastructure projects can positively affect employment and consumption and, in the long-term, unlock economic and human potential. Nevertheless, as pure public financing is becoming scarcer, private sector financing should be mobilized to provide reliable funding flows for transport infrastructure (e.g. OECD/ITF, 2013).

When funds are scarce, infrastructure needs must be prioritized. However, this can only be carried out if all the necessary information is available; this includes not only an analysis of the Internal Rate of Return (IRR) of infrastructure investment, but also an analysis on the short and long-term impacts on employment, economic development and social inclusion (e.g. Dodson and Sipe, 2006; Lucas, 2013). However, such studies are not straightforward exercises and require the development of tools, realistic scenarios and the collation/acquisition of a large variety of data (e.g. OECD/ITF, 2013) as well as improved mechanisms of sharing information/practices.

A significant challenge is associated with backlogs in the maintenance of existing transportation systems.[78] Investment for existing infrastructure is important for keeping the safety, fluidity and reliability levels high. A recent study (UNECE, 2012), which asked UNECE member States to describe the main obstacles they face in the development of transport found that backlogs in maintenance investments form significant obstacles for many countries. For example, in addition to significant shortages in rolling stock, the state of rail infrastructure in Kazakhstan has been assessed as poor and operating on outdated technology. The Government of Kazakhstan has reacted to these findings by approving a large programme for transport infrastructure development in the period 2010-2014. [79] Investment backlogs are, however, not only an issue for low and middle-income countries. The UNECE survey has also found that a lack of funds is a major obstacle for the development of transport in most countries[80]; highlighting the need for careful planning, prioritization and cooperation. For example, some UNECE member States (e.g. Belgium) mentioned that decades of poor investment in rail infrastructure has led to a significant backlog, with supply no longer being able to match increasing demand. In April 2009, the United States Department of Transportation issued the 'Rail Modernization Study' [81]; this study found that the investment backlog of the seven largest rail operators is approximately US$ 50 billion

[78] See also www.wsdot.wa.gov/f<inance/budget/ and www.regionforward.org/highway-and-transit-maintenance-identified-as-top-priority-in-regional-transportation-priorities-plan

[79] See http://mtc.gov.kz/index.php/en/programma-po-razvitiyu-transportnoj-infrastruktury-v-respublike-kazakhstan-na-2010-2014-gody

[80] Information provided by a questionnaire on Transport for Sustainable Development, December 2010.

[81] See www.fta.dot.gov/documents/Rail_Mod_Final_Report_4-27-09.pdf

and that only two of the seven operators were using 'a rigorous process to help rank and prioritize their investment needs'. In this context, it should be noted that the present trends in weather-related extreme events have significantly increased the funding needs for infrastructure maintenance as well as for infrastructure adaptation and resilience (e.g. UNECE, 2013) which, however, will require additional funding.

There are several examples of plans/programmes associated with the provision of transport infrastructure funding under private and/or public private initiatives. These include the Cross-Israel Highway (Israel Highway 6), the US$ 1.3 billion construction costs of which were financed by a 90 per cent commercial debt and a 10 per cent equity, the construction of the Saint Petersburg Highway [82] in the Russian Federation, Switzerland's Infrastructure Fund for Agglomeration Transport[83], the Czech State Fund of Transport Infrastructure and 'The Building Canada Fund'[84]. For more details on some of these initiatives, see UNECE (2012). Experiences from such programmes can be used to identify good practices.

As the provision of adequate funding flows in a prerequisite for the sustainability of the transport sector, there should be increased cooperation between States, as well as the involvement of international organizations. In addition to OECD/ITF which provides reliable statistics and reports on transport infrastructure funding, other international organizations such as the World Bank and UNECE have been considerably active. The World Bank provided funding for large number of transport infrastructure projects (see e.g. World Bank, 2012), whereas UNECE has been active in: (a) providing common methodologies and guidelines[85] for the socioeconomic analysis of transport investment projects; (b) making available planning tools based on multi-criteria approaches that complement the quantitative analysis of the data with the qualitative evaluation of strategic and political concerns[86]; and (c) facilitating an improved understanding of PPPs [87] in all fields of infrastructure development by information and practical experience sharing between UNECE member States. UNECE has provided guidelines and examples of best practice and contributes to the implementation of capacity-building programmes for public and private sector officials from transition economies.

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[82] Information given in UNECE questionnaire survey on Transport for Sustainable Development, December 2010.

[83] For further details see www.are.admin.ch/themen/verkehr/00250/00460/?lang=en

[84] See www.infrastructure.gc.ca/prog/bcf-fcc-eng.html

[85] See www.unece.org/trans/main/wp5/wp5.htm

[86] For a detailed description of the multi-criteria model used in UNECE infrastructure planning projects, see Tsamboulas (2007).

[87] See the 'Guidebook on Promoting Good Governance in PPPs' (www.unece.org/fileadmin/DAM/ceci/publications/ppp.pdf) and the UNECE Training module on PPP and sustainable development 'How to do PPP'.

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5. Transport Safety

Transport related injuries are major social, economic, development and public health problems. Developing countries and economies in transition bear the majority of this burden — as such road traffic crashes are a development issue that disproportionately affect the poor in low and middle-income countries. Globally, well over a million people are killed annually in road traffic accidents causing, in addition, to human loss and suffering, billions of dollars of associated costs which, in some countries, amount to 1-3 per cent of GDP (UNECE, 2012). The need for improving road safety has been acknowledged by the United Nations and its member States for almost 60 years. Extensive work on road safety has been carried out by different global and regional organizations, including the United Nations regional commissions, the World Health Organization (WHO) and the World Bank.

This chapter will provide an overview of factors and trends that control safety aspects in the major inland transport modes – road, rail and inland waterway – key global and regional statistics, an overview of challenges in improving transport safety and a summary of regional best practices.

Prevention and Mitigation Holistic approach across the modes of inland transport and terminals	
Key challenges	• On a global level, development of transport safety is slow; • High rates of trespassing, particularly on railways, lead to fatalities; • Inadequate recognition of the high level of safety needed for the transportation of dangerous goods; • Underreporting and insufficient harmonization in statistics across the board.
Role of the United Nations	• Promote the United Nations transport safety Conventions and other legal instruments, such as the Agreements on Transport of Dangerous Goods, the Code of Practice for Packing of Cargo Transport Units (CTU code); • Promote intergovernmental platforms for sharing best practice, such as ITC; • Provide statistical and analytical information that enables regions to identify problems and develop optimal policies.

5.1 Road Safety

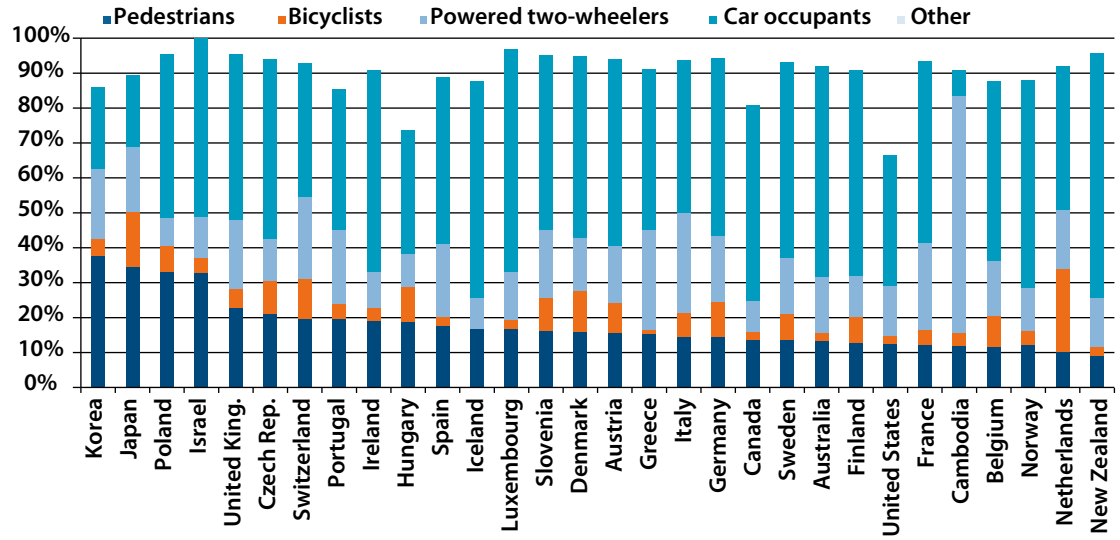
Road safety depends on driver behaviour, infrastructure quality and vehicle safety developments. Improvements can be achieved only by considering all these factors. The global average fatality rate was 18.04 persons per 100,000 inhabitants (WHO, 2013). Road safety performance, however, differs widely between countries. For example, road safety measured in terms of fatalities per 100,000 citizens across OECD-IRTAD member States reveals a wide distribution, with fatality rates being about 3 times lower in the best performer compared with the worst performer (ITF, 2013).

Prevention and Mitigation management + behaviour + infrastructure + vehicles + post-crash services	
Key challenges	• On a global level, road safety does not improve; • Ineffective road safety management, weak regulatory frameworks and underfunded road safety programmes at national and local levels; • It is not enough to build safe and forgiving road infrastructure with clear road signs and markings, they need to be maintained • Application of traffic rules is often not tailored to local environment, e.g. category of road; • Keeping vehicles safe throughout their lifetime – lack of periodic vehicle maintenance challenges safety; • Motorcycle, powered two-wheeler, bicycle and pedestrian casualties are overrepresented in road accidents and have not been adequately addressed; • Lack of high quality or even any public transport, traffic management and safe infrastructure for pedestrians and cyclists exacerbates road safety performance; • Road Safety Data is not collected according to international standards; • Insurance coverage in many countries still remains to be developed; • Post-crash trauma care to be improved.
Role of the United Nations	• Promote access to and better implementation of the United Nations road safety legal instruments, e.g. the 1968 Conventions on road traffic, The 1968 Convention on road signs and signals, Agreements on Vehicle regulations of 1958 and 1998; Agreement on Periodic Technical Inspection of Vehicles (1997), Agreement on Transport of Dangerous Goods by Road (ADR); • Provide inter-governmental forum on road safety (Working Party on Road Traffic Safety (WP.1) of UNECE Inland Transport Committee); • Provide technical assistance and capacity-building to improve road safety; • Carry out analytical activities and provide support for road safety policies.

5.1.1 Road Safety Trends

The risk exposure of different road users varies between countries (see Figure 5.1). Pedestrians are the largest group of vulnerable road users in most countries and account for around 19 per cent of all fatalities in IRTAD countries. Nearly 40 per cent of pedestrians killed are of the age group of 65 and above; this share has constantly increased from less than 34 per cent in 2000, indicating the changing safety requirements of an ageing society which need to be met by our transport systems.

Figure 5.1 Fatalities as a share of classes of road users (average for 2008-2012)

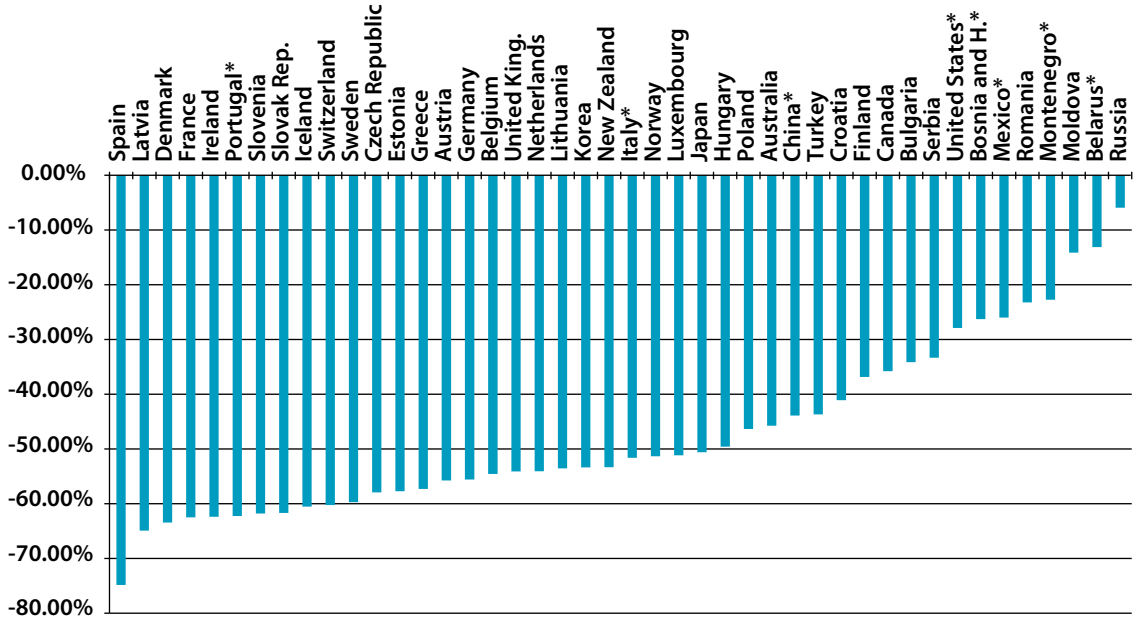


Source: ITF, 2014

The highest shares of pedestrian fatalities were recorded in the Republic of Korea, Japan, Poland and Israel compared with only about 10 per cent in New Zealand, the Netherlands and Norway. Pedestrian safety continues to be one of the major road safety issues worldwide, especially in lower income countries. Cyclists are also involved in considerably more fatal crashes in the Netherlands (22 per cent of all fatalities), in Japan (16 per cent) and Hungary (13 per cent) than in the United States of America and Greece (1-2 per cent of all fatalities). Fatalities involving Powered Two Wheeler-PTW (motorcycle) riders are extremely high in Cambodia (about 65 per cent of all fatalities), and of increasing concern in Greece (30 per cent), Italy (27 per cent), France (25 per cent) and Switzerland (22 per cent).

Trends in road fatalities are mixed. Some countries show sharp reductions in fatalities over the last decade (Figure 5.2). Most of the reductions are related to car drivers/passengers, probably due to the increased passive safety of cars, improved speed management and more effective drink-driving policies. However, statistics are unsatisfactory for vulnerable road users, such as pedestrians, cyclists and PTW riders (ITF, 2014). Overall, 2013 was the year with the lowest overall fatalies in most OECD-IRTAD countries; it should be noted, however, that the 2008 economic crisis may have influenced the number of road casualties, by a general decrease in overall mobility.

Figure 5.2 Road fatality changes in the period 2000-2013 (unless otherwise indicated)



Source: OECD[88]

These trends may also be related to the introduction or implementation of more effective road safety policies and measures in these countries. In contrast, many emerging economies show rapid private motorization associated with increasing road casualties. WHO has found that'… *worldwide, the total number of road traffic deaths remains unacceptably high at 1.24 million per year. Only 28 countries, covering 7 per cent of the world's population, have comprehensive road safety laws on the 5 key risk factors: drinking and driving, speeding, and failing to use motorcycle helmets, seat-belts, and child restraints.*'[89]

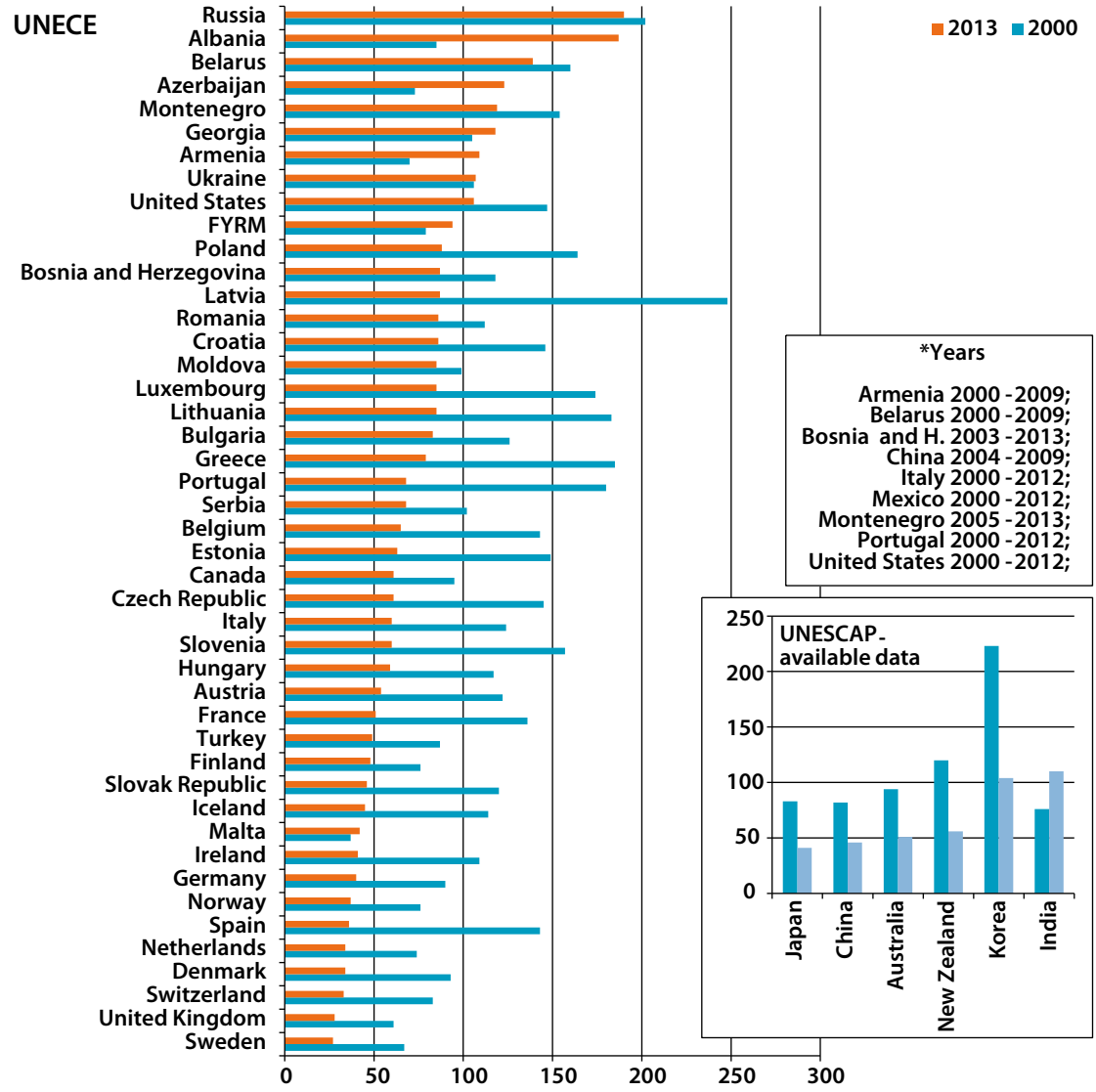
In the UNECE region, road fatalities vary considerably, with improvement when compared to previous years. In terms of the overall population, UNECE member States had, on average, 75 fatalities per one million inhabitants in 2013. On the basis of this indicator[90], the available data also show reductions in road fatalities in the last decade with a large variability between member States (Figure 5.3). The trend is the similar in UNESCAP countries with available data.

[88] http://data.oecd.org/transport/road-accidents.htm

[89] See The Global Status Report on Road Safety 2013 UN World Health Organization (WHO, 2013). The Status Report serves as a baseline for the Decade of Action for Road Safety 2011-2020 and the 50 per cent fatality reduction target for 2020, declared by the UN General Assembly. Available at www.who.int/violence_injury_prevention/road_safety_status/2013/en/

[90] See ITF, 2013 on the debate over the indicator most appropriate to measure risk exposure.

Figure 5.3 Road fatalities per 1 million inhabitants in the UNECE region and five UNESCAP member States, 2000 and 2013



Source: OECD[91]

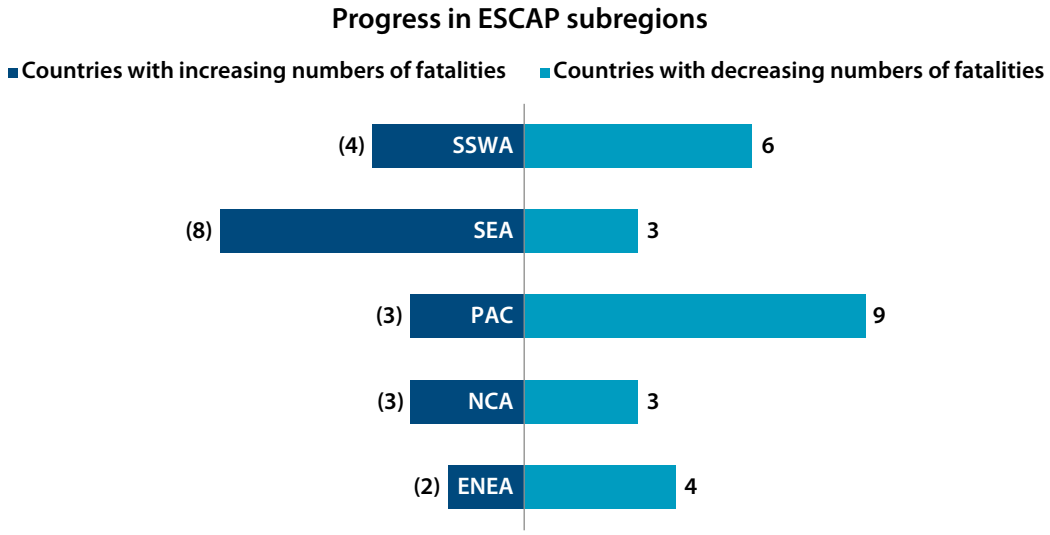
In 2013, more than half of UNECE member States (33 countries out of 40 for which information is available) had less than 50 road fatalities per 100,000 passenger cars. The lowest rates were in Iceland (6), the United Kingdom, Sweden, Norway, Malta and Liechtenstein (7), Switzerland and the Netherlands (8) and Germany and Spain (9). Eastern and South-Eastern member States as well as certain Central Asian States appear, however, to experience substantial road safety challenges; in 2011, road fatality rates were 169 per 100,000 passenger cars in Georgia, 98 in Albania, 97 in the Republic of Moldova and 69 in Kazakhstan.

With the rapid growth in the motorization rate and the length of road network in UNESCAP countries, the number of road traffic deaths in many developing countries of the region has dramatically increased in the recent years. WHO in its Global Status Report on Road Safety (2013) provides several key figures. More than 777,000 people were killed on roads of the UNESCAP region in 2010. At a rate of 18.62 fatalities per 100,000 inhabitants, this amounted to more than half of the world's road traffic deaths in 2010.

[91] http://data.oecd.org/transport/road-accidents.htm

On the basis of available data between 2007 and 2010, progress in road safety in the UNESCAP region appears mixed. In terms of estimated deaths, the region saw approximately an 11 per cent increase in number of road traffic deaths. Some 25 [92] countries in UNESCAP region showed a reduction in the number of deaths on their roads between 2007 and 2010 (Figure 5.4). The majority of South-East Asia (SEA) countries increased in the number of road traffic deaths during the period while North and Central Asian (NCA) countries had mixed results. The Pacific subregion (PAC) has the highest number of countries (9) that made progress. East and North-East Asia (ENEA) and South and South-West Asia (SSWA) are also subregions in which the number of countries that progressed exceeded the number of countries that did not. These encouraging figures show that road safety improvement is possible.

Figure 5.4 Progress in UNESCAP subregions between 2007 and 2010

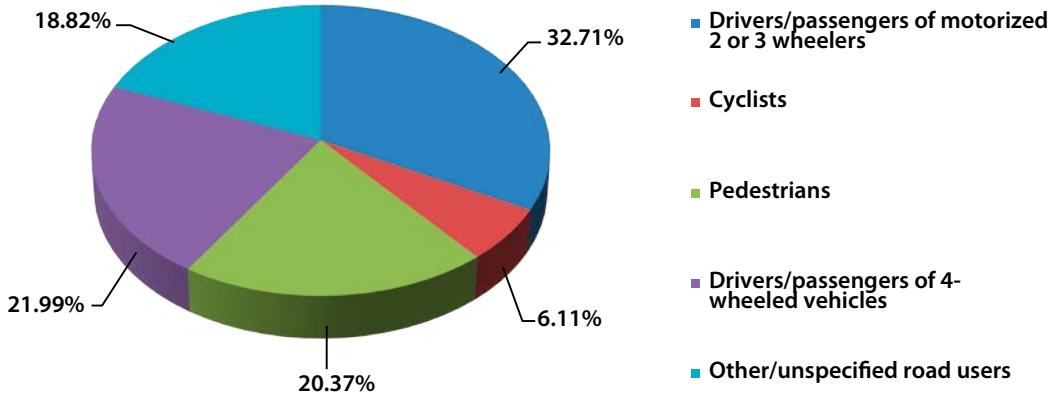


Source: WHO, 2013

In the UNESCAP region, nearly 55 per cent of road traffic deaths are among vulnerable road users (VRUs) — drivers and passengers of motorized two and three-wheelers had the highest proportion of 30.98 per cent. Pedestrians and cyclists had a lower 18.93 per cent share and 4.88 per cent, respectively (Figure 5.5).

[92] Based on country data from 2007 and 2010: Australia, Fiji, Kiribati, Marshall Islands, Micronesia (Federated States of), New Zealand, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga and Vanuatu; North and Central Asia: Armenia, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan; East and North-East Asia: China, Democratic People's Republic of Korea, Japan, Mongolia, Republic of Korea and the Russian Federation; South-East Asia: Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste and Viet Nam; South and South-West Asia: Afghanistan, Bangladesh, Bhutan, India, Iran (Islamic Republic of), Maldives, Nepal, Pakistan, Sri Lanka and Turkey.

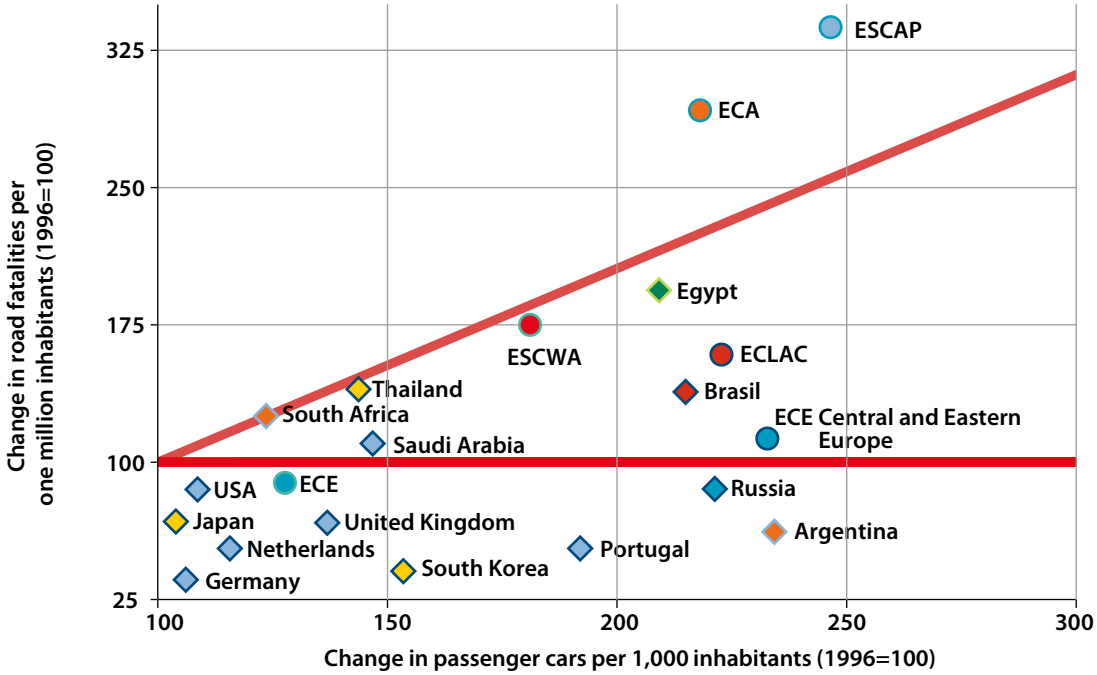
Figure 5.5 Fatalities by road user types in the UNESCAP region in 2010 [93]



Source: WHO, 2013

In comparing motorization and road fatality levels, it appears that whereas several UNECE member States have been able to fully decouple motorization levels (passenger cars per 1,000 inhabitants) from road fatalities over the two past decades, most middle-income countries in Eastern/South-Eastern Europe and especially Central Asia have not (Figure 5.6).

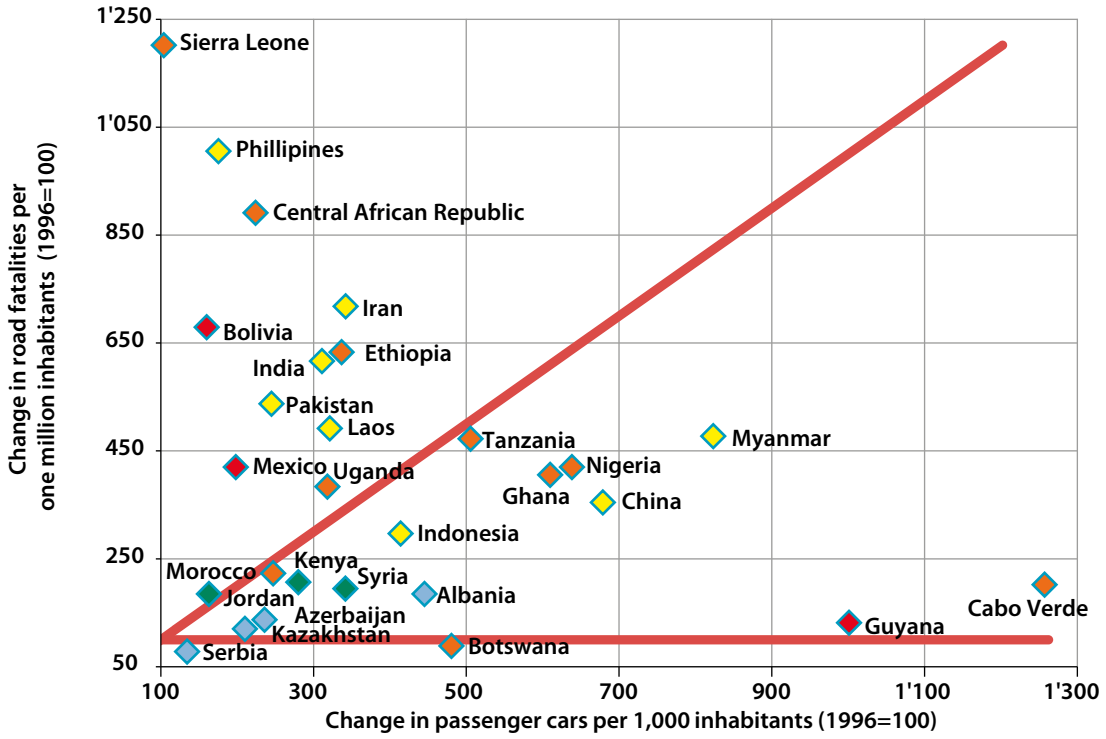
Figure 5.6 Change in Motorization levels and road fatalities – (a) all regions 1996 – 2010;



Source: UNECE and the World Bank

[93] Refers to 35 countries in the UNESCAP region based on data available in the second WHO Global Road Safety Report 2013 (East and North-East Asia (5): China, Japan, Mongolia, Republic of Korea, and the Russian Federation; North and Central Asia (6): Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, and Tajikistan; Pacific (9): Australia, Kiribati, Marshall Islands, New Zealand, Palau, Papua New Guinea, Solomon Islands, Tonga and Vanuatu; South-East Asia (7): Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Singapore, and Thailand; South and South-West (8): Bangladesh, Bhutan, India, Islamic Republic of Iran, Maldives, Pakistan, Sri Lanka, and Turkey.

(b) Country comparisons and examples of notable dimensional shifts 1996 - 2010



Source: UNECE and the World Bank

The countries and regions between the red 45° line and the red horizontal line in Figure 5.6 have relatively decoupled motorization and road fatalities: road fatalities have increased less than motorization levels. UNECE is the only region in which absolute decoupling (i.e. the reduction of fatalities despite increases in levels of motorization) has been achieved. However, this may result from significant reductions in road fatalities in Western and Northern European Countries, whereas Central and Eastern Europe, the Caucuses and Central Asia have, so far, on average managed to relatively decouple motorization and fatality levels. Nevertheless, the trend is quite positive in these countries. Year after year the relationship between motorization levels and road fatalities is improving.

Relative decoupling between motorization rates and number of fatalities has been achieved in the UNECLAC and UNESCWA regions for an observed time period, however, some countries such as Bolivia and Mexico still have very high annual road fatality rate increases. The most critical countries in terms of road fatality levels are from UNECA and UNESCAP. This may be explained by the high economic growth rates and increased transport demand in these countries that resulted in rapid increases in private motorization levels and backlogs in road safety policies.

It should be noted that information on fatal road crashes is relatively easy to collate. In contrast, although road accidents can also result in serious, non-fatal injuries with serious impacts on people's lives and economies, the task to record serious injuries in a compatible format is challenging. International comparisons of serious injuries are inhibited. In 2011, an IRTAD publication[94] recommended an analysis of serious injury data, and proposed a

[94] IRTAD, 2011. Reporting serious road traffic casualties. Available at http://internationaltransportforum.org/irtadpublic/pdf/Road-Casualties-Web.pdf

common definition for serious road accident injuries on the basis of medical diagnosis. The European Commission subsequently adopted a similar definition and is expected to set serious EU injury reduction targets for 2020 (ITF, 2013).

5.1.2 Factors controlling road accidents

Since the establishment of common rules on road traffic and common road signs and signals[95], the larger road safety risks are related to drink-driving, speeding, non-use of seat belts and helmets, and the use of mobile phones while driving. Experience has shown that targeted educational schemes, as well as regulations to modify driver behaviour and enforcement can bring substantial benefits.

Driving under the influence of alcohol

Drink-driving accidents are defined as those where at least one of the road users involved in the crash is under the influence of alcohol. Countries define "*being under the influence of alcohol*" in two different manners: drivers with positive blood alcohol contents and drivers with blood alcohol contents above the maximum allowed limit. In addition, as alcohol content limits differ in different countries (see e.g. Table 4 in ITF, 2013), comparisons between countries cannot easily be standardized. Nevertheless, nearly all countries indicate that drink-driving is a major contributor in fatal crashes, which in many countries, is about one-third of all fatal crashes (ITF, 2013). Drink-driving is also a major issue in several UNECE member States. The majority of these countries apply a maximum blood concentration level of alcohol of 0.05 per cent; nevertheless, the number of road fatalities attributed to alcohol remains high in many countries, with Slovenia and the United States of America heading the list (UNECE, 2012).

Speeding

Inappropriate or excessive speed is also reported behind a large proportion of fatal crashes (typically around 30 per cent). A close relationship appears between the changes in speed limits and the number of fatal crashes. In the UNECE region, many countries have now reduced the speed limits within towns to 50 km/h and, in some urban areas, to 30 km/h. On motorways the speed limit in UNECE countries varies between 100 km/h and 130 km/h; this variability could be important as a speed limit difference of 20-30 km/h can have important implications on road fatalities (UNECE, 2012).

Seatbelts

Seatbelts are compulsory in the front seats of a majority of countries[96] and many countries also have mandatory seatbelt laws for rear car seats. Although there are generally high levels of compliance in the UNECE region, there is still a significant difference in seatbelt usage between the front and the rear car seats. The values for front seats typically range between

[95] The Conventions on Road Traffic and on Road Signs and Signals from 1949 were followed by the so-called Vienna Conventions on Road Traffic and Road Signs and Signals in 1968. These Conventions aimed to increase road safety by standardizing traffic rules road signs, traffic lights and road markings. One of the amendments adopted in 2003 was on priority in roundabouts and signs in tunnels. More details are available at www.unece.org/transport/international-agreements/transconventnlegalinst/list-of-agreements-for-tabs/road-traffic-and-road-signs-and-signals-agreements-and-conventions.html

[96] It is interesting to note that many States of the United States of America do not have primary seatbelt laws (ITF, 2013).

80 and 100 per cent whereas for rear seats the range is between 3 per cent (Serbia) and over 90 per cent (Australia, Germany). There remains scope for improvement in the compliance rates in both front and rear seats, particularly, as it has been found that drivers not wearing seatbelts are more likely to exhibit other high risk driving habits, such as speeding and/or drink-driving (ITF, 2013).

Protective gear

The majority of countries have national helmet laws for the riders/passengers of motorized two wheelers (mopeds and motorcycles). Wearing rates are greater than 90 per cent in countries with an overall high road safety performance. Helmets are compulsory for all cyclists only in few countries (e.g. Australia, Finland and New Zealand) and several countries require helmet use for children. There is little information on wearing rates. Finally, although in many countries there are laws prohibiting the use of (hand-held) mobile phones while driving, there are many drivers that still use hand-held and hand-free mobile phones in these countries.

Infrastructure quality

Safer road networks and improvements in road infrastructure can prevent and/or considerably reduce the severity of road accidents. For example, according to the data from the Asian Highway Database of UNESCAP, primary class Asian Highway roads have the best safety record, while those below class III have the worst record. The upgrading of roads to access-controlled primary class had significant benefits in reducing fatality rates. Substantial improvement in terms of safety can also be gained when roads below class III are upgraded to the minimum class III standards. [97] As safety management through road design and maintenance standards is different between countries, there is scope for further studies to identify good practices as well as indicators that could assist the assessment of road safety in terms of road infrastructure quality (ITF, 2013).

5.1.3 Challenges and best practices

Road safety presents many challenges. Firstly, a reduction of road fatalities and/or injuries can be challenging, particularly in areas with rapid growth rates in economic development and motorization levels. To achieve such reductions, a better understanding of the controlling factors of road accidents and the effective designing of plans/programmes could provide solutions. Secondly, particular emphasis should be given to the increasing problem of motorcycle safety particularly in the well-developed economies where related fatality numbers appear to be elevated. Thirdly, as roads are becoming quieter with the introduction of electrical vehicles ('silent' vehicles) and increasing use of bicycle, elderly people and people with vision and/or hearing problems risk increased accident rates. Fourthly, children have less experience and are often difficult to see in road traffic, thus, facing increased accident risks; early education on road safety rules, blind spots and safe cycling and walking habits is essential for reducing such risks. Finally, many accidents occur in particular road sections ('black spots'), due to road design/maintenance problems, such as sharp corners, reduced visibility, missing signs or other reasons; and the removal of 'black spots' should be given a high priority (see also, UNECE, 2012).

[97] Definitions of different class of Asian Highway roads can be found at: www.unescap.org/resources/asian-highway-database. Findings presented in this paragraph are based on road safety data for 33 per cent of the length of the Asian Highway, including 630 road sections (or 42.7 per cent of all sections), covering 47,939 km in 21 countries.

Fight against fatigue: The digital tachograph

The recording of driver behaviour is especially useful for evaluation. It allows, for example, speeding to be reported to the driver's supervisor immediately. Studies have shown that the impact of the tachograph varies from a 5-30 per cent reduction in accidents, 5.5 per cent reduction in fatalities and 3.5 per cent reduction in serious injuries (Supreme, 2007). Fatigue is a severe risk for road safety and the maximum working hours of professional drivers is regulated in most UNECE member States. The tachograph was invented almost a century ago and has been mandatory in EU countries since 1985. Tampering with the tachographs was a severe problem until the introduction of digital tachographs reduced the problem considerably.

In road tunnels, the rate of accidents is higher by up to 40 per cent in bi-directional tunnels than in unidirectional tunnels. According to the World Road Association, the frequency of breakdowns is about 1,300 per 100 million vehicle kilometres in tunnels under rivers and urban areas, 300–600 breakdowns in tunnels in the open countryside, and 900–1,900 in mountain tunnels. The frequency of fires in road tunnels has been found to be about 25 per one million vehicle-kilometres. [98] Following the incidents at the road tunnels of Mont Blanc and Tauern (1999) and St. Gotthard (2001), UNECE mandated a Multidisciplinary Group of Experts on Road Safety in Tunnels. The Inland Transport Committee subsequently also set up a Group of Experts on Safety in Road Tunnels to consider the issue of safety in rail tunnels[99].

There are several examples of plans/programmes associated increasing road safety. These include the Dutch Education campaigns for young road users, the 'Bob the designated driver' campaign to reduce drink-driving[100], better systems of enforcing drink-driving laws, introduction of 'collision free roads'[101], the Northern European Cooperation programme on traffic law enforcement [102], the Swedish 2010-2020 strategy for the improvement of road safety for moped and motorcycle riders[103], the trial driver's license in Germany, the EuroNCAP classification system of new car safety[104], the EU road safety targets[105], the introduction of digital tachography and speed cameras and the IRTAD twinning programme[106] (for more details on these plans/programmes, see UNECE, 2012).

UNECE also established an Ad Hoc Working Group on the prevention of road accidents in 1950 and a Working Party on Road Traffic Safety (WP.1) in 1988. WP.1 is the only permanent body in the United Nations which focuses on improving road safety and manages the United Nations legal instruments on harmonizing rules on road traffic. More information on WP.1 is available at **www.unece.org/trans/main/welcwp1.html**.

[98] See PIARC (1999).

[99] See www.unece.org/transport/areas-of-work/safety-in-tunnels/meetings/multidisciplinary-group-of-experts-on-rail-safety-in-tunnels-ac9.html

[100] See http://ec.europa.eu/health/ph_determinants/life_style/alcohol/Forum/docs/ev_20080220_co01_en.pdf

[101] See e.g. www.righttoride.co.uk/virtuallibrary/barriers/R636ASve.pdf

[102] Information provided by Sweden and Denmark in the questionnaire on Transport for Sustainable Development, December 2010.

[103] See https://polisen.se/Global/www per cent20och per cent20Intrapolis/Informationsmaterial/01 per cent20Polisen per cent20nationellt/Engelskt per cent20informationsmaterial/Improved_safety_for_mc_moped_1.0_Engelsk.pdf

[104] See www.euroncap.com/home.aspx

[105] See http://archive.etsc.eu/documents/PIN_Report_6_web.pdf

[106] See www.internationaltransportforum.org/irtadpublic/pdf/13IrtadReport.pdf

Professional road transport training: Championing excellence worldwide

The IRU Academy, the training arm of the IRU, is the only global body dedicated to road transport training. By developing top-quality training programmes and ensuring quality control of training delivery, the IRU Academy ensures capacity-building and development of professional competence for road transport managers and drivers across the board.

With its unique structure, the IRU Academy is involved in a number of training initiatives ranging from road safety to HIV/AIDS, and eco-driving, and offers its portfolio of training programmes to road transport professionals through its global network of Accredited Training Institutes to ensure that we support the industry in achieving its priorities in sustainable development, facilitation, safety and security.

Road safety training: Focusing on human behaviour through training

For true road transport professionals, every road accident is one too many. That is why the road transport industry is committed to reducing the number and severity of accidents involving commercial vehicles by addressing the main cause of accidents – the human factor.
The IRU Academy's professional training and knowledge transfer are key elements to effectively tackle the main causes of road accidents and significantly reduce their number. Committed to actively supporting the UN Decade of Action for Road Safety, the IRU Academy has strived to enlarge its training portfolio by developing road safety specific programmes:

- Crash Prevention Programme
  Aims to increase risk awareness and encourage road safety best practices among commercial drivers to reduce the number of accidents and ultimately save lives.
- Safe Loading and Cargo Securing Programme
  Addresses road safety by training road transport professionals in loading and cargo securing theory and practice to ensure safe and legal cargo traffic on roads.

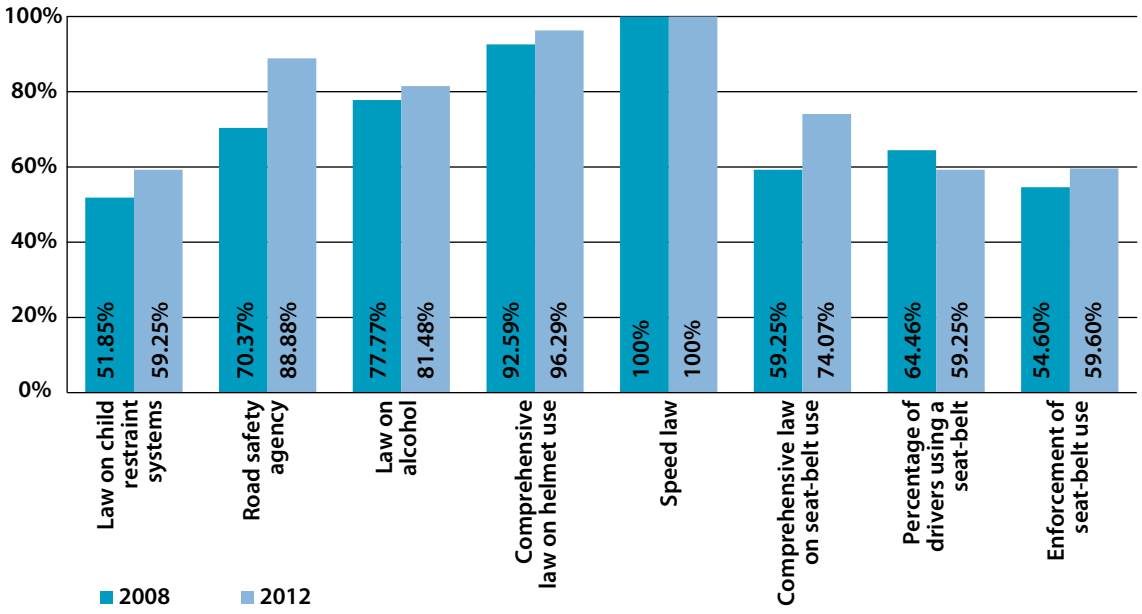
To further support the IRU Academy's work, the IRU continuously develops road safety publications such as driver safety cards and checklists.

The challenge of the safe mobility of people is especially important for the Latin America and the Caribbean countries, where, despite national and multilateral efforts in the framework of the Decade of Action for Road Safety, the estimated road traffic death rates are still high. Most of these deaths occur among vulnerable road users, with pedestrians accounting for up to 31 per cent of total road traffic fatalities recorded in the region, while the figures for Canada and the United States of America are 14 per cent and 12 per cent, respectively (UNECLAC, 2013/06).

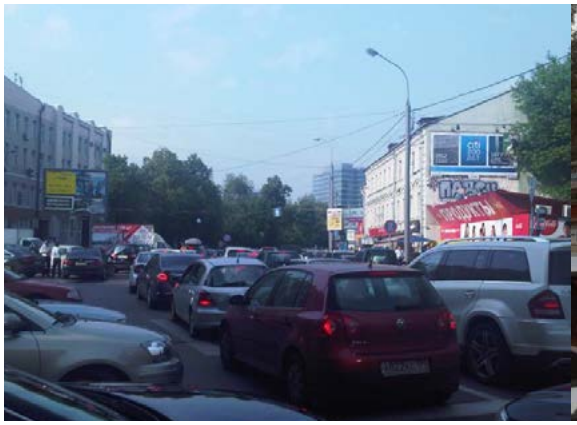
UNECLAC recently reviewed the progress of the road safety measures implemented in 27 countries across the region for the period 2008-2012 (Figure 5.7). In general, the region showed positive trends for most of the selected indicators, in particular a substantial rise in the creation of road safety agencies and advances in the laws on alcohol and mandatory helmet use. However, the legislation on compulsory use of child restraint systems in vehicles has had minimal success in the region and it cannot be ruled out that acquired behaviours have been relaxed due to weaker law enforcement. It must, therefore, be emphasized that a substantial reduction in the number of killed and injured requires continuity in measures over time.

UNECLAC, undertook the promotion of road-safety measures that are part of a comprehensive and sustainable mobility policy. This approach allows for the application of broad solutions, and also permits the evaluation of their effects on, for example, the financial impacts on the national budget and on social welfare. By correctly anticipating these direct and indirect effects, fiscal measures may be discovered (for example, by savings on health costs or insurance premiums) in order to fund effective road safety measures and to ensure that they are economically sustainable. The environmental benefits of certain means of transport, insofar as they are provided with appropriate infrastructure and regulations (cycle paths, pavements and pedestrian overpasses and underpasses), can also be assessed with this approach.

Figure 5.7 Trends in road safety policies in the UNECLAC region



Source: WHO, 2013; PAHO, 2009



Congested Moscow roads

Congerstion on the road to New Delhi

Those who did not reach their destination

And the new generation in Belgrade learning how to participate in traffic

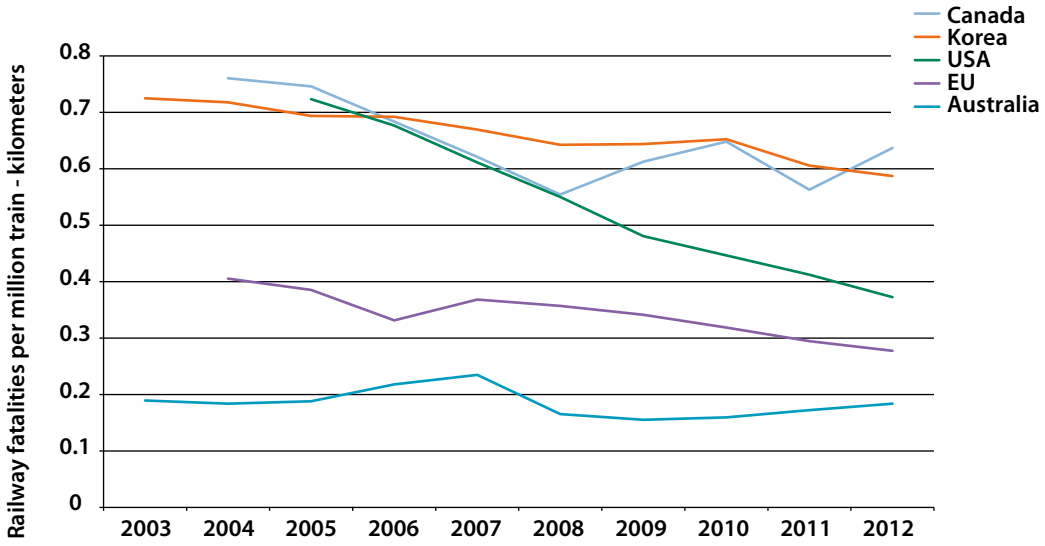
5.2 Rail Safety

Railways have always been built with safe transport in mind and included concepts such as "fail-safe" technologies. With improved technical performance and the increasing use of railways as a mode of transport, so have the volumes carried, the density of traffic, and the extent of services offered by the railways. Rules and regulations are already in place and continue to develop, becoming ever more precise and applying to all stakeholders, whether infrastructure managers, railway operators or service providers and contractors working in rail. Although rail transport is operated exclusively by professionals and one of the safest transport modes, safety incidents and accidents continue.

5.2.1 Trends

The fatality risk for Australia, Canada, the Republic of Korea, the United States of America and for EU-28 countries is shown in figure 5.8 below. Official data could not be obtained from other major countries. A strong decrease in fatalities over the last decade is shown for three countries and the EU-28; the rate of the decrease for the latter is comparable with that of the North American countries, however it falls short when compared to the trend in the Republic of Korea (ERA, 2014).

Figure 5.8 Railway fatalities per million train-kilometres in 2003–2012 for Australia, Canada, the Republic of Korea, the United States of America and for EU-28 countries (excluding suicides)



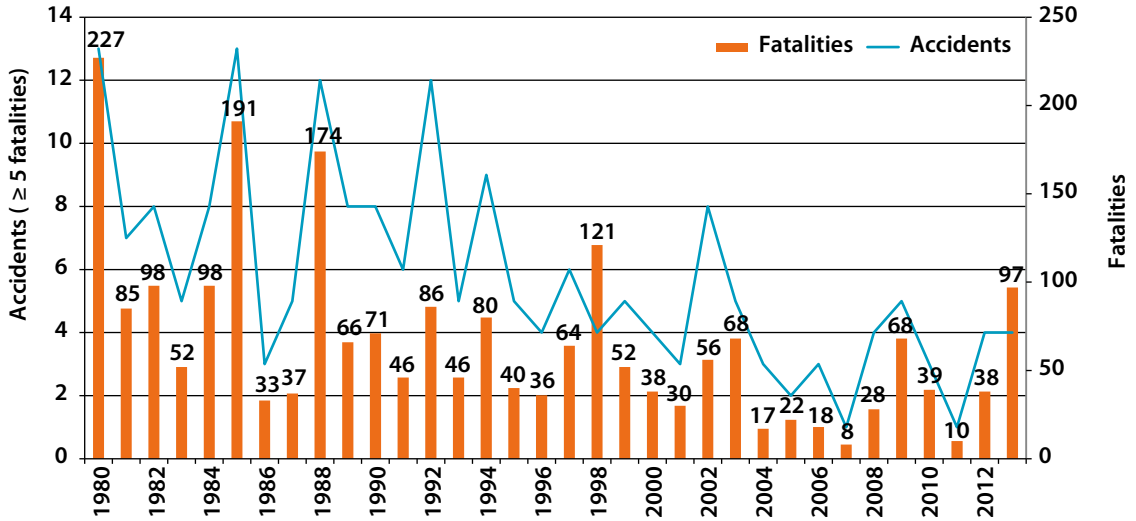
Source: ERA, 2014

A continuous decrease in major accidents and resulting fatalities can been seen in EU-28 since the beginning of the 1980s in Figure 5.9. Nevertheless, serious accidents have a significant effect on the trend in the annual number of fatalities as a result of their relatively infrequent nature. Figure 5.9 shows the serious rail accidents during the period 1980–2013 and includes not only train collisions and derailments with five or more fatalities, but also the major level-crossing accidents, train fires and accidents involving people and rolling stock in motion.

Trends in major accidents show substantial decreases over the period 1980-2012, and even more so in the period 1990-2012. Unfortunately, 2013 saw the highest rail accident

casualty levels since 1998; a tragic high speed train accident in the north of Spain claimed 79 lives in July of that year. On average, there were eight major railway accidents each year in the 1990s, and about five major accidents each year in the 2000s.

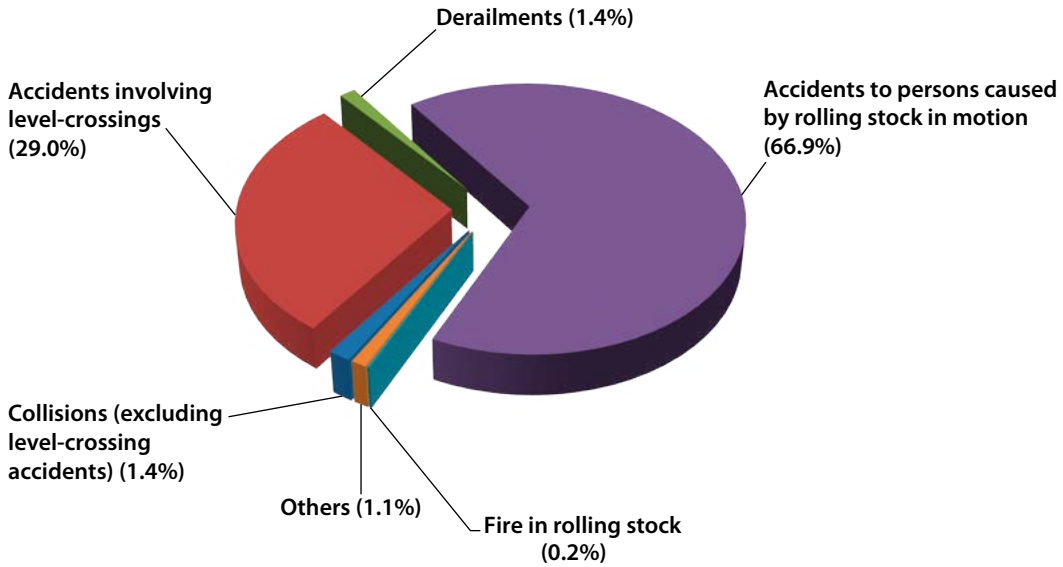
Figure 5.9 Railway accidents in Europe with five or more fatalities, 1980-2013[107]



Source: ERA, 2014

An analysis of the rail incidents in EU-28 for the period 2006-2013 (Figure 5.10) shows that about 95 per cent of these fatalities were caused by rolling stock in motion and/or occurred at level crossings. More than two-thirds of the fatalities (66.9 per cent - 7,328 fatalities) were due to accidents caused by rolling stock in motion (*ERA, 2014*).

Figure 5.10 Rail fatalities in the EU-28, 2006-2013

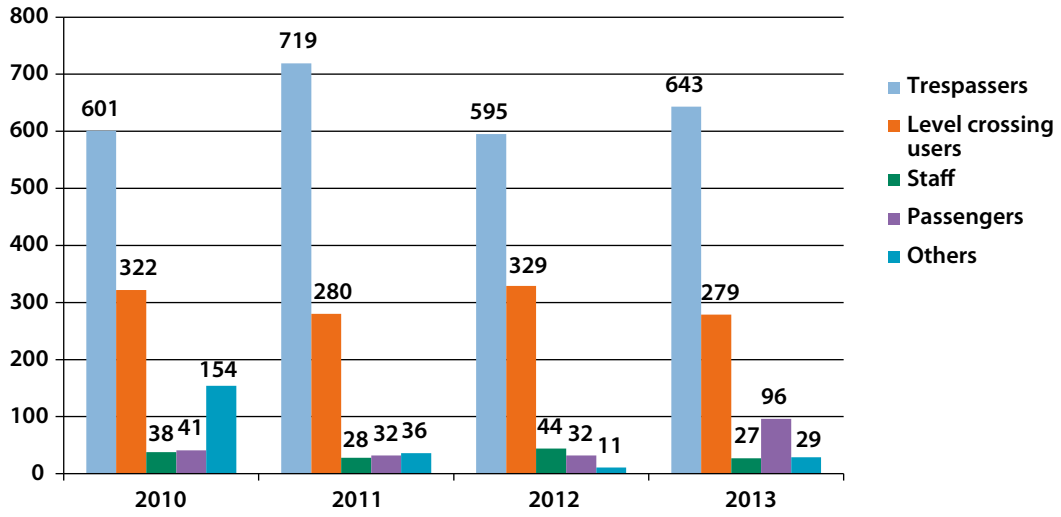


Source: ERA, 2014

[107] Includes Norway, Switzerland and EU-28; excluding Croatia and Romania (1980–1989).

Again, the recent positive trend in EU-38 suffered in 2013: 9 per cent were passenger fatalities, 3 per cent were railway staff, the remaining 88 per cent were mostly trespassers, i.e. illegal access of persons to railway assets, and persons using a level crossing to cross a railway line by any means (Figure 5.11).

Figure 5.11 Railway fatalities per category of victim, 2013



Source: International Union of Railways Safety Database - 21 member States

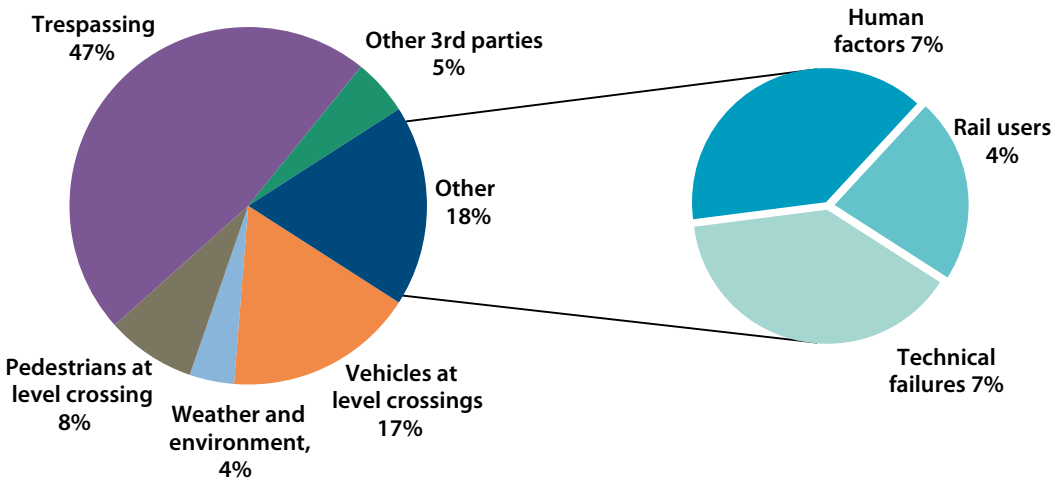
The trend is similar in Canada, where an average of 96 per cent of fatalities between 2004 and 2012 resulted from trespassing and level crossing incidents. As in Europe, one incident changed the trend in 2013 — a severe freight train derailment in the province of Quebec was responsible for the deaths of 47 inhabitants of the town in which the incident took place (40 per cent of total national rail fatalities in that year).

In the United States of America, 231 fatalities were the result of 2,097 accidents on level crossings in 2013. Also in 2013, 939 fatalities were in rail accidents and 553 were from trespassing. As in Canada and EU, a very high percentage of railway accident fatalities in the United States of America result from trespassing and level crossing incidents—averaging 84 per cent of the total railway accident fatalities between 2010 and 2013.

5.2.2 Factors causing rail accidents

The International Union of Railways (UIC) differentiates between two groups of factors that are the root cause of railway accidents: those within the responsibility of the railway system, and those as a result of external causes. According to UIC Safety Database data for 2013 (Fig. 5.12), 81 per cent of accidents happened as a result of external causes, while internal causes are split between technical failures (7 per cent) and human factors (11 per cent).

Figure 5.12 Main causes of railway accidents in 2013

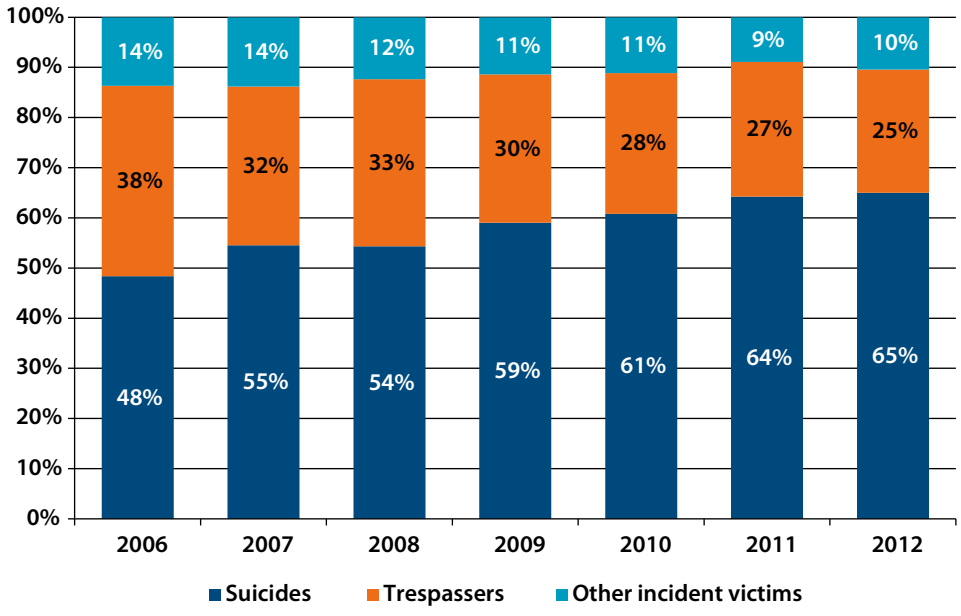


Source: UIC Safety Database - 21 member States

Technical failures and human factors

The European Railway Agency has identified common technical failures which cause railway accidents and has established guidelines for a safety management system, which EU member States can use to monitor technical failures: broken rails, broken track buckles, wrong side signalling failures, broken wheels and broken axels (details are provided in the section on best practices in this chapter). Excessive speeds and the lack or malfunction of the automatic speed reduction safety system are an additional factor leading to significant accidents (i.e. accidents with five or more fatalities, as defined by the ERA).

Figure 5.13 Causes of fatal accidents in EU-28 railways



Adapted from: ERA, 2014

Trespassing and suicides

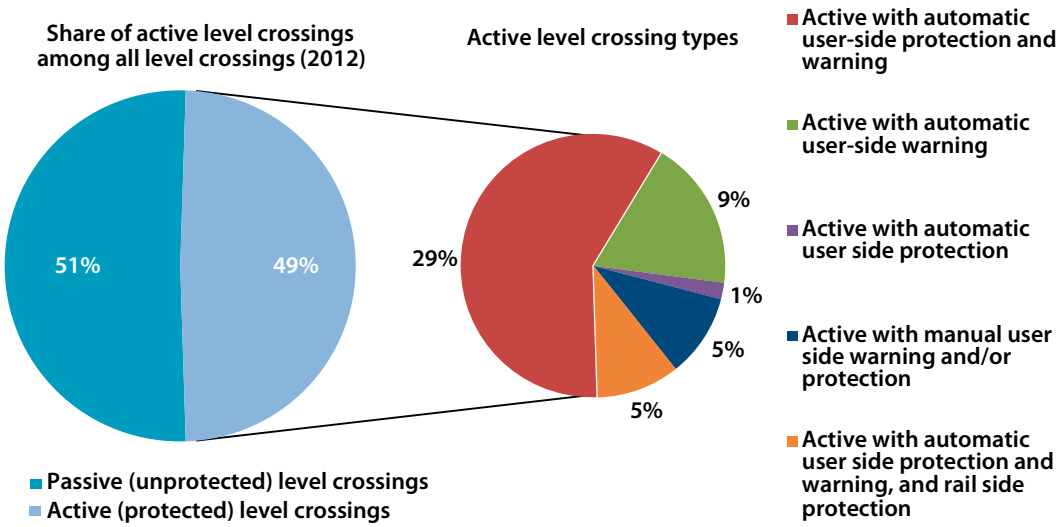
The data in Figure 5.8 excludes suicides and are treated as a separate category of an intentional nature and, as such, considered a security concern rather than a safety issue. [108] During 2006-2012, suicides represented, on average, 70 per cent of fatalities. In addition to trespassers accidents, these amount to 88 per cent of all fatalities occurring in EU railway systems (Figure 5.13).

Lithuania, Poland, Portugal, Sweden and the United Kingdom registered a significant increase in railway suicides in 2012, with the frequency increasing by 25 per cent on a year-to-year basis. Therefore suicides, which in other countries increase by 6 per cent per annum, and trespassing incidents, demand urgent mitigation measures in EU, and are a serious security concern in railway systems (see chapter 6). In the United States of America, the recorded suicide rates are somewhat lower, but still represent a significant proportion of total fatalities, with an average of 250 annual incidents between 2011 and 2014 (See: U.S. Federal Railroad Administration[109])

Level crossings

Road and rail intersections present special challenges for the safety of both modes of transport, each with distinct operational characteristics. For example, road users are individual drivers with high operational flexibility, whereas train drivers follow strict schedules and guidelines and are restricted to the railway tracks. Trains have priority at level crossings. Road users are warned by audible signals such as horns or bells, visible signals such as lights and gates and/or physical signals or vibration of road bumps.

Figure 5.14 Active level crossings in the European Union [110]



Source: ERA, 2014

[108] See chapter 6 for a detailed explanation of the distinction between safety and security.

[109] http://safetydata.fra.dot.gov/officeofsafety/publicsite/Query/CasualitiesReport.aspx

[110] Active level crossing are those where users are either warned (unprotected) or protected (by a barrier/gates).

Currently, there are more than 118,000 level crossings in the EU-28 alone, i.e. five level crossings per 10-railway-km (although there is a current 2 per cent average annual decrease from investments to replace level crossings with other infrastructure). Half of these crossings are active level crossings, equipped with some sort of user warning; the remainder are passive level crossings, typically equipped with a St. Andrew's cross traffic sign (Figure 5.14). Level crossings with automatic user-side warnings (typically flashing lights and sound warning) are the most common type of active crossings (43 per cent), closely followed by level crossings with automatic user-side protection and warning (barriers with lights) (34 per cent). Austria, the Czech Republic, Hungary, the Netherlands and Sweden have the highest density of level crossings per railway-km. A low ratio of active level crossings to all level crossings is typical for less densely-populated countries. For example, Spain has the lowest average number of level crossings per railway-km, i.e. one level crossing per 5 railway-km (ERA, 2014).

5.2.3 Challenges and best practices

Effective safety management is a prerequisite for maintaining and improving the safety of railway systems over time, particularly for technical, organizational and human factors affecting the internal operation of railway systems. A safety management system is proactive and identifies hazards of activity, assesses risks presented, and takes action to reduce those risks. It involves continuous checks and timely identification of new hazards.

Precursors to Accidents

Railway accidents are rare in comparison to road accidents: monitoring even the less serious consequences is an essential tool of a proactive safety management system. An example of such an approach is the EU proactive system of monitoring railway safety where national safety authorities (NSA) report Common Safety Indicators to the European Railway Agency. One such measure is the investigation and reporting of "Precursors to accidents", indicators of incidents that under other circumstances, i.e. if not monitored and mitigated, could lead to accidents. These indicators have been determined (Transport Research Laboratory) by studying the causes of major incidents:

- derailment;
- collision of trains;
- collision with obstacle;
- level crossing accident;
- accidents to persons caused by rolling stock in motion (excluding suicide);
- fires in rolling stock.

By identifying the precursors of the incidents, and developing a harmonized set of accident precursors for safety management at the EU, NSA, railway undertaking and infrastructure management levels:

- broken rails;
- broken track buckles;
- danger signals passed;
- wrong side signalling failures;
- broken wheels;
- broken axels.

Between 2010 and 2012, EU countries reported more than 10,000 precursors to accidents per year.

There are two key methods for evaluating and managing accident risks. One is to use historical accident data to identify the types of accidents with the highest risk or frequency; the other is to develop a model to examine the potential causes of – or precursors to – an accident. Serious railway accidents are rare and the use of just historical accident data may conclude remote or non-existent risks. Proactive management of accident risks, therefore requires looking beyond the accident statistics and identifying and estimating possible accident causation sequences. The frequency of such causes and sequences is large enough in the rail industry to provide a reasonable empirical base for estimating risks. The aim of a risk model is to determine how particular minor events could interact to lead to a more serious accident.

As seen above, suicides are a significant percentage of fatalities in railway systems. Although the rates of suicides in Canada are lower than in the European Union, concern did motivate the Department of Transport of Canada to fund a programme to research the causes, reduce the rates and mitigate the consequences of such tragedies. A similar initiative was carried out in the scope of the International Union of Railways RESTRAIL project[111] funded by EC.

Railway Suicide Prevention and Reduction of Negative Consequences

The Centre for Research and Intervention on Suicide and Euthanasia (CRISE) of the University of Québec in Montréal (UQAM) conducted their Railway Suicide Prevention and Reduction of Negative Consequences programme between 2007 and 2013, resulting in an online database providing assistance to all interested parties and stakeholders affected by railway suicides. The objectives of the programme are to:

- provide railway stakeholders from Canada and around the world with relevant scientific information to improve prevention of railway fatalities and reduce their impact on employees;
- promote sharing of information among railway network stakeholders regarding suicide prevention and support for employees;
- encourage and support the development of evidence-based suicide prevention practices;
- encourage and support the development of evidence-based support and trauma prevention practices;
- encourage and support the evaluation of practices in order to improve practices and ensure continuing quality control.

The programme resulted in finely detailed data and a knowledge base that can be accessed at www.railwaysuicideprevention.com. It contains a structured analysis of suicide prevention challenges, suicide and trespassing prevention methods and descriptions of measures for monitoring incidents and discouraging perpetrators, advice for identification of hotspots, preventive measure effectiveness evaluation methodologies, and many more tools to address the occurrences of trespassing and suicides on railways.

Level crossings are another safety problem for the rail system. According to European statistics, level crossing accidents account for only 1 per cent of road deaths but comprise 29 per cent of all rail accidents, and the risk of injury or death is extremely high and unacceptable because it is mostly preventable. Numerous efforts have been undertaken to raise awareness of level crossing safety issues. A significant number of accidents at level crossing result from negligence in crossing by motorists, cyclists and pedestrians, either deliberately or mostly by mistake. As a result, educating users is a very important measure for highlighting the risks and raising public awareness of the potential consequences of ignoring traffic rules and safety signals and barriers.

In 2009, the International Level Crossing Awareness Day (ILCAD) campaign aimed at making the road users and pedestrians aware of the dangers at and around level crossings. The International Union of Railways (UIC) initiated and organized the event which has become a worldwide annual campaign.

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[111] See section 6.3 below.

International Level Crossing Awareness Day

The first campaign, named ELCAD (European Level Crossing Awareness Day), started in Europe and Israel (25 June 2009). The collaborative effort brought together major railway undertakings, the road sector, infrastructure managers, and many railway companies, members of UIC, the European Commission, education organizations, law enforcement authorities and media.

The focus was to unite a series of existing national campaigns on the same date around a common theme and image in a unique way which would be held across participating member States of the European Union. The key message was, "Stop accidents! Europe for safer level crossings!".

The objective was to raise awareness of the risks at the road/rail interface and focus on the behaviour of users at level crossings. The international success lead to the name 'International Level Crossing Awareness Day'.

During ICLAD 2010 (22 June) more than 40 countries (including Estonia, France, Germany, Italy, Lithuania, Poland, Portugal, Russian Federation and the United Kingdom) presented awareness-raising videos, posters, etc. The 2010 edition expanded to all five continents. [112]

In May 2013, during the 2nd UN Global Road Safety Week, UNECE hosted an exhibition of the best entries by children in the last three ICLAD drawing contests on level crossing safety. **www.unspecial.org/wp-content/uploads/2013/07/UNSpecial_Juillet-Auot2013.pdf**. The campaign has rapidly grown in the last 5 years with 45 countries participating in the 2014 edition. To launch the sixth edition on 3 June 2014, the Federal Office of Transport of the Switzerland, UIC and UNECE co-financed and co-produced a film to raise the awareness of decision makers: "Saving lives at level crossings" www.unece.org/videoc/welcome.html.

The Working Parties of UNECE on Road Traffic Safety (WP.1), on Rail Transport (SC.2) and on Road Transport (SC.1) provide a framework for knowledge sharing and capacity-building problems related to level crossings. A multidisciplinary group of experts with members from each Working Party and other stakeholders (mainly railway experts on level crossing safety) was mandated to improve safety at level crossings. The Group of Experts on safety at level crossings (GE.1) provides an international discussion platform for increasing safety at the interface of road and rail systems. GE.1 brings together specialists from the public and private sectors, Government officials and experts from UNECE member States and non-member States, academia and independent researchers as well as special organizations such as the UIC. The Group's mandate[113] includes taking stock of available data; describing, assessing and understanding better the safety issues at a road/rail interface; as well as developing a multidisciplinary strategic plan to reduce the risk of death/injury at level crossings.

It should also be mentioned that a UNECE informal task force on rail security deals with the threat of terrorism for the railway system and provides a framework for sharing best practices. The task force works on key issues using a risk-based approach. The UNECE Working Party on Rail Transport works with the International Union of Railways to raise awareness on the importance of rail security (workshops, joint meetings and knowledge sharing).

[112] See also www.ILCAD.org.

[113] Further information on GE.1, its Terms of Reference and meetings is available at www.unece.org/trans/roadsafe/eg_level_crossings_01.html.

5.3 Inland Waterway Safety

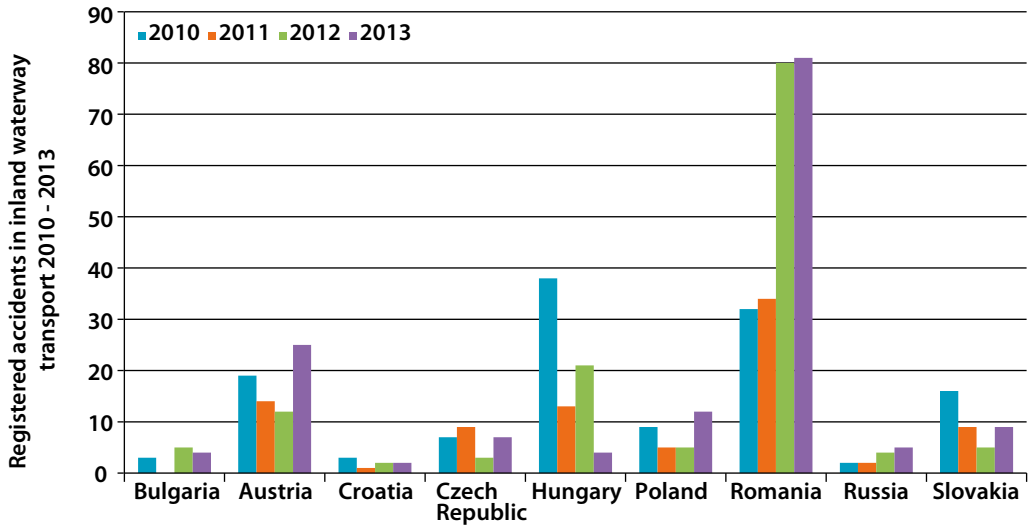
Inland Waterway Transport (IWT) is at least 50 times safer than road and 5 times safer than rail (in persons killed per ton-km) transport (UNECE, 2012). IWT vessels are, in contrast to road and rail, predominantly used for freight transport and particularly so in Europe and North America, thus limiting the scope of private/citizen accidents.

In contrast, certain parts of Africa and Asia have high rates of commuter accidents on inland waterways in densely populated areas. This may result from inadequate road infrastructure, high traffic volumes and relatively high costs in land travel, which all tax the existing IWT capacities.

5.3.1 Trends

Available statistics show very low accident rates on European IWT (Figure 5.15). Exceptions are river cruise or ferry accidents such as the 2011 *Bulgaria* cruise disaster on the Volga River (Russian Federation), which resulted in 123 fatalities.

Figure 5.15 Accidents on the European inland waterways, 2010-2013



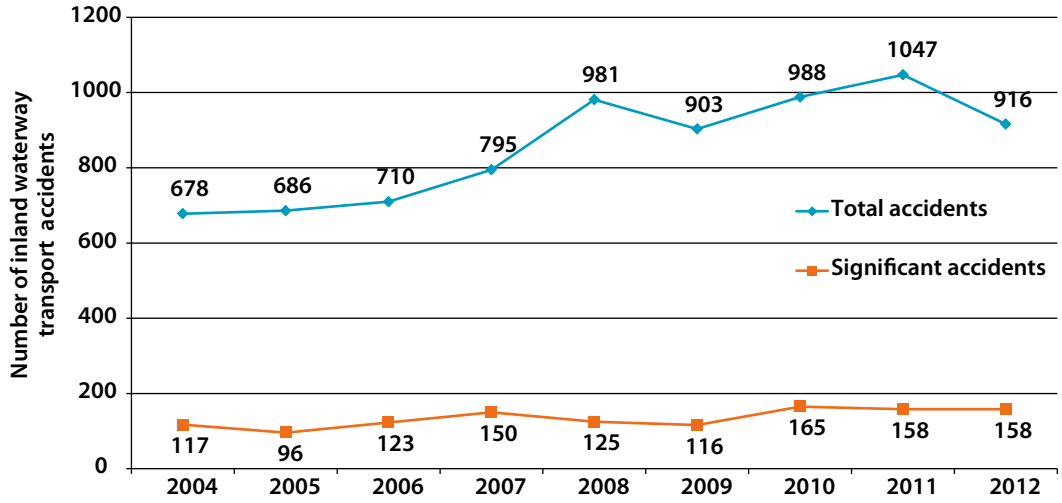
Source: Eurostat, Russian Federation Ministry of Transport

The transport of dangerous goods requires special attention due to the possible consequences of accidents on the environment and the individuals involved. Special safety precautions are required for the transport of dangerous goods, including toxic, corrosive, explosive, radioactive or flammable substances . According to Eurostat, 23 accidents were reported on European inland waterways between 2004 and 2013: seven in Austria and five in Romania.

The Netherlands has one of the most developed national inland waterway transport networks in Europe and the world, as well as the highest per capita carriage of goods by inland waterway. Accordingly, the Netherlands has a well-established practice of monitoring IWT traffic incidents. Instances and causes of internal waterway accidents are monitored and published by the Dutch Ministry of Infrastructure and Environment, and include data on number of accidents, type of accidents (according to a defined damage and casualty scale), environmental damage and victims in commuter, freight and recreational waterway traffic. Nevertheless, in the past few years, the traffic and the number of accidents on inland waterways has increased (Figure 5.16).

The national accident monitoring system shows that recreational craft are more frequently involved in accidents than previously. In 2013, four serious accidents involving professional and recreational vessels claimed seven lives. Between 2004 and 2012, the number of registered accidents involving professional and recreational vessels was on a slight upward trend, with, on average, no more than one fatality per year.

Figure 5.16 Inland waterways accidents in the Netherlands, 2004-2012



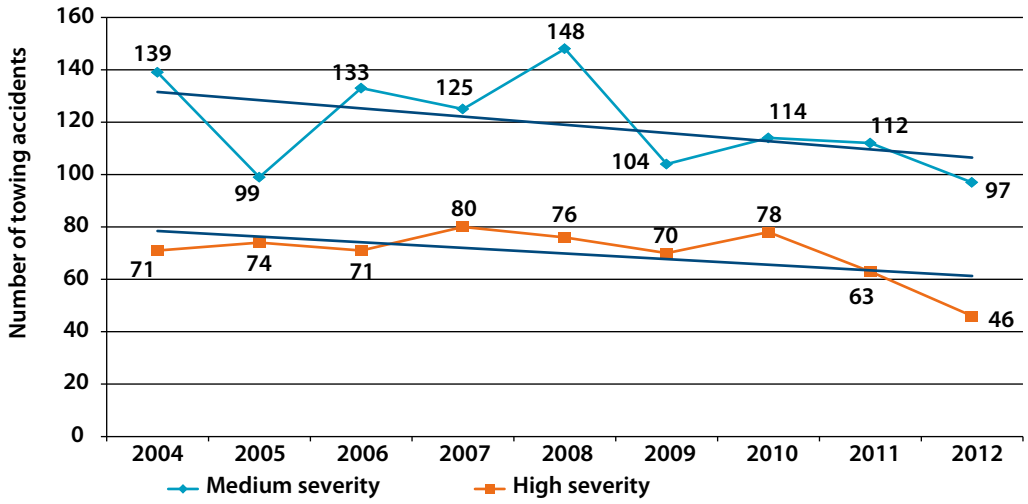
Source: the Netherlands, (Ministry of Infrastructure and Environment, 2010 and 2013)

An international comparison of data on inland waterway safety is difficult to establish as definitions of 'serious accidents' on inland waterways and the scope of accidents differ from country to country. The box below compares some definitions from the Netherlands and from the United States of America.

Inland waterway transport (Netherlands)	Inland waterway towing industry (USA)
• Victims: There are casualties missing, dead or severely wounded;	• Victims: Any injuries or deaths;
• Damage: waterway or ship damage of € 50,000 or more; more than 10 tons of cargo, or at least 1 container is damaged or lost; • Environment: stage 2 or 3 environmental damage; • Navigation suspended: if the waterway traffic is blocked for one hour or longer.	• Damage: More or equal to US$ 250,001; • Pollution: 1,001 or more gallons of oil spilled

The U.S. Coast Guard and the American Waterway Operators established a Safety partnership in 1994 for measuring and tracking the overall trends in safety and environmental protection in waterway transport. While not all-encompassing, the measures are considered as useful safety indicators and consist of: (a) the number of crew fatalities on towing vessels, (b) gallons of oil spilled, and (c) number of accidents and degree of severity. In the past decade, incidents of high and medium severity have both followed a decreasing trend. Medium and high severity incidents accounted for an average of 11 per cent of all incidents in the towing industry in the United States of America between 2004 and 2012 (Figure 5.17).

Figure 5.17 Inland waterways towing accidents in the United States of America, 2004-2012



Source: U.S Coast Guard - American Waterway Operators

Some of the most common causes of medium and high severity accidents between 2000 and 2012 in the United State of America have been allision (38 per cent), material failure (19 per cent), collision (11 per cent), grounding (10 per cent), vessel manoeuvrability issues (8 per cent) and flooding (5 per cent).

South-East Asia, West and Central Africa and to a lesser extent the Amazon and Parana River regions in South America are areas with reoccurring severe accidents accompanied by high fatality rates. A lack of adequate road infrastructure, high volumes of traffic and the relatively high cost of overland and air travel have made waterways in these regions important transport arteries for the general population and specifically for traders and market vendors. In particular, large rivers such as the Padma and Meghna Rivers in Bangladesh and Congo and Niger River in West Africa, and their tributaries are notable.

Between 2003 and 2013, at least 1,000 persons died in numerous ferry accidents in Bangladesh: given reasons have been vessel overloading, poor construction and a lack of appropriate safety measures and their enforcement. The same causes were reported for two accidents on the Congo River in 2008 and 2010 in which 185 people drowned, and for 3 accidents on the Niger River in 2013 resulting in 264 fatalities. In the cases of severe accidents involving ferries with dozens of passenger fatalities on the Nile in Sudan and Egypt, and on large rivers in Brazil, Paraguay, Myanmar and Viet Nam in the past decade, the most common reasons given have been poor vessel maintenance, overcrowding of cargo and passengers, and commuting during storms with heavy precipitation and strong winds.

In South America, the inland shipping sector has received little attention. In the majority of the region's countries, standards and specific policies do not exist. The sector has a high level of informality, particularly in the remote areas of the continent where river transport is often the only mobility option for the local communities. Here, the risks of accidents are high, particularly as minimum standards such life vests and position lights on vessels are typically absent.[114]

[114] Wilmsmeier G. (2013): Conectando América del Sur: Movilidad fluvial y sistemas de navegación fluvial. Bulletin FAL Issue 327, no. 11/2013. ECLAC. Santiago, Chile.

5.3.2 Challenges and best practices

Increasing safety of navigation in inland waterways worldwide can evolve from international agreements and conventions. These should seek to improve the existing infrastructure, develop new waterways, introduce new regulations on safety and environmental protection, implement existing regulations or standards and customs, etc.

As such, the International Maritime Organization, in 2002, reacted to the frequently, severe accidents in the shipping industry on the lakes and navigable rivers of Africa by adopting the Model safety regulations for inland waterways vessels and non-conventional craft, including fishing vessels. The Model regulations were agreed upon by representatives of: Burundi, Ghana, Kenya, Malawi, Mozambique, Nigeria, Rwanda, Sierra Leone, Tanzania, Uganda, Zambia and Zimbabwe (15–19 October 2001, Mwanza, Tanzania). The Model regulations provide safety and pollution prevention standards for new vessels and barges (and, as appropriate, existing vessels and convention-sized vessels) that trade regularly and consistently on inland waterways, at sea on non-international voyages, and for the personnel aboard.

Non-intervention has led to tragic losses of life, damage to property and marine environment in many of the inland waterways and lakes of Africa, Asia and South America. The need for harmonized standards, regulatory laws, rules, procedures and practices for vessels operating on inland waterways in these continents cannot be over-emphasized. The IMO project based regulations can serve as a model for further required improvements in inland navigation safety standards.

In Europe, however, such a system already exists at the pan-European level for inland waterways of international importance covered by the European Agreement on main inland waterways of international importance (AGN). The most important instrument for safe navigation in the UNECE region is the European Code for Inland Waterways (CEVNI). This Code contains the core rules applicable to the traffic on inland waterways in the UNECE region such as marks and draught scales on vessels, visual signals on vessels, sound signals and radiotelephony, waterway signs and markings, rules of the road, berthing rules, signalling and reporting requirements as well as prevention of pollution of water and disposal of waste. These harmonized rules constitute the legal and technical basis for national inland waterway codes in UNECE member States.

Technical prescriptions for the construction of vessels cover all aspects of the vessel structural and operational safety. Environmental safety of vessels, apart from those carrying dangerous cargoes, includes protection against pollution of water basins by oil, waste and household water, protection against air pollution by engine exhausts, noise and harmful components of anti-fouling systems. The Inland Transport Committee serviced by UNECE carries out work on the harmonisation of technical prescriptions for vessels on the basis of national and international regulations. The results of this work include:

- Resolution no. 61: Recommendations on harmonized Europe-wide technical requirements for inland navigation vessels,
- Resolution no. 21: Prevention of pollution of inland waterways by vessels,
- Resolution no. 69, Guidelines for Passenger Vessels also Suited for Carrying Persons with Reduced Mobility,
- Resolution no. 48, Recommendation on electronic chart display and information system for inland navigation (Inland ECDIS),
- Resolution no. 57, Guidelines and Recommendations for River Information Services,

- Resolution no. 58, Guidelines and Criteria for Vessel Traffic Services on Inland Waterways,
- Resolution no. 63, International Standard for Tracking and Tracing on Inland Waterways (VTT), and
- International Standards For Electronic Ship Reporting In Inland Navigation (Resolution no. 79) and For Notices To Skippers (Resolution no. 80).

All these provisions could also be a model for increasing safety across the inland waterways of the world.

5.4 Transport of dangerous goods

Dangerous goods (e.g. toxic, infectious, corrosive, explosive, radioactive, flammable substances) are produced and transported in large quantities, and by definition cover a large range of products with great economic returns. They present risks for the population, property and the environment at all stages of extraction, production, transport, at the workplace and when handled by consumers or in use. Transport is a specific part of the lifecycle of these goods, since it, or parts of it, takes place in areas where people and the environment are particularly exposed.

Although in recent years, major accidents involving dangerous goods (particularly in developed countries) have been relatively few, dangerous goods have been involved in some of the worst disasters in transport history:

- In April 1947, a freighter being loaded with ammonium nitrate in the port of Texas City (United State of America) caught fire in one of the holds and exploded. Two light planes flying overhead were destroyed by the blast. The explosion also blew the hatch covers off another ship, which was moored some 180 m away. The second ship, also carrying ammonium nitrate, caught fire and subsequently exploded. Four-hundred-and-sixty-eight people were killed, mostly as a result of the first explosion.
- In July 1978, a road tanker transporting liquefied propylene sprang a leak as it passed a camping site at Los Alfaques (Spain). The propylene escaped as a gas and rapidly engulfed the camping site in a huge cloud, which rapidly ignited. The explosion caused a fireball of 180 m in diameter which was so intense in heat that more than 200 people burned to death. Devastation reached 360 m in all directions. The road tanker was carrying only 43 cubic metres of liquefied gas. Today, some inland navigation vessels carry more than 2,500 cubic metres of such gases and some sea-going vessels may carry 250,000 cubic metres of liquefied natural gas.
- In the night of November 1979, a train of 106 wagons derailed in the city of Mississauga (Canada). The first wagon to derail was loaded with a flammable liquid 'toluene'. Twenty-three other wagons followed, 19 were tank-wagons loaded with dangerous goods. Fire spread through most of the derailed cars; three of which were loaded with propane (flammable gas) and exploded in a fireball causing considerable damage to surrounding property. One tank-wagon loaded with chlorine (toxic gas) incurred a hole in its shell 76 cm in diameter. Almost 250,000 people from the city were evacuated from their homes and businesses for almost 5 days.

Accidents such as these have prompted Governments to develop and regularly update regulations on eliminating, or minimizing to the extent possible, the risk associated with the transport of dangerous goods. The economic importance of the international transport of dangerous goods has necessitated international discussions on these regulations so as to ensure a high level of safety acceptable for all countries and authorities responsible for different modes of transport while making international and multimodal transport possible through the harmonization of transport conditions.

This is the role, since 1953, of the United Nations Economic and Social Council (ECOSOC) Committee of Experts on the Transport of Dangerous Goods, which UNECE services. The first mandate of the Committee was to develop recommendations that would allow Governments and international organizations to establish uniform national and international regulations on the transport of dangerous goods. In 1999, the mandate was extended to worldwide harmonization of classification criteria and hazard communication

of chemicals not only for safe transport, but also for safety in the workplace, and consumer and environmental protection. The recommendations of the Committee are found in the "Recommendations on the Transport of Dangerous Goods, Model Regulations", also known as the "Orange Book". The Book aims to:

- Identify the goods that are dangerous for transport, and define, according to chemical characteristics, how they can be transported safely.
- Ensure that those involved in any stage of transportation are informed about the potential risks of the dangerous goods. Methods include internationally harmonized labels and marks, placarding the containers (packaging and cargo transport units) with indications of hazardous consignment and including specific information in the transport documents.
- Identify the types of containment and cargo transport units suitable for the specific characteristics of the dangerous goods in transport. These include, for example, provisions for use, construction, approval, inspection, testing and marking.
- Identify incompatible dangerous goods and define the conditions of separation during transport so as to prevent or effectively minimize hazards in the case of leakage, spillage or any other accident during transport.
- Define the requirements for training (general, specific and safety training) for all those involved in the transport of dangerous goods (i.e. those who classify, pack, mark, label, carry or handle, offer or accept dangerous goods, who prepare transport documents for dangerous goods or mark, placard or load/unload dangerous goods into/from cargo transport units.

The Orange Book applies to all modes of transport, however, remains sufficiently flexible to accommodate special additional requirements necessitated by specific modes of transport, or specific national or regional requirements. They are not legally binding per se, but are applied worldwide in the form of international and national legislation. International legal instruments include:

(a) For maritime transport: International Maritime Dangerous Goods Code (IMO), of mandatory application for the 162 Contracting Parties to the 1974 International Convention for the Safety of Life at Sea;

(b) For air transport: Technical Instructions for the Safe Transport of Dangerous Goods by Air (International Civil Aviation Organization (ICAO)), of mandatory application for the 192 Contracting Parties to the Convention on International Civil Aviation;

(c) For road, rail and inland waterways transport:

(i) ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road (UNECE) (48 Contracting Parties)

(ii) ADN: European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (UNECE) (18 Contracting Parties)

(iii) RID: Regulations concerning the International Carriage of Dangerous Goods by Rail (appendix C to the Convention concerning International Carriage by Rail), Intergovernmental Organization for International Carriage by Rail (OTIF) (48 Contracting Parties)

Nationally, all EU countries are bound to apply ADR, RID and ADN to domestic transport of dangerous goods. Non-EU countries worldwide also apply the United Nations recommendations in their national legislation. See the 'Legal Instruments and Recommendations' tab at **http://www.unece.org/trans/danger/danger.html** for the full list of countries by Instrument, as well as other information.

The number of serious accidents involving dangerous goods has significantly decreased, though the zero risk does not exist, as shown, for example by the Tauern tunnel fire (May 1999, Austria) (12 deaths, 50 injured; 17 million German marks for the reconstruction and renovation of the tunnel); the derailment of a freight train carrying liquefied petroleum gas (2009, Italy) (31 deaths, 30 injured, 32 million euros of estimated damage cost to buildings and rail infrastructure), or the capsizing and sinking of a ship carrying 2,378 tonnes of sulphuric acid in the Rhine (2011) (2 deaths, 2 injured, approximately 900 tonnes of sulphuric acid leaked into the Rhine and approximately 50 million euros of lost profits and damages).

Accidents in developing countries that lack appropriate transport infrastructure, safety measures, trained personnel etc., and where the regulatory system is either weak or not implemented usually result in a significantly higher number of casualties and injuries, as well as to greater damage of property and the environment[115]. Unfortunately, despite the significant industrial development in an increasing number of developing countries, which results in a parallel increase of transport of dangerous goods, many of them still lack proper legislation for regulating inland transport of dangerous goods and improving safety in this respect. For this reason, UNECE published the "Road Map for accession to and implementation of ADR" [116] to support countries in developing a suitable legislative framework to regulate the transport of dangerous goods by road.

5.4.1 Trends

Dangerous goods can be transported by road, rail, inland waterways, sea or air in quantities ranging from a few grams to thousands of tonnes. Many international organizations, chemical industry associations and national Governments. Statistics from the United States of America and the European Union suggest that:

(a) Transport of dangerous goods is increasing regularly;

(b) The highest volumes transported are energy products (petroleum products, flammable gases), followed by non-energy flammable liquids and gases, and by corrosive substances;

(c) Road transport is by far the most frequently used inland transport mode, in terms of quantity carried and in terms of number of shipments.

Type and quantity of dangerous goods carried

Maritime transport

The IMO[117] estimated in 1989 that more than 50 per cent of the cargoes transported by sea could classified as dangerous, hazardous and/or harmful under IMO criteria, but this estimation probably included carriage in packaged form, bulk carriage by oil tankers, chemical tankers and gas tankers, and solid bulk cargoes in bulk carriers.

[115] E.g. accidents involving petroleum products in Africa: Yaounde, Cameroun (1998): 220 deaths and 130 persons injured; Molo, Kenya (2009): 122 people killed; about 200 injured; Sange, DR Congo (2010): 230 people killed; about 200 injured.

[116] Available at www.unece.org/trans/danger/publi/adr/adr_roadmap.html

[117] Focus on IMO, the Safe Transport of Dangerous, Hazardous and Harmful Cargoes by Sea, August 1989.

United States of America (all modes)

Data from the 2002 and 2007 U.S. Commodity Flow Survey showed that there were around 2.2 billion tons of dangerous goods [118] shipments in the United States of America. In 2008, it was estimated that more than 3 billion tons of dangerous goods would be transported each year in the United States of America with about 1.2 million daily dangerous goods movements by air, on railroads, seas, inland waterways and highways (USDOT, 2008).

European Union

Statistical data provided by Eurostat exhibits interesting information but should be interpreted with caution as the methodologies used for collecting data imply considerable uncertainties. In addition, this data do not seem to include 'dangerous goods packed in limited quantities' which represent a large number of shipments. From 1990 to 2002, the transport of dangerous goods (all inland transport modes) in EU-15[119] increased from 98.3 billion tonne-km in the year 1990 to 111.1 billion tonne-km in the year 2002 (+13.0 per cent). The highest increase was by road (+27.4 per cent), followed by inland waterways (+11.1 per cent) and rail (-9.4 per cent). The market share of road transport in all transport of dangerous goods increased from 51 per cent in 1990 to 58 per cent in 2002.

Data available in Eurostat from 2003 to 2010 concern mainly road transport, although data are available for rail transport by year or by country. For road transport only, the transport of dangerous goods in EU-27 increased from 74.3 billion tonne-km in 2003 to 84.7 billion tonne-km in 2008, then fell to 78.2 billion tonne-km in 2009 to increase again up to 80.2 billion in 2012. The transport of dangerous goods by rail in EU-27 in 2006 was of 64.9 billion tonnes-km.

EU transport of dangerous goods by class and mode

From 1990 to 2002, the share of dangerous goods in EU-15 decreased from 9.1 per cent to 7.8 per cent meaning that transport of dangerous goods was increasing more slowly than the whole transport market. The growth rate from 1990 to 2002 for the total market was 31 per cent while dangerous goods increased by 13 per cent only.

For **road transport**, the share varies considerably depending on the country, ranging from 2 per cent to 28 per cent, with figures in the 4 per cent to 8 per cent range for major economies. In 2010 for EU-28, the largest specific product group was flammable liquids, taking over a half of the total. Two other groups, gases (compressed, liquefied or dissolved under pressure) and corrosives, accounted for 13.6 per cent and 10.3 per cent respectively. This represents very little change compared with previous years when there was a very similar distribution between the product groups.

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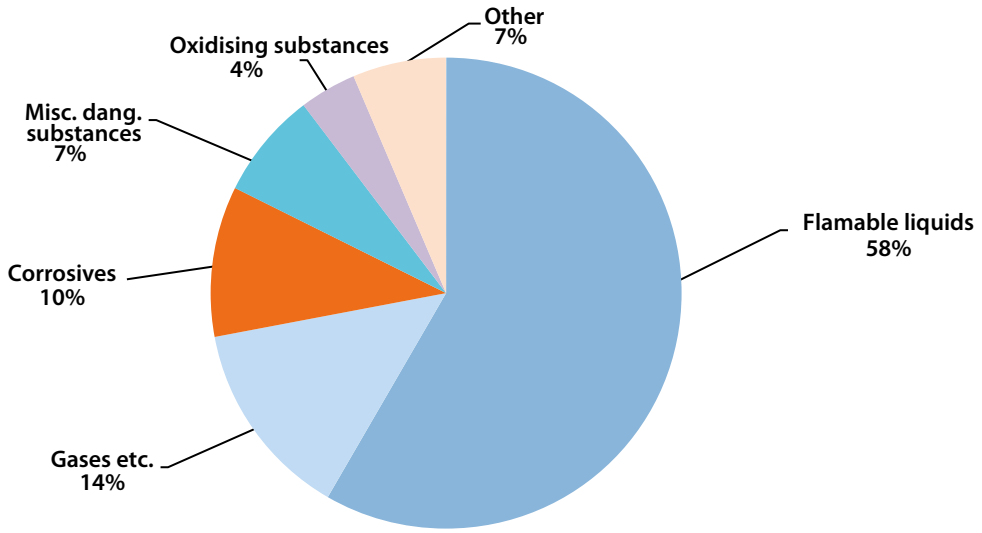
[118] The term "hazardous materials" is used in the United States to designate dangerous goods.

[119] EU-15 was the number of member States of the European Union prior to the accession of ten candidate countries on 1 May 2004: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom.

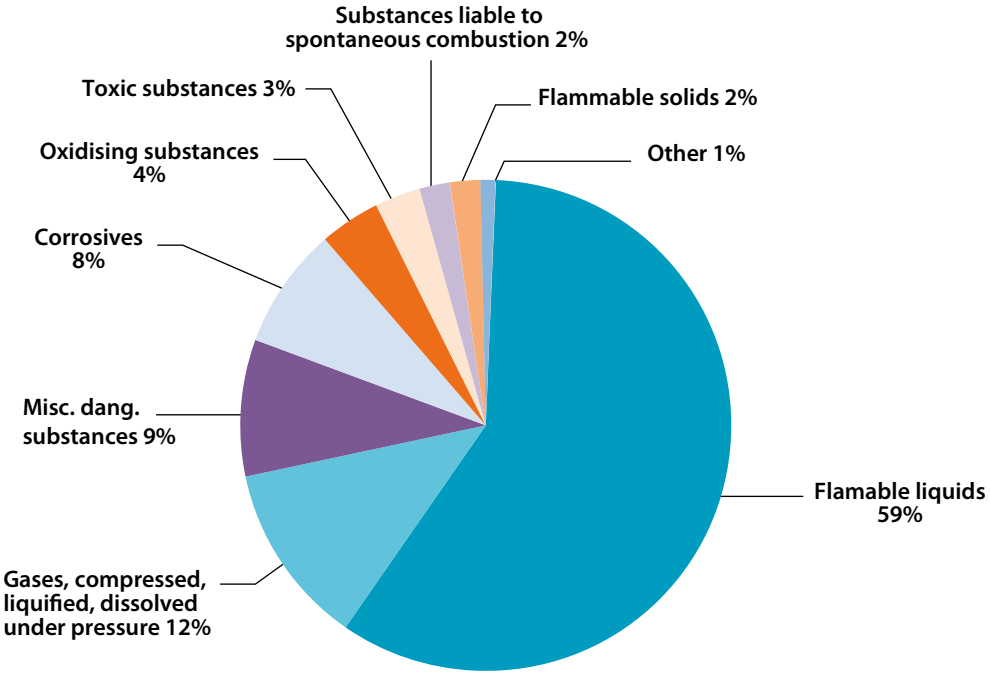
Figure 5.18 EU-28 (provisional data) Road transport of dangerous goods by type of dangerous goods, 2010 (percentage in tonne-km)



Source: Eurostat [120]

For **rail transport** dangerous goods including gases, liquid hydrocarbons and corrosives accounted for an estimated 14 per cent of the total tonne kilometres of goods transported by rail in 2006. Flammable liquids (59.4 per cent), which mostly consist of hydrocarbons used for fuel, made up by far the largest share of performance in transport of dangerous goods by Rail. They were followed by Gases, compressed, liquefied, dissolved under pressure (12.0 per cent) and miscellaneous dangerous substances (9.0 per cent).

Figure 5.19 Dangerous goods transported by rail EU-27 (2006) (per cent tkm)



Source: Eurostat, 2009

[120] http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=road_go_ta_dg&lang=en

For **inland waterways transport i**n the European Union in 2006, three groups of goods, all of mineral origin, accounted for over half of the weight of goods transported by Inland waterways: crude and manufactured minerals (27.0 per cent), petroleum products (16.9 per cent) and solid mineral fuels (e.g.: coal) (9.2 per cent). While miscellaneous articles accounted for 9.1 per cent of total, the next four groups of goods, including ores, metals and chemicals, accounted for 20.9 per cent. Very few EU countries have reported data concerning dangerous goods by inland waterways, but from those reported it would seem that flammable liquids represent 80 per cent of dangerous goods carried.

Accidents/Incidents

United States of America

Between 2002 and 2011, dangerous goods incidents totalled 161,617 and resulted in 129 fatalities in the United States of America. Since reaching a peak of 20,336 incidents in 2006, numbers have declined every subsequent year. Approximately 87 percent of the incidents and 85 percent of the fatalities from dangerous goods occurred on highways--the most common mode of dangerous goods transport. In 2011 alone, nearly 12,300 of the 14,400 total dangerous goods incidents occurred on highways, with 10 fatalities. Gasoline and sulphuric acid were by far the most common materials involved in dangerous goods incidents, accounting for 67 percent of total incidents. The most common source of casualties is derailment or rollover of vehicles, followed by human error. Due to high product demand and frequency of use, rail and road transport of dangerous goods are expected to increase over the next decade, raising the number of opportunities for incidents.[121]

Table 5.1 Incidents by mode and incident calendar year

Mode of transport	2007	2008	2009	2010
Air	1,556	1,278	1,356	1,293
Highway	16,930	14,804	12,730	12,637
Railway	753	749	643	750
Water	61	99	90	105
Total	**19 300**	**16 930**	**14 819**	**14 785**

Source: Hazmat Intelligent Portal, U.S. Department of Transportation. Data as of 14 September 2011.

Table 5.2 Fatalities and major injuries by mode and incident calendar year

Mode of transport	Fatalities		Major injuries	
Year	2009	2010	2009	2010
Air	0	0	0	0
Highway	11	8	17	17
Railway	1	0	10	0
Water	0	0	0	0
Total	**12**	**8**	**27**	**17**

Source: Hazmat Intelligent Portal, U.S. Department of Transportation. Data as of 7 July 2011

[121] Source: Senate Report 112-162 - HAZARDOUS MATERIALS TRANSPORTATION SAFETY IMPROVEMENT ACT OF 2011.

European Union

In 2012, EU Member States reported a total of 61 accidents involving the transport of dangerous goods by rail; in 32 of these, the dangerous goods being transported were released during the accident (Source Eurostat). Data concerning other modes of transport are not available from Eurostat.

5.4.2 Economic and social impact of regulatory measures intended to increase safety and protection of the environment

Safety – and protection of the environment – during the transport of dangerous goods may be ensured through:

(a) The use of containment systems of good quality, adapted to the danger presented by the goods to be transported and compatible with them, meeting the construction requirements and the performance tests or other tests contained in the UN Model Regulations on the Transport of Dangerous Goods, as appropriate, in order to withstand stresses, impacts and other wear and tear to which packages may be submitted during normal conditions of transport. Failure of containment systems can lead to leakage or spillages or even explosion of the containment system itself in case of pressure build-up.

The means of transport themselves may also have to meet certain safety requirements depending on the goods carried (e.g. tank-vehicles, holds of ships, maritime or inland navigation tankers);

(b) Good operational practices;

(c) An adequate hazard communication system (labelling, marking, placarding, documentation) which provides appropriate information to:

(i) Transport workers involved in dangerous goods handling;

(ii) Emergency responders who have to take immediate action in case of incidents or accidents;

(d) Training of transport workers and all participants involved in a chain of transport of dangerous goods;

(e) Effective control and enforcement by competent authorities.

Irrespective of the economic value of the dangerous goods transported, the safety measures to be applied according to the regulations have important economic effects on various industrial sectors, in particular in relation to the construction of packaging, gas receptacles, and tanks since all authorized containment systems must meet certain performance requirements and must be tested and certified accordingly.

European yearly market for some specific types of "UN" certified dangerous goods packaging

Plastics drums	Steel drums	Flexible IBCs ("Big bags")	Other IBCs
11 million	45 million	5 million	3.8 million

Source: Estimates provided by representatives of the International Confederation of Plastics Packaging Manufacturers (ICPP) and by the European Association of Steel Drum Manufacturers (SEFA) provided in 2007 (relating mainly to EU market).

The European Industrial Gases Association (EIGA) reported in 2007 that its companies fill, store, transport and maintain an inventory of about 40 million cylinders to serve the market, and these cylinders are moved several times a year for refilling. To supply in bulk or in cylinders its 4 million customers at its 4.5 million delivery points, they operate a fleet of 14 000 vehicles covering 500 million km per year.

Similarly the European Association of Liquid Petroleum Gases (AEGPL) reports that its companies fill, store, transport and maintain 200 million gas cylinders per year (involving a fleet of 20 000 to 30 000 vehicles for delivery) and operate a fleet of 9700 road tank vehicles for bulk carriage of GPL.

For carriage of all kind of dangerous goods in tanks, 150 000 railway tank-wagons are operating in the EU, and 3000 new tank-wagons are built in Europe every year, according to the International Union of Private Wagons (UIP).

The introduction of new requirements in ADN for prevention of pollution from inland navigation tank vessels has entailed, since 2007, a conversion of the Western European tankers fleet from single hull to double hull vessels and construction of new double hull tankers, reaching a peak of 121 new double hull tankers in 2010, and still 42 new double hull tankers in 2012 and 45 in 2013 (source: European Barge Inspection System).

The proper implementation of the regulations also requires that appropriate administrative structures are put in place by governments, e.g. in relation to design type testing and certification of packaging and tanks, approval and inspection of road vehicles and inland navigation vessels. For example 1748 tank type approval certificates were issued in Bulgaria in 2007. In the same year, 38203 ADR certificates of approval were issued in Germany for vehicles carrying certain dangerous goods (vehicles for carriage in tanks or carriage of explosives). Such vehicle certificates have to be renewed every year after inspection. Inland navigation vessels carrying dangerous goods must also be provided with an appropriate certificate of approval, to be renewed every five years after inspection.

Operational requirements

Since the Model Regulations contained in the United Nations Recommendations on the Transport of Dangerous Goods are intended to apply to all modes of transport, the operational requirements contained therein are only those relevant for all modes, mainly concerning the use of packaging, bulk packaging and tanks. The applicable regulations usually contain additional requirements specific to the mode of transport, e.g.:

(a) For maritime transport: stowage and segregation; restrictions on passenger ships; some restrictions on quantities allowed for certain packaging; provisions in the event of incidents and for fire precautions;

(b) For air transport: stowage and segregation; restrictions on quantities allowed per packaging; passenger aircraft restrictions;

(c) For road and rail transport in Europe: provisions concerning loading, unloading and handling; requirements for vehicle crew and equipment; restrictions for the passage of vehicles through road tunnels; supervision of vehicles;

(d) For inland navigation (ADN): requirements for loading, carriage, unloading and handling of cargo on board dry cargo vessels or tank vessels; provisions concerning vessel crew and equipment.

In order to comply with these requirements, all those involved in transport of dangerous goods must be appropriately trained (see "Training" section below).

Hazard communication, emergency response

Hazard communication in the transport of dangerous goods consists in:

(a) Affixing appropriate hazard label(s) on the packages;

(b) Marking the UN (identification) number of the goods on the package, and (except for inland transport in Europe) the "Proper Shipping Name";

(c) Affixing placards identical to hazard labels but of a bigger format on the cargo transport units (vehicles, wagons, containers, tanks) and displaying, either on these placards or on separate orange plates, the UN identification number;

(d) Providing details of the dangerous goods offered for shipment in the transport document (i.e. UN No., name, hazard class, etc.).

The labels, marks and placards provide information to transport workers as to the dangerous nature of the consignments, and help them in deciding how to stow such goods in the means of transport and checking compliance with relevant stowage and segregation requirements. They also provide essential information to emergency responders since the UN number itself provides sufficient information for immediate emergency action. Databases and guide books have been published in order to provide emergency responders with appropriate emergency action guidelines, on the basis of the UN number (e.g. North American Emergency Response Guidebook, IMO Emergency Procedures for Ships carrying Dangerous Goods (EmS) and Medical First Aid Guide for Use in Accidents involving Dangerous Goods (MFAG), ICAO Emergency Response Guidance for Aircraft Incidents involving Dangerous Goods).

For road transport in Europe (ADR), drivers also have to be provided with instructions in writing informing them of the nature of the danger presented by the cargoes, proper use of personal protection equipment, action to be taken to protect themselves and to inform road users and emergency response services, first aid and how to deal with minor leakages or minor fires if this can be done without personal risk.

The information which has to be entered in the transport document by the consignor allows the carrier to take appropriate steps to comply with the transport requirements applicable to the dangerous goods carried. It is also an important tool for advance planning in particular for multimodal transport, for emergency response, and for control by authorities.

Training

As shown by accident statistics, one of the main causes of accidents in the transport of dangerous goods is human error. The United Nations Model Regulations and the related legal instruments require that all persons engaged in the transport of dangerous goods receive training in the contents of dangerous goods requirements commensurate with their responsibilities and they lay down specific provisions regarding general awareness/familiarization training, function specific training, safety training, records of training, etc. This training can be provided by the employer and concerns all persons involved in classification, packing, filling, labelling, documentation etc. as well as drivers and transport workers in general.

In Europe, additional mandatory and certified training is required for drivers of road vehicles (ADR driver training certificate). This involves mandatory initial training for about three days and examination for all drivers of vehicles carrying certain quantities of dangerous goods; two-day refresher courses and a new examination every five years; additional training is required for drivers of tank vehicles, vehicles carrying explosives and vehicles carrying radioactive material. In 2007, 68560 drivers held a valid ADR training certificate in Sweden.

For inland navigation, experts are required to be on board chemical and gas tankers (under ADN), and these experts also have to undergo training every 5 years and to pass examinations.

Finally, in Europe, in all countries applying ADR, RID or ADN, each undertaking, the activities of which include the carriage, or the related packing, loading, filling or unloading of dangerous goods, has to appoint one or more dangerous goods safety advisers (DGSA) for the carriage of dangerous goods, responsible for helping to prevent the risks inherent in such activities with regard to persons, property and the environment. These DGSAs also have to hold a vocational training certificate issued after examination which has to be renewed every five years. In 2007, there were 21,221 DGSA holding a valid vocational training certificate in Spain.

Apart from the safety benefits that result from these various training requirements, it is important to note that they also have important economic and social implications. They have of course a cost for the various employers concerned, but they also raise significantly the professional qualifications of the workers trained.

Controls

Controls or other enforcement actions are normally carried out under the direct responsibility of national authorities designated for these purposes. The number of controls and the level of penalties in case of infringement may vary considerably from one country to the other, but controls are deemed necessary to ensure compliance. They are also an effective tool in revealing problems connected with the safety of the transport of dangerous goods or with the practicability of regulations, and in improving them. Some guidance may be found in Chapter 1.8 of ADR, RID and ADN on how to carry out control operations without causing major disruption of transport services. ADR, RID and ADN also require their Contracting Parties to agree on mutual administrative support for the implementation of these legal instruments.

Problems of compliance occur very often in countries where the requirements applicable to international transport by one mode of transport differ from those applicable nationally to domestic transport by the same mode. This problem no longer exists in EU countries since all domestic regulations have been replaced by ADR, RID and ADN. This is nevertheless still a problem in many European countries outside the EU, and in particular for the controls in international transport by road since road transport controllers themselves may be confused when checking vehicles involved in international transport if the regulations are not the same as those they are used to when checking vehicles involved in domestic traffic. Harmonization of national and international rules, in particular in the road sector is therefore an important factor not only for better compliance with safety requirements but also for transport facilitation.

Controls in the United States of America

According to the US Department of Transportation, there are approximately 47,000 firms shipping significant quantities of hazardous materials. This figure, however, does not include small or occasional shippers. The figure of 75,000 represents the total of hazardous materials shippers in the United States. However, this figure may be understated because many "firms" or shippers have multiple business locations. The US Department of Transportation also estimates that there are approximately 500,000 potential carriers of hazardous materials in the United States. About 43,000 carriers are dedicated hazardous materials transporters that primarily move petroleum products and corrosives in cargo tank trucks. Yet, every carrier can knowingly, or even unknowingly, carry hazardous materials. Table 29 shows the number of hazardous materials carriers which could potentially carry hazardous materials.

Table 5.3 Number of potential hazardous materials carriers (United States)

Mode	Number of carriers
Air	3,500
Highway	497,908
Rail	559
Marine	1,300
Total	**503,267**

Sources: FAA Air Carrier data; FMCSA National Carrier Census Summary Report; FRA Inspection Database; and U.S. Army Corps of Engineers Waterborne Transportation Lines of the United States, Calendar Year 1997, Volume 1, National Summary.

Approximately 444,000 vehicles and vessels are dedicated to hazardous materials transport in the United States, primarily highway tank trucks and railroad tank cars. Potentially, another 7.6 million vehicles, vessels, and aircraft could carry hazardous materials on a periodic basis. When one considers the potential for hazardous materials to be undeclared, either due to economics or lack of knowledge, any vehicle, vessel, or aircraft could carry hazardous materials. The fleet breakdown for hazardous materials by mode in the United States is shown in Table 30.

Table 5.4 Hazardous materials fleet/vehicles (United States)

Mode	Dedicated HM Fleet/ Vehicles	Additional potential HM fleet	Total potential fleet
Truck	195,000	6,436,000	6,631,000
Rail	238,000	1,078,000	1,316,000
Waterborne[1]	11,000	68,000	79,000
Air (commercial aircraft)[2,3]	0	12,000	12,000
Total	**444,000**	**7,594,000**	**8,038,000**

Source: United States Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Department wide evaluation of hazardous materials shipments, March 2000.

[1] Represents both United States and foreign flag vessels including barges.
[2] The figures are based on the air fleet of carriers who "will carry" hazardous materials.
[3] Aircraft are not typically dedicated to hazardous materials transport.

The US administration carried out about 250 000 inspections in 1998 (all modes of transport), which showed 95 361 violations. 40 per cent of the violations were attributed to shipper functions, 37 per cent to either the shipper or the carrier, and almost 23 per cent to the carrier. The situation remained almost the same in 2009 (248 126 inspections, 96 885 violations which led to 2 520 penalties).

Road checks in Europe

EU Council Directive 95/50/EC on uniform procedures for checks on the transport of dangerous goods by road requires EU Member States to report on its application.

In 2006, the average in the EU was 2.95 checks per million tonne-kilometres; in 2007, it was 3.50. This implies an increase of 18.6 per cent. Bulgaria and Hungary had an exceptionally high frequency of checks. Without the numbers of Bulgaria and Hungary, the EU average would have been 2.33 in 2006 and 2.90 in 2007 and the annual increase would be 24.5 per cent. Approximately in one check out of eight an infringement was detected. Some 40 per cent of these infringements were of the most serious type. Consequently, almost 10 000 vehicles were immobilised following their check. This clearly demonstrates that practical enforcement of rules on the transport of dangerous goods at the roadside is useful and helps to improve safety.

5.5 Cross Sector Safety

Transport safety also needs to look at practices that cross specific transport modes. In particular, intermodal freight transport specialises in the transporting of goods using more than one transport mode. While there are different products that can use intermodal transport, the most common form of intermodal transport is carried out using containers. The benefit of using a container is that it is of standard size and can transport almost anything. This means that the container is handled at a number of different locations, in a number of different manners and can carry diverse cargo. In the 1970s and 1980s, the significant increase in use of the container, was also accompanied by a significant increase in accidents and injuries from their handling. The IMO identified this risk and proceeded to publish the first guide on the safe packing of containers (the CTU Code). The Code is now in its 4th Edition and is co-developed by the UNECE, IMO and ILO. It is expected that this latest version will make a significant contribution to reducing injuries and accidents in the handling of containers as well as limiting the potential transfer of pests across borders.

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6. Transport Security

The notion of transport security encompasses all malevolent acts which stakeholders in transport systems — States and government institutions, local authorities, regulatory agencies, infrastructure managers or owners and operators, railway companies, road concessionaires, shipping and freight forwarding companies — take action to prevent. Malevolent acts include the ordinary infliction of damage and everyday delinquency to highly orchestrated acts of terrorism on transport systems, infrastructure or passenger and freight vehicles (Colliard, 2012).

Inter/trans-modal security of transport ⇨	Infrastructure ⇨ Passengers ⇨ Staff ⇨ Freight ⇨	Secure transport
Key challenges	• High rate of transport related crime in many parts of the world; • Enhance collaboration between state security services and transport systems operators; • Balance between personal freedoms and collective security; • Due to their open areas, inland transport systems are relatively unprotected from security threats in comparison with ports and airports; • Strengthening analytical and statistical information on transport related crime (freight theft, vehicles theft, etc.); • Boosting international cooperation in coordination of responsive action towards cross-border transport related crime.	
Role of the United Nations	• Promote international frameworks that ensure the security of transport infrastructure, persons and freight; • Provide analytical and technical assistance activities to reduce vulnerabilities of transport infrastructure and services.	

Safety versus Security

Although safety and security, as two related dimensions of sustainable development of the transport sector, may intuitively seem to be overlapping fields, and the approach towards the analysis of security problems in transport systems are often inspired by work on transport safety (OECD/ITF, 2009), they are in fact fundamentally different issues. Safety standards are set by specific bodies and implemented by transport sector companies, whereas ensuring a secure environment is the shared responsibility of transport sector stakeholders and the state. Furthermore, safety is associated with risk while security is associated with uncertainty (USDHS, 2010).

In the case of risk, such as accident risk, the events are unintentional and can be reasonably estimated from empirical observations. The probability with which intentional breaches of security occur is much harder to quantify, for two reasons (OECD/ITF, 2009). First, security breaches or criminal activity, especially severe cases such as extreme terrorist attacks, are infrequent. The analysis of a few incidents does not render sufficient information to supply probabilities on security threats. Second, attaching probabilities to intentional acts is particularly problematic because of the possibility of strategic behaviour of culprits. For example, criminals and terrorists adapt their strategy to changes in the security environment in which they operate. Since little is known about how they will respond (because the set of available strategies is very large), it is not clear how security policies or other relevant changes affect attack probabilities (OECD/ITF, 2009). In sum, security concerns are not characterised by risk but by uncertainty, meaning that credible objective probability cannot be assigned to their occurrence.

It is within this challenging and unpredictable environment that public and private transportation stakeholders must work to establish national, regional and international frameworks that can ensure the security of people, infrastructure and freight. This, without forgetting the economic cost of transportation crimes or that security systems should not interfere with the efficiency of operations and the movement of persons and freight in all transport modes.

6.1 Minimizing Terrorism Threats and Preventing Attacks

Inland transport systems are potentially vulnerable and attractive targets for terrorism. Infrastructure such as roads, rail lines, inland waterways, bridges and tunnels are located in open areas and generally without surveillance; both passenger and freight transport may be targets of terrorism or be used as vehicles for terrorist activities (EC, 2012c). Improving security is a complex matter since transport systems involve large numbers of transnational companies, as well as a wide range of public and private sector stakeholders.

Effective measures require close cooperation of transport authorities with other intelligence, security, customs and border service authorities, and a broad range of private sector stakeholders. The objective is to improve the security of domestic and international transport systems by reducing the likelihood of transport becoming a target or being used as a vehicle for terrorism without unduly hindering passenger mobility and the flow of goods.

The context: Why are mass transit networks and transport infrastructure attractive terrorism targets?

- Potential for mass casualties;
- Transport systems are accessible, open to the public and vulnerable to attacks;
- Spectacular imagery and infliction of shock, fear and anxiety to the global audience;
- Broad opportunities and likelihood of success;
- Potentially severe economic impact of attacks;
- Symbolic dimensions of attacks and potential source of inspiration and motivation for further extremist plots.

Following the events of 11 September 2001, safety and security moved to the forefront of international concerns. As world trade is dependent on safe and secure transportation of goods across global supply-chains, there is general recognition that the security of transportation systems deserves particular attention.[122] Thus, over recent years, a variety of different unilateral and multilateral security measures, regulations and legislative initiatives have been developed at the national, regional and international level.[123]

Much of the focus has been on enhancing maritime transport security and on addressing the particular challenges of transport in containers.[124] Relevant initiatives at the national level include those first developed in the United States of America, such as the Customs Trade Partnership Against Terrorism (C-TPAT), the Container Security Initiative (CSI) that focus on establishing partnership relations with industry actors and ports, as well as the so-called "24-Hour Rule", requiring advance notification of US-bound container-shipments. Furthermore, the National Infrastructure Protection Plan of the United States of America has developed

[122] For instance, the former European Conference of Ministers of Transport developed a Ministerial Declaration on Combating Terrorism in Transport (Council of Ministers, 2002). The Ministers declared their determination to work on the continued smooth and secure flow of goods and people nationally and internationally, unhindered by the threat of terrorism.

[123] The UNCTAD secretariat has been monitoring legal and regulatory developments in maritime and supply-chain security; analyses and reports are available in the annual Review of Maritime Transport (see unctad.org/rmt). For further information, see http://unctad.org/en/Pages/DTL/TTL/Legal.aspx and http://unctad.org/en/Pages/DTL/TTL/Legal/Maritime-Security.aspx.

[124] For an overview of relevant regulatory initiatives, see the UNCTAD report "Container Security: Major Initiatives and Related International Developments" UNCTAD/SDTE/TLB/2004/1, available at http://unctad.org/ttl/legal.

the Sector Specific Plan (SSP)[125] in which consolidated strategic plans and infrastructure protection requirements are given for aviation, maritime, mass transit (public transport) and passenger rail, highway infrastructure and motor carrier, freight rail, and pipeline sectors. SSP describes collaboratively developed strategies to reduce the risks to critical transportation infrastructure from a broad range of known and unknown terrorism threats. SSP adopts and amplifies the risk management framework of the National Infrastructure Protection Plan by describing a process intended to encourage wider participation in risk-reduction decision-making activities. The main objective of the process is declared as developing a set of programmes and initiatives that will reduce the transport sector's most significant risks in an efficient, practical, and cost-effective manner.

Australia's National Surface Transport Security Strategy provides its framework for inland transport security. The Strategy was developed and adopted in 2004 and is reviewed and updated on a 3-year basis, or more frequently if the Transport Security Committee sees fit. The main purpose of the Strategy is to achieve surface transport systems across Australia that are more secure and resilient to the effects of terrorism. Australia's National Surface Transport Security Strategy is based on two fundamental principles : regulatory responsibility in the surface transport sector rests with the state and territory governments; surface transport owners and operators have primary responsibility for security arrangements at their own facilities, assets and networks (NSTSS, 2013).

Articles 91 and 222 of the Treaty on the Functioning of the EU (TFEU[126]) state that transport security policy is a matter of shared competence between the EU and its member States. At the EU level, amendments to the Community Customs Code have introduced a number of measures aimed at increasing the security of shipments entering or leaving the EU, including obligations on advance electronic declaration of security data and detailed rules on the Authorized Economic Operators (AEOs).[127] Nevertheless, unlike in the aviation and maritime sectors, there are no EU level security standards/requirements in road, rail or waterway transport, apart from a regulation on rail passenger rights in which a short reference to security is made.[128] In response, the European Commission (EC) Staff Working Document on Transport Security (31 May 2012) was drafted to initiate discussions on what can be done at the EU level to improve transport security in inland transport modes, "particularly in areas where putting in place common security requirements would succeed in making Europe's transport systems more resilient to acts of unlawful interference". The Document explores issues that currently hinder transport security and the potential benefit of action, as well as potential areas to be developed for land transport security policy at the EU level. Reiterating the position established in the EC 2011 White Paper on Transport, the Document argued for the establishment of an EU Experts Advisory Group on Land Transport Security (LANDSEC). The LANDSEC Group was established on the day that the Working Document was published to examine its recommendations. The Group consists of representatives from member States and stakeholders with responsibilities for land transport security. Five sessions have been held since establishment, the most recent in September 2014.[129]

[125] SSP is the strategic plan fulfilling the requirements of Homeland Security legislation: Critical Infrastructure Identification, Prioritization, and Protection, and the requirements of the Intelligence Reform and Terrorism Prevention Act of 2004 for the National Strategy for Transportation Security.

[126] See: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:12012E/TXT

[127] Further information is available at http://ec.europa.eu/ecip. See also UNCTAD, Review of Maritime Transport ,2013, Chapter 5.

[128] See "Consistency at the European and international level" below.

[129] http://ec.europa.eu/transparency/regexpert/index.cfm?do=groupDetail.groupDetail&groupID=2821

At the international level, regulatory developments include those of the International Maritime Organization (IMO). IMO adopted the International Ship and Port Facility Security (ISPS) Code, which entered into force on 1 July 2004 and imposed wide-ranging obligations on Governments, shipping companies and port facilities.[130] The International Organization for Standardization (ISO) developed and published a range of relevant security standards[131], and the World Customs Organization (WCO) adopted (in 2005) the Framework of Standards to Secure and Facilitate Global Trade (SAFE) with the objective of developing a global supply-chain security framework.[132] The WCO SAFE Framework provides a set of minimum standards and principles that must be adopted by national customs administrations. These standards comprise two pillars: (1) customs-to-customs network arrangements and (2) customs–business partnerships. As of July 2013, 168 national Customs administrations had expressed their intention to implement WCO Framework of Standards.[133]

One evolving multilateral initiative is the International Working Group on Land Transport Security (IWGLTS), established in Tokyo in January 2006 by the Ministerial Conference on Global Environment and Energy in Transport. The IWGLTS is composed of 20 member countries, including G8 States, and includes representatives of UNECE, EU, UIC and UITP (International Association of Public Transport). The purpose of the initiative is to provide an international forum that allows countries affected by terrorism to share information and experiences, to develop new security solutions for common challenges and to collaborate on research. The role of the Group is to share information and develop best practices, unlike IMO or ICAO (International Civil Aviation Organization) which establish international security standards.

A practical outcome of IWGLTS is the 'Security Measures and Resources Toolbox' (SMARToolbox) which was developed by the Transportation Security Administration (TSA) of the United States of America. SMARToolbox is a searchable database of inland transportation security measures with additional self-assessment functions. Users of the tool include members of the industry, local, national and regional governments and law enforcement professionals. Inland transport professionals use the resource to consider security measures that are in place as part of their security programmes, and to discover insights into security practices by peers throughout the industry. Although the database does not include sensitive security information, website is password protected.

[130] In December 2002, IMO had adopted the ISPS Code as part of an additional chapter XI-2 to the 1974 Safety of Life at Sea Convention (SOLAS). The Code, together with a number of other amendments to SOLAS, provides a new comprehensive security regime for international shipping. It applies to all cargo ships of 500 gross tonnage or above, passenger vessels, mobile offshore drilling units and port facilities serving ships engaged in international voyages (see www.imo.org). For further information, see also Asariotis (2005) and the UNCTAD report, "Maritime security: ISPS code implementation, costs and related financing" UNCTAD/SDTE/TLB/2007/1, available at http://unctad.org/en/Docs/sdtetlb20071_en.pdf.

[131] For an up-to-date overview of ISO standards, published or under development, see UNCTAD.

[132] See also the WCO website at www.wcoomd.org/en/topics/facilitation/instrument-and-tools/tools/safe_package.aspx and UNCTAD (2013).

[133] For a list of the WCO members, see www.wcoomd.org/en/topics/facilitation/instrument-and-tools/tools/safe_package/~/media/2E5C6962E0FD4424976432BC440FAC6B.ashx.

SMARToolbox

- Smart tool box contains over 350 security measures which are searchable by a combination of filters, including: mode, user type, asset type, phase, attack type;
- The security measures were provided by IWGLTS and other international security organizations, facilitated by TSA;
- The tool was developed for use by governments and transport systems operators.

UNECE and the Inland Transport Committee (ITC) have also considered the issue of transport security. The work was initially conducted under the auspices of various Working Parties. To ensure a comprehensive intersectoral approach, ITC established a Multidisciplinary Group of Experts on Inland Transport Security (2007-2009) that presented the final report on the private sector's standards, industry initiatives, guidelines and best practices in inland transport security.[134]

The Group comprised experts from UNECE member States and international governmental and non-governmental organizations. The work showed that, internationally, there is a lack of organizational work on improving passenger safety, especially in urban transport. Secondly, inland transport systems are relatively unprotected compared to ports and airports, due to their open areas. Inland transport is often the weakest link in supply-chain security. In the final report, the Group of Experts concluded that there was no single international body for security in inland transport that was comparable to IMO (Maritime Transport Security) and ICAO (Air Transport Security). The Group of Experts emphasized the importance of strengthening the work of UNECE on inland transport. UNECE has continued its work in the field by providing a forum for expert discussions, such as the Inland Transport Security Discussion Forum, held annually since 2010 and the Workshop on Rail Security, held in October 2013.

6.2 Criminal Activities

Inland transport is also vulnerable to criminal activities, such as vehicle and cargo theft, and burglary . Concentrations of transport activities, busy borders and lack of safe border facilities increase the risk, especially for professional road users.[135] Theft of goods and vehicles and fraud in road-transit systems is an important issue for road transport, while theft of goods, illegal immigration and transit fraud are issues that require special attention in rail transport. Analytical information is generally missing for transport security. However, the International Transport Forum estimated that up to 1 per cent of vehicles might be stolen annually (Short, 2003). In the United States of America, it has been estimated that in 2004 a vehicle was stolen every 26 seconds and only 13 per cent of these thefts were followed by arrests (Auto Theft, 2011).

[134] See also www.unece.org/trans/main/ac11/ac11_inf01.html.

[135] As noted for instance in UNECE 2012, an IRU survey of drivers of heavy goods vehicles showed that about one in six had been attacked in the period 2003-2008.

Transport related crime: An example from Berlin

On 12 January 2015, in Berlin-Tempelhof, a truck carrying tobacco was attacked and hijacked by several perpetrators who made off with an unspecified amount of cigarettes. At 5.50 a.m., the driver of the truck was tricked into stopping at Gottlieb-Dunkel-Straße in an industrial estate by individuals who blocked the road with a large Christmas tree. When he stopped and left his vehicle to clear the road, he was immediately attacked and overwhelmed by several assailants who bound his hands and feet and pulled a plastic bag over his head and upper body. He was then pushed into the back of the truck while the criminals drove away with the load.

After a short drive, the perpetrators stopped and laid the pinioned driver on a park bench at Schlosspark Britz. After some time, he managed to free himself and alert the police. Two hours later, the empty truck was found in Neukölln; the thieves had set fire to it. A large number of pallets with cigarettes had been transferred into another truck and driven away (Source: **www.tapaemea.com/recent/tobacco-truck-hijacked-in-berlin.html**).

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Trends in vehicle thefts[136] vary from country to country. In Germany and in the United States of America, the number of reported vehicle thefts in 2012 was lower than in 2003 by 36 per cent and 43 per cent respectively, whereas in the Russian Federation and Turkey, vehicle thefts varied from year to year but the number of instances remained more or less constant. It appears that there is a general downward trend, at least in the UNECE region. In 2005, approximately 2.8 million car thefts were recorded in 41 UNECE member States where data have been available, whereas in 2012 recorded thefts fell to approximately 1.6 million.

Only six UNECE countries had increasing trends in car thefts for the period 2005-2012. In 2012 alone, six UNECE countries experienced a high per capita vehicle theft rate of more than 200 vehicles stolen per 100,000 citizens, namely, Canada, France, Greece, Italy, Sweden and the United States of America. Finally, bicycles are also at high risk due to lack of safe parking spaces; in Copenhagen, for instance, 60 bicycles on average were stolen every day in 2009 (DST, 2011).

On the other hand, motor vehicle theft rates are on the rise in all but one of eight UNESCWA states for which data is available, most severely in Egypt where the number of stolen cars in 2003 was 1,994, reaching 20,221 in 2011. The car theft trend in the UNESCAP region indicates that in high income countries such as Australia, Japan, New Zealand, Singapore and the Republic of Korea the number incidents is decreasing, whereas India, Indonesia and the Islamic Republic of Iran face increasing instances of vehicle theft, with rates in India almost doubling between 2004 and 2010.

[136] All vehicle theft data is based on figures published by the United Nations Office on Drugs and Crime (www.unodc.org/unodc/en/data-and-analysis/statistics/crime.html)

In the UNECLAC region, Uruguay, Columbia, Mexico had the highest per capita car theft rates in 2012, reaching 438, 189 and 172 stolen vehicles per 100,000 citizens respectively. The United Nations Office on Drugs and Crime reported vehicle theft statistics for only a handful of UNECA region countries, most of which have breaks in time series, with continuous data for the period 2004-2012 available for Kenya, which is seeing a rise in vehicle theft numbers from 2.3 to 2.8 stolen vehicles per 100,000 citizens during the period.

Data of the Transport Asset Protection Association (TAPA) identifies that, in TAPA member countries, most incidents of theft occur when vehicles are parked in non-secured locations. This is an increasing trend according to the data as 67 per cent of vehicle thefts in TAPA member countries occurred in 2010, as opposed to 55 per cent of the thefts in 2008.

TRANSPark

A lack of adequate parking facilities and a serious problem of criminal gangs targeting commercial vehicles, their loads and the drivers themselves, led to the IRU creation in 2009 of the online platform TRANSPark. In 2014, the IRU launched the TRANSPark mobile app to help commercial drivers and road transport fleet managers search, locate and contact over 4,000 parking areas in more than 40 countries worldwide.

By listing the security features and amenities available within each parking area, it adds and extra level of security and comfort for drivers on duty, who have to follow strict driving and rest time rules that sometimes force them to stop at unsafe roadsides or insecure parking areas.

The app makes it easy for drivers and managers to communicate and stay connected throughout the entire journey, sharing invaluable information and experiences throughout the TRANSPark community. Drivers can help each other by adding favourite parking areas and sharing experiences on ones visited. The new check-in feature helps drivers see languages spoken by other drivers who checked-in at nearby parking areas, for friendlier stops and journeys.

TRANSPark is available for download on Google Play and the iTunes store.

Another element with huge impacts on the economy - especially affecting the area of second hand cars – is the phenomena of mileage fraud. This is considered to affect between 5 and 12 per cent of used car sales in general and 30 to 50 per cent for cross-border transactions. In the European Union (EU-25), the economic effect of mileage fraud is estimated at € 5.6 billion to € 9.6 billion.[137] In the United States of America, the Department of Transportation, National Highway Traffic Safety Administration has estimated annual consumer loss from this fraud as between US$ 4 billion and US$ 10 billion.[138]

Transport related crime in the UNECLAC region[139]

The "Security of the terrestrial logistical chain in Latin America" report[140], by the UN Economic Commission for Latin America and the Caribbean indicates that crimes and thefts involving freight on inland routes in Latin America are not only a security problem with economic losses, but that they also impact the full supply chain and hamper the national competitiveness. According to the report, transport related crime is serious concern in countries in the region. The most prominent cases are Brazil and Mexico, where the number of vehicle thefts per capital increased by 23 per cent between 2004 and 2012. Urgent implementation of effective and coordinated regional measures aimed at addressing the issues are strongly recommended in the document. Freight terminals, areas near ports, logistics transfer infrastructures and freight consolidation zones are most vulnerable to robberies. Crimes are mainly concentrated on road cargo transport, although railway attacks are also common, occurring mostly in urban areas at weekends and during the daytime.

Estimates are that annual global losses due to crime are US$ 30 billion. However, many developing countries do not have official records of the extent of the phenomena. According to the report, the lack of regular and comparable sectorial statistics on such crimes has hidden or underestimated their impact in the region. As a result, public policies to tackle the problem in an effective and sustainable way have not been developed thus far. Private initiatives in this respect, such as armed escorts or self-defence by transporters have not only been ineffective, but have also increased the costs and strengthened the perception of insecurity among the population. The lack of security in logistics chains also reduces tax income and discourages enterprise and private investment, hampering competition and maintaining high prices of consumer goods, all of which are factors that reduce economic growth and social development.

The document also emphasizes that criminal gangs are not bound by national borders, and constantly move their operations in search of vulnerable targets, which makes it vital for countries to coordinate responsive actions aimed at tackling these challenges that threaten the region's competitiveness and hampering the coordination of intraregional logistics chains.

The report describes best business practices and calls for policy changes to deal with the phenomenon effectively without impacting regional competitiveness. It offers a series of recommendations, including: generating knowledge of the problem, implementing regionally coordinated legal changes, investing in infrastructure and promoting facilitation, establishing regional insurance and promoting collaboration to achieve a safer and more competitive logistics chain for everyone. The only way of reducing risks in the logistics chain

[137] Study of the economic impact of mileage fraud, CRM used car management (in proceedings of Cars2010 conference, Brussels 2010)

[138] www.odometertampering.com/Federal%20odometer%20criminal%20statute.htm

[139] Source: Salaz, 2013.

[140] http://www.eclac.cl/publicaciones/xml/6/49546/Seguridad_de_la_cadena_logistica.pdf

without affecting economic competitiveness is to adopt a systematic and comprehensive approach to security. It is, therefore, vital for States to ensure necessary security conditions that facilitate an efficient and effective flow of goods and information, so that companies can take advantage of the competitive advantages resulting from minimum inventories, be actively involved in value chains and attract more investment.

6.3 Elements of Railway Security – The perspective of the International Union of Railways

The definition of security from the rail sector's view, in partnership with the public authorities, to malicious intentions or acts, is a very broad one and covers extremely disparate realities and constraints, between which a choice must be made or which must be combined in an overall strategy to offer customers and staff the responses they expect.

Everyday security in the railway scenario

When we think of security, we mostly think of terrorist attacks targeting transport – whether everyday commuter services or high speed trains – as a way of destabilizing governments. However, we must not neglect everyday offences such as graffiti, vandalism or antisocial behaviour, which delay, disrupt and harm the image of public transport, eventually preventing those who most rely on it from using it to remain connected to the rest of society.

Security is very often at the forefront of people's minds when choosing a mode of public transport for a journey, and this concern needs to be addressed, since for many people the fundamental freedom to come and go as they please is underpinned by the ability (whether subjective or objective) to use public transport. The matter becomes complicated when we try to distinguish between objective security and feelings of security. UIC, some years ago, studied major stations (in London, Paris, and Brussels) which revealed some remarkable aspects. When travellers were asked to name a particularly secure place (i.e. a place where nothing could happen), most travellers cited military bases or embassies. That is places where the coordinated deployment of technical and human resources to protect and monitor on a massive scale (with all the associated constraints) rendered any security breach or attack impossible, or so unlikely that it was unworthy of consideration. However, when the same travellers were asked about places in which they felt particularly secure, they spoke about their home, where they went on holidays – places without specific external constraints but where they did not imagine anything could happen to them.

Railway companies' security policies must distinguish between objective security (video protection, special uniformed staff, technical monitoring systems, etc.) and feeling secure (cleanliness and agreeableness of facilities, customer service staff in company colours, etc.). Of course, they have to involve themselves in the level of security and feeling secure, and remain in touch with the clients in order to define the priorities according to their requests.

In addition, all the measures taken, which could result in constraints for customers, must be understood and accepted by customers — no security policy can survive if the measures provided are not acceptable for customers. Furthermore, security policies will be more effective if travellers support them and play an active part in ensuring their own security: remain vigilant, report unusual situations, unattended objects, etc.

Personal freedoms and collective security

Introducing security restrictions for passengers, particularly in the daily transport systems, raises a problem of principle, one which depends on the political and institutional make-up of each country, that is, according to the balance between personal freedom and the need for collective security. If a terrorist threat necessitates strict emergency protective measures, which may be coercively applied, everyday security must be based in clear principles where each party's rights and obligations are defined.

This issue is of particular concern for video protection systems, specifically: the permitted retention period of recorded material, the authorized viewers of this material, and under what circumstances and with what controls it may be viewed. The issue is also concerns the legal and technical division of labour between the public authorities in charge of security and their various partners such as railway companies' in-house security services and private contractors allowed to work on or monitor railway property.

The terrorist threat

The extent, complexity, and impact of a terrorist attack on daily lives targets railways for domestic or international terrorism, and we do not need to recall the attacks in Madrid, London, the Russian Federation, India or elsewhere. Allowances must constantly be made for terrorism by the services of States. The services need to work in close collaboration, particularly the intelligence services (which must gauge the threat to the country) and railway companies (which must be aware of their own vulnerabilities) to allow headway.

Probability-based analysis for safety management cannot apply the normal methods when the task is to counter the acts of individuals or groups with significant intellectual and financial resources, whose singular determination is deployed in strategies which evolves as rapidly as the policies developed to counter-act and protect citizens. Although anti-terrorist strategies are developed to counter previous attacks, it must constantly take account of new threats and adapt to them.

The particularity of the railways, given their extensive infrastructure and the significant traffic flows they carry, requires them to develop their own strategy, since the examples of other transport modes (airlines, for instance) can only be followed to a limited degree and in very specific circumstances, otherwise the efficiency and capacity of rail transport would be compromised. The question arising is whether significant flows can be securely monitored without jeopardizing the atmosphere, duration or cost of carriage by rail.

The cost of security

Since security does not obey probability-based reasoning, it is difficult to assess the efficiency of security measures, impossible to establish a direct mathematical link between the money spent and the outcome in terms of the number of offences committed, culprits arrested, etc. It is difficult enough even to gauge the real cost of security, beyond the cost of the staff and infrastructure directly allocated to this task. It is particularly difficult to gauge the effect of prevention policies, which aim to avoid malicious acts being committed.

It would perhaps be useful to reason in terms of a feeling of security. That would involve, as some railways do, regularly questioning both customers and those reluctant to travel by train to assess how important feelings of security or insecurity are in their decision and in the image they have or will retain of their journey and the rail-sector stakeholders which

executed it. In any case, it remains to be clarified what is the carrier's responsibility and thus included in the cost of carriage as paid by the user, and what is the public authority's responsibility and paid for by the taxpayer. Here again, the challenge is also the terms of competition between transport modes.

Security of stations: The challenge of joined-up thinking

Stations are set to play an increasingly complex role. Initially solely transport-focused, over time they have become places where people live their lives, and form part of the urban environment. Their long opening hours mean that at some times of day they are the only building open to the public when all others are closed, and are thus frequented by various groups and categories of people, whose goals in using or occupying them are not necessarily the same.

The development within stations of bigger and bigger retail areas, of which high-street shops are a particular feature, creates other everyday security issues, and suggests that we need to clearly define the roles of the various security players for each area of the station affected. It is normal that a security guard working for a railway's in-house security service should come to the aid of passengers on a platform, though the police of course retain jurisdiction, but what about being called to assist with a security incident in the retail area of a station — perhaps between people who are not even there to catch a train? Moreover, major termini are also multi-modal transport hubs served by various transport companies at any one time — these may not share the same view or analysis of their security commitments in terms of policy or financial outlay, which may again raise issues of consistency. Lastly, participation of multiple train operators at individual stations is already a reality in some European countries. The challenge will be to ensure consistency between their operations and security policies, and to avoid security becoming or causing a distortion of competition between them.

Consistency in managing the security of a space comprised of various locations, each of which obeys its own logic, and playing host to stakeholders who alternate between being collaborators and competitors, is becoming a major challenge, since stations, as well as being multi-modal, are also increasingly multi-stakeholder.

Consistency at the European and international level

The issue of consistency among stations also extends to international traffic, which could certainly be a source of traffic and railway business growth, particularly with the development of high speed systems.

Guaranteeing a "sufficient" level of security throughout the journey in international traffic may convince people to travel by train rather than by a different mode of transport. Alongside this "commercial" argument, in the European Union there are the provisions of Regulation (EC) no. 1371/2007 of the European Parliament and Council of 23 October 2007 on rail passengers' rights and obligations (published on 3 December 2007). Article 26 of this Regulation contains the provision titled "Personal security of passengers":

"In agreement with public authorities, railway undertakings, infrastructure managers and station managers shall take adequate measures in their respective fields of responsibility and adapt them to the level of security defined by the public authorities to ensure passengers' personal security in railway stations and on trains and to manage risks. They shall cooperate and exchange information on best practices concerning the prevention of acts, which are likely to deteriorate the level of security."

Here again, then, consistency should be an objective (though the form remains to be defined) in order to guarantee the involvement of domestic and international players throughout the journey; this consistency cannot merely be limited to an array or succession of bilateral agreements such as those developed for specific infrastructure (e.g. the Channel Tunnel, etc.).

Specific aspects of high speed systems: Risks and opportunities

What has been said for major stations and international traffic is naturally also true of high speed systems, with some specific aspects and limitations. Though the most notorious recent terrorist attacks have mostly occurred in urban networks, high speed rail is definitely an attractive target, given what it represents.

Firstly, it is an important symbol of technological development in industrialized countries, any attack guarantees immense political attention and media coverage, and for the culprits thereof (or those claiming responsibility). Furthermore, any consequences of attacks would be magnified by the speed of the train (obstacles on the track, derailment, etc.).

Travellers on high speed services have a legitimate demand for high-quality service due to the highest price. If a local train is covered in graffiti or looks the worse for wear, the minimum solution for the operator may be to continue running nonetheless, as long as it does not present a safety risk, since cancelling such services would create chaos in terms of punctuality. At the same time, travellers will use such trains because they do not really have a choice, even if they feel uncomfortable doing so, that is, they feel the opposite of feeling secure.

What is tolerable for local services will not be tolerated for high speed trains. Thus, the high speed rail system also offers helpful opportunities: the speed at which it develops means constant new trains or upgrades, allowing security of operation to be integrated upstream as one factor in quality of service, rather than adding-on measures or operating restrictions post-fact.

A complex balance must, therefore, be achieved. Railway security, preventive action and anti-terrorism are an interactive whole: passengers have a right to secure travel in in daily travel and on high speed services. However, the high speed sector presents specific risks calling for a specific and tailored response. High speed rail represents a very significant investment by society and thus requires protection. At the same time, the rapid roll-out of high speed services in many countries means that security issues can be integrated upstream in the design and management of such systems, bringing maximum effectiveness at an optimum cost: security is one part of service quality, not an additional constraint imposed post-fact.

The way forward

The rail sector has learned to live with a number of external constraints, which impact on its environment, above and beyond the internal safety constraints which are a constant of its business. This is the challenge to be met by the security policies to be developed. The challenge is complex since it involves taking on-board new systems of thought which need to be linked or synergized with those within the railways. But the challenge is also to meet the expectations of customers who wish to be able to travel undisturbed and of staff who wish to work without undue risk: this is the legitimizing basis for railways' actions, whether they are infrastructure managers or operators.

The task is simultaneously to construct a set of principles, which may require updating or strengthening by legal texts defining the rights and obligations of each party and its role

in the process, and to develop constant awareness of security amongst the various players — including customers.

Travellers expect their transport to be secure, but also that transport operators allow for all their various concerns, and for the random events which may disrupt their journey. To achieve their vision - which is one of integrated protection for rail transport - each component part must be integrated. This is no easy task, but to quote the philosopher Seneca: "It is not because things are difficult that we do not dare, it is because we do not dare that things are difficult."

The Security Platform of the International Union of Railways

In its Working Groups and at its annual Congress, the Security Platform brings together UIC members from across the world who strive to make headway on the subjects they consider vital priorities. The Steering Committee is attended by representatives of the rail business units (passenger, freight, rail system), representatives of the UIC regions (Europe, Asia, Middle East, Africa), representatives of the major industry, technical and institutional partners, and by the Chairs of the Working Groups, so as to guarantee that the needs of each party and of the rail sector, in all its complexity, are optimally considered.

Overseen by the Security Division, which also acts as a centre of expertise and a think-tank, the Platform acts as a standing venue for exchange between members and as an arena for partnership with the various European and international institutions and bodies responsible for railway security. Chaired by a European and a non-European on a rotating basis, its global dimension goes beyond regional particularities. The Platform holds an annual world security congress on a mutually-agreed topic which is defined by members' needs. Meanwhile, the Working Groups continue to address:

- the three "constants", developed by UIC which form the core of the security policies: human factors, technologies, strategy and regulations. The idea is to develop these three aspects in parallel: an effective security policy starts by supplying frontline staff (human factor) with the information and decision-making support they need (technology), all within a legal or regulatory framework in partnership with the public authorities (strategy and regulations).
- the two priority subjects, requested by UIC members in the light of current events and the problems encountered on the ground: metal theft, and border crossings and security of international transport corridors. Metal theft is an intolerable burden for railway companies both in terms of the direct costs caused by theft (replacement, repair, etc.) and in terms of the indirect costs (compensation for delay, damage to company image, etc.). In terms of the second point, developing international traffic is assumed to save time and ensure the end-to-end integrity of convoys: in this context it has been deemed a priority to conduct a pragmatic examination of security conditions on international routes (predominantly Eurasian freight corridors) and of border crossings en route (customs, compatibility between systems, etc.), in order to subsequently define a shared method of analysis and a harmonized response, where necessary, along the whole route.

In addition, the Security Division provides services, either at the request of the technical departments (e.g. the above-mentioned work in the form of a handbook on security in high speed systems, in collaboration with the Passenger Department), or at the request of UIC members (participating in studies, organizing working seminars, disseminating results and documentation, etc.)

International Union of Railways – projects
PROTECTRAIL - RESTRAIL

Security, prevention, and combating crime and terrorism are, perhaps even more than in other fields, tomorrow's challenges that will not be met with today's solutions. The threat is ever-evolving, and the response must develop at the same pace, at least.

UIC is thus engaged in various research projects, including those funded by the European Commission, focusing on the general protection of the rail system (stations, infrastructure, rolling stock), and on the reduction of suicides and trespassing, protection of the most vulnerable infrastructure against threats of all kinds, etc.

One output of the PROTECTRAIL project was a general demonstration of project proposals in Zmigrod (Poland) in October 2013; the project concluded with the final conference held at UIC in Paris in June 2014. The goal was to coordinate the various useable security technologies within a consistent architecture, provide railway undertakings with solutions and standards for the security issues they encounter, whether these are objects blocking the tracks, unattended items in stations, identify those responsible for risky behaviour, etc. The project took a modular approach to the various aspects, and developments in problem-solving technologies can be included and integrated within the whole without adverse effects on its components.

The RESTRAIL project (Reduction of Suicides and Trespass on Railway property) aimed to help railway stakeholders to reduce the number of suicides and trespassing accidents and the costly service disruption caused by these events. Some of the various measures identified and examined came under education and communications policy; others drew on early-warning or infrastructure-protection technologies. The most promising solutions were field-tested in 2013, and the final toolbox was made available at the end of 2014. The project outcome provided the rail industry and the scientific community with a free online tool (www.restrail.eu/toolbox) comprised of an extensive list of cost-effective interventions, recommendations, guidance materials and study results (www.uic.org/com/IMG/pdf/cp_restrail_final_en.pdf).

The other projects underway include, in particular, those on cybercrime, which is undoubtedly a future threat. Beyond the inherent value of these projects, they offer opportunities for partnership and joint thinking between disparate communities: railway companies, research centres, universities, specialist consultants, technical service-providers, etc., and allow us to broaden the scope of our enquiry, compare and contrast our analyses, and obtain a broader view of the roles, capabilities, and rights and obligations of the various potential players.

6.4 Security in the Transport of Dangerous Goods

After 11 September 2001, the transport of dangerous goods was rapidly identified as one of the areas where appropriate international action should be taken urgently. As a result, the United Nations ECOSOC Sub-Committee of Experts on the Transport of Dangerous Goods issued, as of December 2002, recommendations on the security measures or precautions that should be provided by regulations on the transport of dangerous goods, so as to minimize the risks of theft or misuse of dangerous goods that could endanger persons or property. These were included in the United Nations Recommendations on the Transport of Dangerous Goods, Model Regulations and related instruments (see also section 5.4). The security provisions consist of:

- General provisions applicable to all dangerous goods: the security of areas used for the temporary storage during carriage of dangerous goods; identification of carriers and their staff; training; registration of valid training certificates;

- Provisions applicable to the so-called "high consequence dangerous goods" i.e. those which have the potential for misuse in a terrorist incident and which, as a result, could produce serious consequences such as mass casualties, mass destruction or, particularly for radioactive material, mass socioeconomic disruption. They require special measures to be applied to prevent theft of vehicles or cargoes. Arrangements between consignors, carriers and other participants in the transport operation must be with adoption and implementation of and compliance with a security plan in mind.

The security provisions are in Chapter 1.4 of the United Nations Model Regulations. They have been adopted in the International Maritime Dangerous Goods (IMDG) Code (for maritime transport) and the ICAO TI (for air transport) with reservations that:

(a) For maritime transport, they remain recommendations to Governments, that national competent authorities may apply additional security provisions, and that the relevant security provisions of Chapter XI-2 of the 1974 SOLAS[141] Convention and of the International Ship and Port Facility Security (ISPS) Code apply;

(b) For air transport, they supplement (and do not supersede) the provisions of Annex 17 (Security) of the Convention on International Civil Aviation and of the ICAO Security Manual for Safeguarding Civil Aviation against Acts of Unlawful Interference.

The provisions of Chapter 1.4 of the United Nations Model Regulations are reproduced in Chapter 1.10 of ADR, RID and ADN for mandatory application in international transport (and in EU for domestic transport also) by road, rail and inland waterways.

Challenges

In 2005, the European Commission conducted a study[142] on the evaluation of the security provisions for the transport of dangerous goods adopted by the land modal regulations (RID/ADR/ADN), their effective implementation and practicability, as well as their consistency and deficiencies.

The study showed that the regulations on security during the transport of dangerous goods had provided the correct level of protection for the public considering that trade in dangerous goods must continue with the minimum of restrictions as it provides important raw materials for many different sectors of the economies of Europe. It was noted, however, that the three sets of modal regulations adopted the same provisions (with minor changes) despite the fact that the individual modes do present different security risks. Vehicles, for instance, are easily stolen and easily moved from one place to another while barges and trains are unlikely to be stolen, though the contents of the barge or train are likely stolen. The current provisions do not take into account this distinction and it was recognized that it may be necessary to consider this aspect of modal differences in the future.

The study also identified some shortcomings which since been addressed, as well as some problems of enforcement and implementation, e.g. in relation to proper security training for staff, security inspections on the road-site and at premises, and the lack of secure parking facilities, which are still under discussion.

[141] International Convention for the Safety of Life at Sea, International Maritime Organization, 1974

[142] Study on transport of high consequence dangerous goods (HCDG). EU Ref: TREN/07/ST/S07.76239. 13 October 2008, available at : http://ec.europa.eu/transport/themes/security/studies/doc/2008_10_hcdg_study.pdf

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7. Inland Transport and the Environment

Inland transport requires infrastructure that involves land use and loss of natural habitat. It also requires energy, most of it non-renewable. Unfortunately, many of the most popular transport modes depend on non-renewable energy sources, which add to the direct reduction of natural resources and contribute to the emission of greenhouse gases and harmful pollutants.

Much can be done to reduce the negative impact of transport on environmental sustainability, such as the discovery of new or use of renewable energy sources, use of intelligent transportation systems and improved engine efficiency.

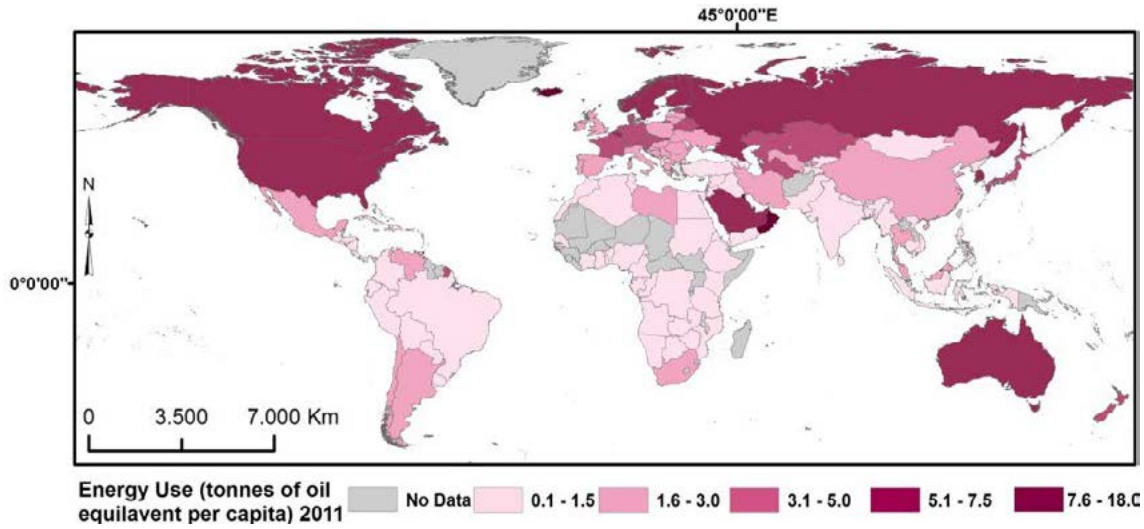
Energy-efficient behaviour ⇨ Renewable energy sources ⇨ Low-emission technologies ⇨	Environmentally sustainable transport
Key challenges	• Despite energy efficiency improvements, energy consumption in transport is increasing; • Environmental impacts of new technologies are not fully understood yet; • Greenhouse gas emissions from transport are increasing; • Keeping vehicles environmentally friendly throughout their lifetime; • Modal split is not in favour of environmentally friendly modes; • Noise from transport affects large numbers of people in agglomerations; • Transport infrastructure is vulnerable to the effects of natural disasters induced by climate change.
Role of the United Nations	• Service the World Forum for Harmonization of Vehicle Regulations (WP.29); • Encourage governments to pursue an integrated approach for transport policies; • Define regulations limiting the maximum admissible level of vehicle emissions; • Promote the use of tools such as the "For Future Inland Transport Systems" (ForFits), a CO_2 reduction scenario builder; • Promote the accession to and implementation of agreements on vehicle regulations and periodic technical inspection of vehicles.

7.1 Energy Use

The transportation sector accounted for about 27.9 per cent of the total world final energy consumption and 55 per cent of the total liquid fuel consumption in 2012. [143] In the period 2001-2012, energy use (Figure 7.1) increased in most countries, but at a slower pace than (nominal) GDP (see e.g. Figures 2.10 and Chapter 2.3). Energy consumption is projected to increase substantially in the following decades (EIA, 2013) and this development will control the sustainability of the transportation sector.

[143] www.iea.org/Sankey/index.html#?c=World&s=Final%20consumption

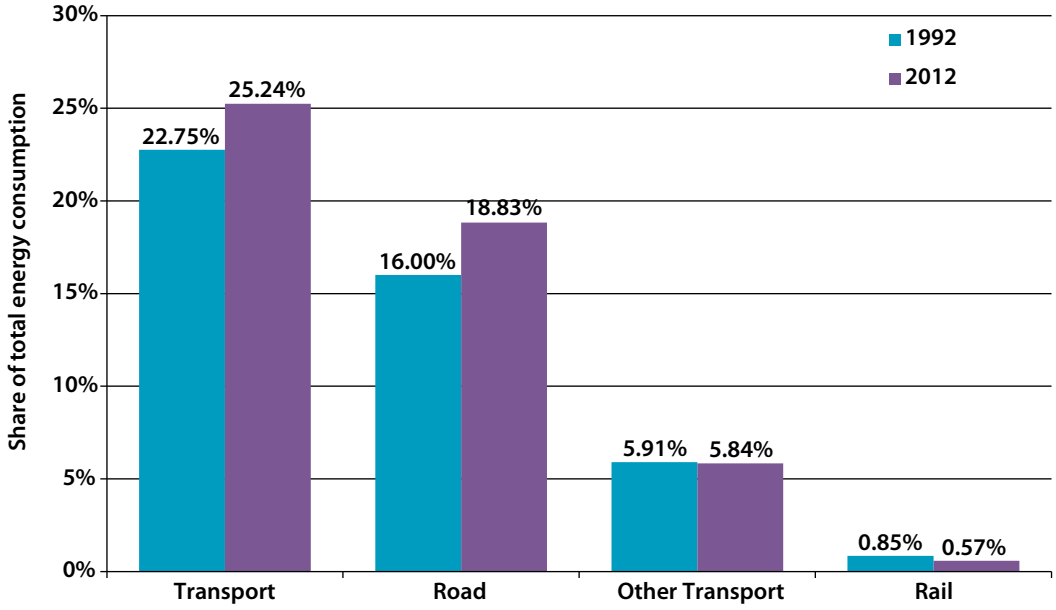
Figure 7.1 Energy use per capita, 2011 (in TOE-Tonnes of Oil Equivalent)



Source: OECD/IEA

According to recent projections (EIA, 2013), transportation energy use will grow by 1.1 per cent annually at a global level in the period 2010-2040, driven by an increase of 2.3 per cent annually in the non-OECD economies; in comparison, energy use in the OECD countries will decline by an average of 0.1 per cent annually.

Figure 7.2 Share of energy use in transport of total energy consumption-global, 1992-2012



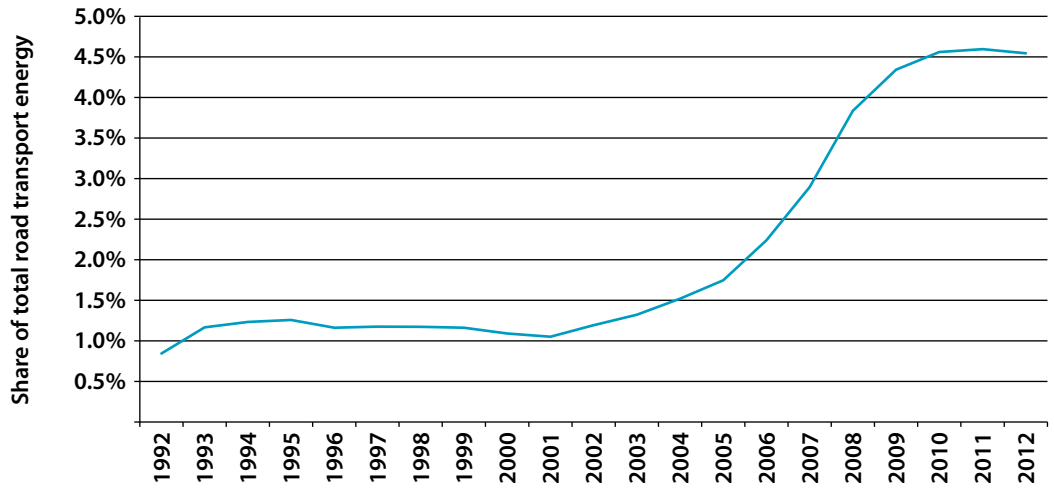
Source: OECD[144]

It is interesting to note that, in some regions, total energy consumption decreased in recent years, in contrast to transport; this is the result of the substantial increase in the energy used in road transport (about 20 per cent in the period 1992–2012), while 'rail' and 'other transport' modes experienced a reduction in energy use (Figure 7.2). This shows that, in terms of resource use and environmental impact, the ball is firmly in the court of road transport.

[144] http://stats.oecd.org

Recent years have seen an increasing use of alternative and renewable energy sources in transport. For example, the worldwide use of renewable energy sources has increased in road transport much more than the total energy use. For the period 1992–2012, the use of combustible renewables increased almost eight-fold (Figure 7.3), with the total energy use increasing by only 4.83 per cent. Nevertheless, the use of renewable sources is still very low; the 2012 total share of renewables in transport energy use was only 3.4 per cent (REN21, 2013).

Figure 7.3 Proportion of combustible renewables and waste of total energy use in road transport – global, 1992-2012



Source: OECD [145]

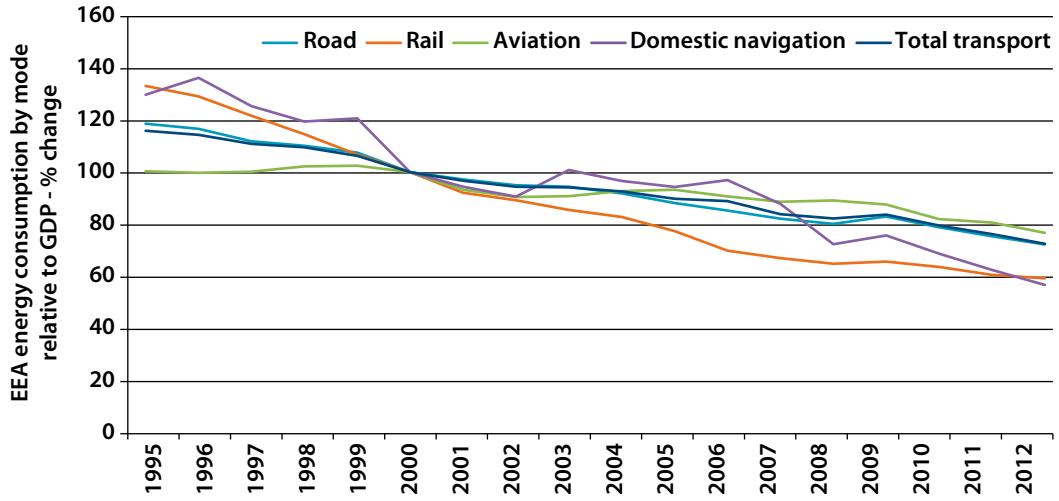
Transport energy consumption increased substantially in the European Economic Area during the 1995–2012 period (Figure 7.4a) with the higher rates of increase observed in air and road transport; nevertheless, a significant drop in energy consumption of transport per unit of GDP was achieved between 2000 and 2012. [146]

Globally, energy consumption of transport relative to GDP (Figure 7.4b) is decreasing, i.e. the oil equivalent for each United States dollar of GDP used to satisfy the total transport demand is decreasing. This ongoing, almost steady decline indicates a relative decoupling over the 1992-2012 period.

[145] http://stats.oecd.org

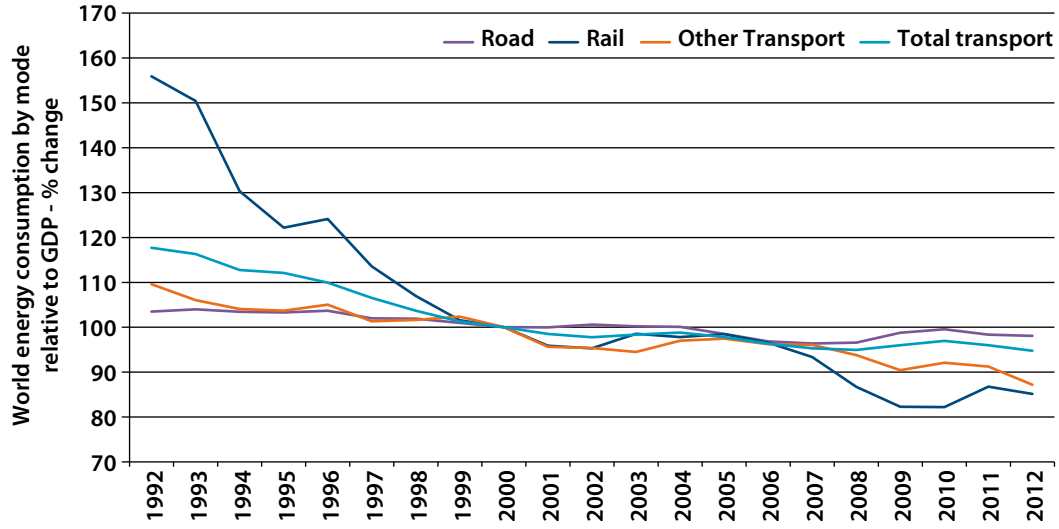
[146] See: http://ec.europa.eu/eurostat/statistics-explained/index.php/Sustainable_development_-_transport

Figure 7.4a Energy consumption of transport relative to GDP, by mode in the EU-27 plus Norway and Switzerland (index 2000 = 100)



Source: Eurostat; European Energy Agency

Figure 7.4b Energy consumption of transport relative to GDP, by mode – global (index 2000 = 100)



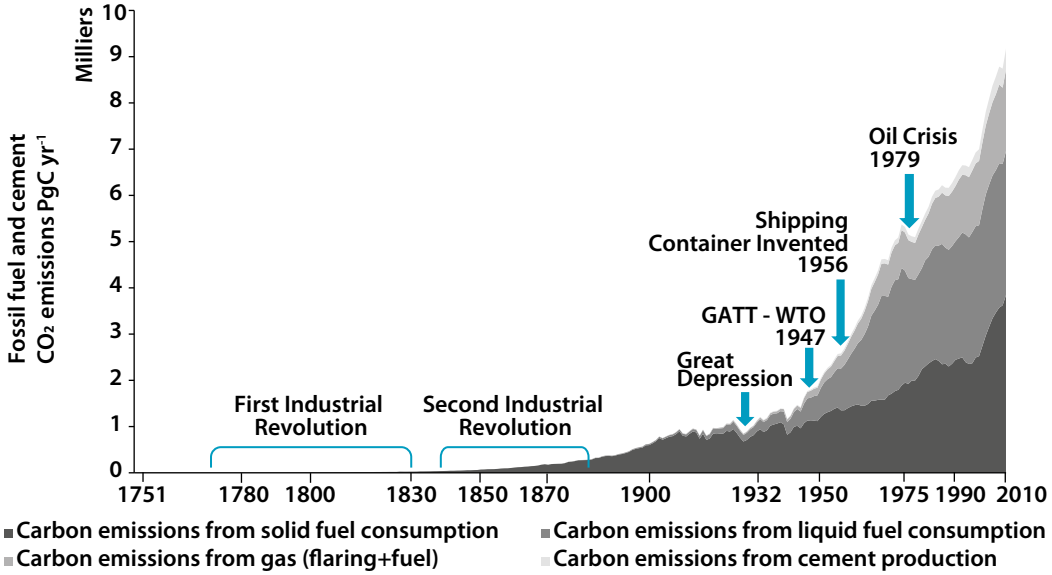
Source: OECD[147]

Fossil fuel consumption has significant effects on the environment, mainly from carbon emissions, which have been steadily increasing over time (Figure 7.5). Research and development allows the progressive introduction of more environmentally friendly energy sources, such as biofuels; however, it should be kept in mind that such sources should be also sustainable. Another increasingly popular energy source in road transport is electricity together and/or instead of fossil fuels; this has the potential to make some significant inroads into the carbon footprint of road transport (see e.g. Daly and Ó Gallachóir, 2012), but further research and development is required to increase efficiency. Nevertheless, we must bear in mind that electric automobiles can contribute to the reduction of carbon emissions if the electricity used by the car comes from non-fossil fuel

[147] http://stats.oecd.org

sources. Without supportive public policies, the uptake of new technology will depend mostly on household income. Low income households cannot afford and/or are generally reluctant to spend on e.g. hybrid/electric vehicles (Andrich et al., 2013).

Figure 7.5 Annual anthropogenic CO_2 emissions, 1750 – 2011 *(in PgC/year)* Fossil fuel and cement CO_2 emissions by category, estimated by the Carbon Dioxide Information Analysis Center (CDIAC))



Source: IPCC, 2013
Note: Since the 1950s, liquid fossil fuels are the most significant driver of this increase.

A recent UNECLAC publication illustrates the relevance of energy consumption in strategic infrastructure, especially in ports. The evolution of energy consumption in ports has become a more relevant issue as the Latin American region increasingly integrates the global trade network. Furthermore, the change in the structure of trade in the region, as a result of establishing the region as a main exporter or perishable products, is significantly altering energy demand of infrastructure, transport services and the whole supply chain (Wilmsmeier G. et al., 2014). Understanding these trends is crucial for understanding the future demands of the transport and logistics sector, for calculating carbon footprints or for developing energy efficiency standards in the future.

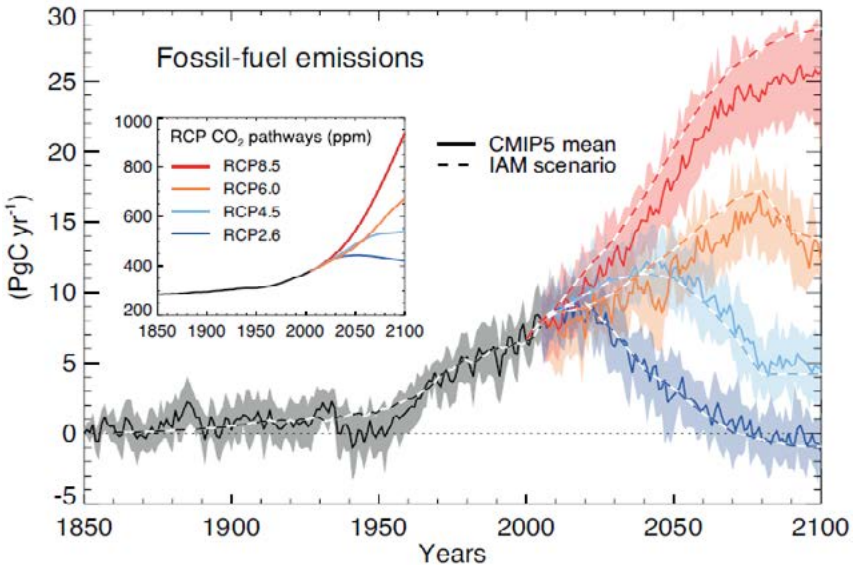
7.2 Transport Effects on the Environment

Transport can affect the environment in many ways and at different spatio-temporal scales. Inland transport requires infrastructure, the construction of which could involve extensive land-use and, consequently, a potential loss of natural habitat. Transport also influences air quality: air pollutants from transport (i.e. nitrogen oxides, particles, carbon monoxide and hydrocarbons) can have damaging (local) impacts on human health and ecosystems. Moreover, transport produces noise, which can also have significant implications for human health/ecosystem services, and uses a great amount of primary natural resources (e.g. metals and fossil fuels). It can also affect quality of life: traffic can be dangerous and intimidating and divide communities. Last, but not least, transport produces GHG emissions and, thus, can severely affect environment at the global level.

7.2.1 Climate change

The combustion of fossil fuels results in CO_2 [148] emissions which contribute to global warming and, thus, to climate change. CO_2 (and other GHG) emissions are now considered to be the major cause of the observed climatic changes: they result in increased atmospheric concentrations of GHGs than can absorb heat reflected back from the Earth's surface and, thus, increase the Earth's heat storage (IPCC, 2013). Fossil fuels based carbon emissions have been increasing steadily since the 1950s. Projections to 2100 (IPCC, 2013) show that with the exception of the most mild Representative Concentration Pathways (RCP) 2.6 scenario, fossil fuel emissions will continue growing until at least 2050 (Figure 7.6).

Figure 7.6 Carbon emissions from fossil fuel combustion according to four RCP 149 scenarios (in PgC/yr150)



Source: *IPCC, 2013*

Note: *Dashed lines show historical estimates. RCP emissions calculated by the Integrated Assessment Models (IAMs) were used to define the RCP scenarios. Solid lines and plumes show results from CMIP5 Earth System Models (ESMs, model mean, with one standard deviation shaded)*

Presently, CO_2 emissions from transport show significant spatial variation: the highest emissions are in the United States of America, followed by the Russian Federation, China, Japan and Brazil, then Western Europe, Australia and India; in comparison, Africa and central Asia generate the lowest transport emissions (see also Chapter 2.3). Across the UNECE region, CO_2 emissions from transport have been increasing (on average) during the past few decades. In 1990, about 2.75 billion tonnes of CO_2 were emitted from the UNECE transport sector; in 2008, emissions were over 3.2 billion tonnes, an increase of 17 per cent. In 2008, 85 per cent of total transport CO_2 emissions originated from road transport, showing an increase of 23 per cent from the early 1990s; this was in spite of the increasing efficiency of vehicles (UNECE, 2012). Nevertheless, measured in emissions per capita, a number of Western European countries have decreased emissions over the last decade.

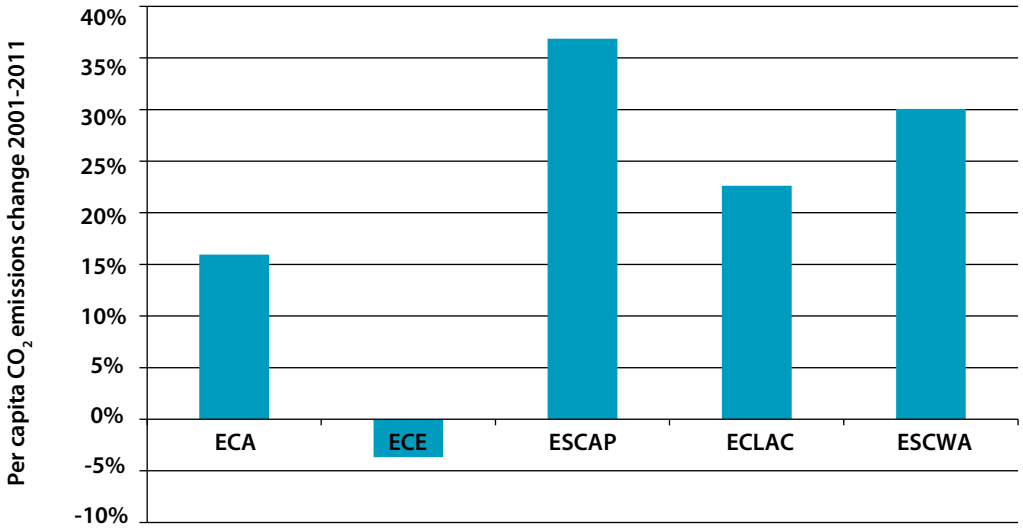
[148] Among other gases.

[149] In the last IPCC Assessment Report AR5 (2013), forecasts were made on the basis of the Representative Concentration Pathways-RCP scenarios and not the IPCC SRES scenarios. The CO_2 equivalent concentrations have been set to (e.g. Moss et al., 2010): RCP 8.5, 1370 CO_2-equivalent in 2100; RCP 6.0 850 CO_2-equivalent in 2100; RCP 4.5, 650 CO_2-equivalent in 2100; and RCP 2.6, peak at 490 CO_2-equivalent before 2100.

[150] 1 PgC = 10^{15} grams of carbon = 1 Gigatonne of carbon = 1 GtC. This corresponds to 3.667 $GtCO_2$.

Global transport-related per capita CO_2 emissions increased by 6 per cent between 2001 and 2011. [151] During the same period, the UNECE region reduced per capita CO_2 emissions (significant reductions for Western European countries), while varying degrees of increase were observed in other regions of the world (Figure 7.7).

Figure 7.7 Regional per capita transport-related CO_2 emissions 2001-2011



Source: International Energy Agency

7.2.2 Other environmental effects

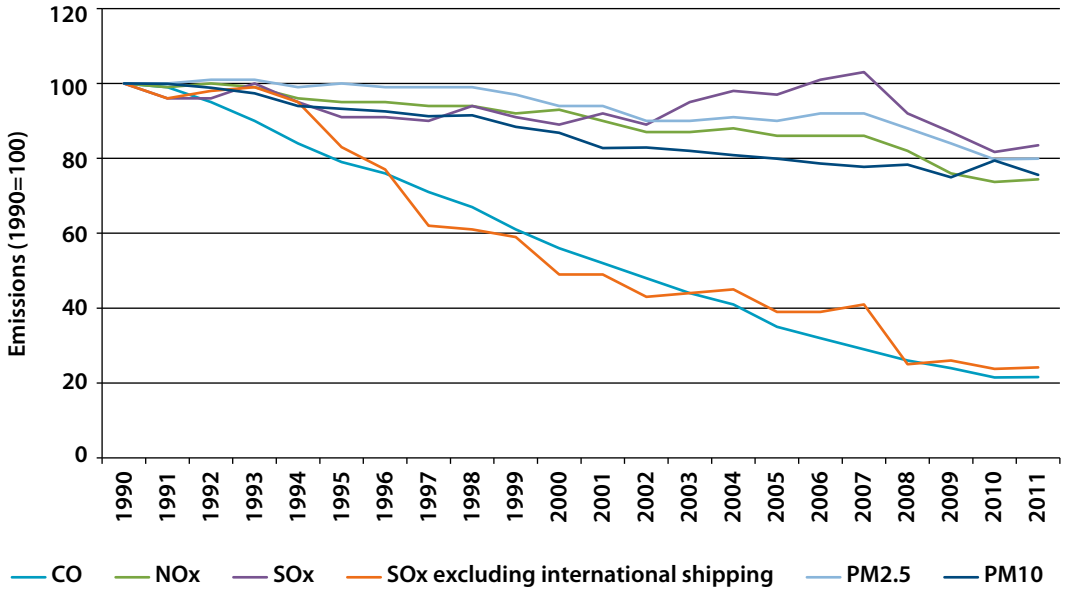
Transport directly emits pollutants such as **carbon monoxide (CO)** which is a product of incomplete combustion and reduces the blood's ability to carry oxygen, is poisonous in high concentrations and dangerous for people with lung or heart diseases. Volatile organic compounds, composed of unburned or partially burned fuel, are also toxic causing liver damage and, possibly, cancers. Nitrogen oxides (NOx), generated by gaseous reactions in engine combustion chambers can irritate lungs and contribute to creating 'photochemical smog' and acid rain. Nitrogen pollution from vehicles as well as from industry, agriculture and waste treatment costs the European Union up to € 320 billion per year; whereas bad air quality causes nearly 500,000 premature deaths a year across all EU countries.[152] Finally, increased concentrations of atmospheric particulate material (mostly carbon particulates) can cause respiratory problems; in recent years, improved technology (e.g. particle filters) in cars has significantly reduced particulate matter emissions. In the EU, member States have generally managed to reduce emissions of fuel combustion gases (e.g. CO, NOx, SOx, PM_{10}, $PM_{2.5}$) over the past few decades (Figure 7.8); this however, does not represent a global trend (See also UNECE, 2012). [153]

[151] *Note from the International Energy Agency:* CO_2 emissions from transport in this context include emissions from the combustion of fuel for all transport activity, regardless of the sector, except for international marine bunkers and international aviation. This includes domestic aviation, domestic navigation, road, rail and pipeline transport, and corresponds to IPCC Source/Sink Category 1 A 3.

[152] See www.millennium-project.org/millennium/Global_Challenges/chall-01.html.

[153] The new (2014) IPCC AR5 report on Climate Change Mitigation, released in early 2014 contains detailed information on to GHG and pollutant emissions and mitigations. See www.ipcc.ch/.

Figure 7.8 European Union emissions of fuel combustion gases (CO, NOx, PM10 and SOx), 1990-2011



Source: UNECE, 2012

In town centres and alongside busy roads, vehicles are responsible for most of the local pollution. Vehicles tend to emit more particulates during the first few kilometres of a journey when their engines are warming up. Although new technology and cleaner fuel formulations will continue to cut emissions of pollutants, the increasing number of vehicles on the road and kilometres driven is eroding these benefits.

Noise from transport can also be a serious health issue by causing stress, sleep disturbance and other harmful effects on health. In urban agglomerations, noise from road transport affects considerably more people than noise from rail, inland waterway and air transport, or noise from the industrial sector (UNECE, 2012). Sources of noise from road transport include car engine noises, tyre-on-the-road noises, car horn and music noises, door slamming and squeaking brakes. In urban areas, engine sound appears to be the most significant problem, whereas in rural areas tyre noise on busy highways (which increases with speed) is the main noise source.

In the EU in 2010, at least 60 million people were exposed to road noise above 55 decibels (db) every day (Figure 7.9), although vehicles have been subject to noise standards for many years through EU legislation. The same study, repeated in 2014 by the Noise Observation and Information Service for Europe of the European Environment Agency on a similar sample size (-5 per cent) and showed a significant improvement compared to the 2010 study results — concluding that the number of surveyed persons exposed to noise levels higher than 55 db decreased from 2010 in all categories. The most significant decrease was by 15 per cent in road transport noise exposure: low-noise road surfaces, effective noise barriers in sensitive locations, and low noise tyres can all help reduce noise levels.

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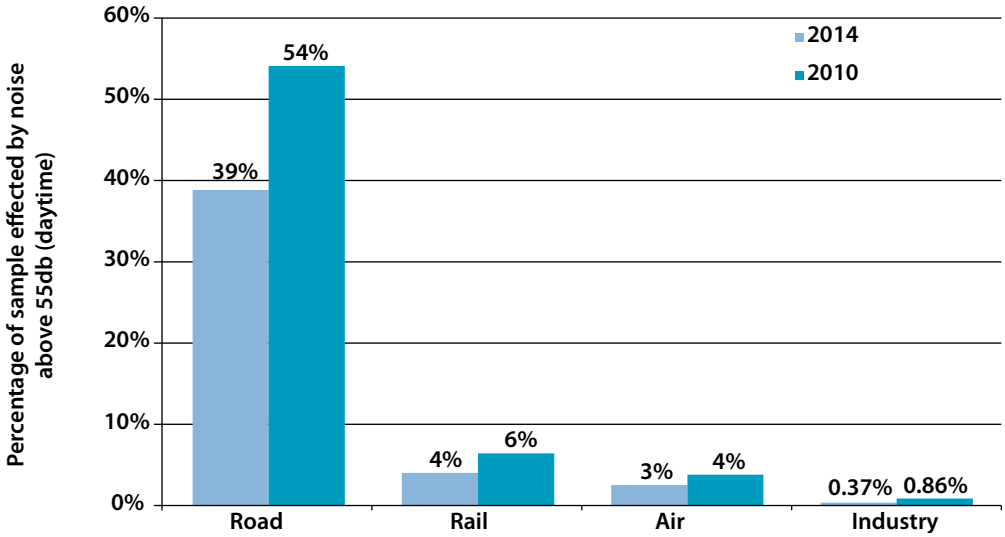
Figure 7.9 Daytime exposure to noise above 55 db in select European Union countries (in 2010 and 2014)



Source: European Environment Agency (EEA) and the European Topic Centre for Air Pollution and Climate Change Mitigation (ETC-ACM) [154]

Nevertheless, it should be noted that the environmental effects of transport (e.g. noise and nuisance) should not be considered independently of their positive socioeconomic effects. A recent survey of 1,225 people living within a 1 km distance of a highway in the Netherlands (Hamersma et al., 2014) found that 85 per cent of respondents (on average) were satisfied with living in proximity of highway. The negative feelings appeared to relate to air quality, noise and nuisance which can be balanced by easier transport accessibility and a positive attitude towards private motorization. While this is true for the road sector, the same does not often apply for railways.

Noise from rail transport and, particularly, freight rail movements are often seen as sources of significant distress to residents living near railways because freight is often transported at night. This has become a significant issue in some countries (for example in Germany) and has led to the European Union seeking a solution to reduce rail noise and to further provide incentives to upgrade rolling stock to reduce noise output.

Transport can also have major environmental impacts during the construction, use and eventual disposal of its infrastructure and rolling stock components. For example, it has been estimated that of the total CO_2 emissions produced during car's lifespan, 10 per cent originate from its manufacture and 5 per cent from its disposal; the remaining 85 per cent are from fuel use and services.[155]

In conclusion, the expansion and upgrading of transport infrastructure can have considerable adverse effects on the environment. These effects are generally included in the national and international regulations on environmental impact that are force in many countries and regions.[156]

[154] http://noise.eionet.europa.eu/

[155] For more information, see for example, www.environmental-protection.org.uk/committees/air-quality/air-pollution-and-transport/car-pollution/

[156] For example: – the 1992 Espoo Convention and its 2003 Kiev Protocol (www.unece.org/env/eia/eia.html and www.unece.org/fileadmin/DAM/env/eia/documents/legaltexts/protocolenglish.pdf.); – the European Environmental Impact Assessment Amended Directive (97/11/EC) (http://ec.europa.eu/environment/eia/eia-legalcontext.htm; and – the Strategic Environmental Assessment Directive (2001/42/EC) (http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2001:197:0030:0037:EN:PDF).

7.3 Environmental Effects on Transport

Transport is not only a major contributor to the observed growth in carbon emissions and a probable force behind climate change (IPCC, 2013); it is also a 'victim' of climatic changes and extreme events which can have diverse impacts on transport infrastructure and services. The impacts vary significantly by mode, climate change factor and depend on the local or regional circumstances and vulnerabilities, including those associated with the natural environment, as well as a broad range of socioeconomic factors (see also UNECE, 2013).

Rising sea levels, storm surges and waves are likely to have major impacts, including transient and permanent flooding of roads, rail lines and tunnels. Coastal inundations (e.g. Figure 7.10) can render transportation systems unusable for hours or days causing damage to terminals, intermodal facilities, freight villages, storage areas and cargoes and, thus, disrupting intermodal supply chains and transport connectivity for even longer (USDOT, 2012).

Heat waves limit operations and cause damage to road pavement (PIARC, 2012), whereas increased intensities in tropical storms and hurricanes can lead to infrastructure damage and interruption or failure of transportation. Arctic warming continues to reduce sea ice (IPCC, 2013), which lengthens the arctic shipping season, but also results in increased coastal erosion from the increased wave activity (for example, polar shorelines of Canada, the Russian Federation and the United States of America (Lantuit and Pollard, 2008)). Another effect is permafrost thaws which result in severe damage to transport infrastructure. A review (UNECE, 2013) of the sensitivity of inland transport networks to climate variations and change, has found that:

(a transportation assets tend to be more sensitive to extreme events, such as storm surges, heavy precipitation, heat waves and high winds, than to incremental changes in the mean climate variables;

(b) services (e.g. maintenance, traffic conveyance and safety) are generally more sensitive to climate forces than physical assets (such as thresholds for e.g. delaying or cancelling transport services are generally lower than those for damage to infrastructure); and

(c) transport assets are sensitive to stressors whose occurrence is relatively unlikely in comparison to typical weather variation. For example, during the 2005 Hurricane Katrina, the superstructure of the (United States of America) Gulf Coast bridges failed against the excessive force of the waves and the unprecedented sea levels (USDOT, 2012).

Figure 7.10 Weather related damages to transport infrastructure

(a) *Many roads, including sections of the US Highway 34 (black arrows) were washed away by the South Platte River flood (Colorado, United States of America) in mid-September of 2013 (http://landsat.visibleearth.nasa.gov/view.php?id=82090)*

(b) *Damaged rail track from a storm surge and waves along the Dawlish seafront in the south-eastern part of the United Kingdom in February 2014 (photograph, Toby Melville/ Reuters).*

Two recent seventh Framework Programme (FP7) projects of the European Union studied the impacts of climate change and extreme events on the European transport systems. The WEATHER [157] Project aimed to identify the risks, economic impacts and adaptation strategies for all modes of transport and the EWENT [158] Project considered long-term climate scenarios in detail. Both Projects found a lack of reliable statistical data on the vulnerability of different transport modes.

The WEATHER Project estimated that the total costs borne by the transport sector (e.g. damages, infrastructure repair/maintenance, vehicle damages, increased operation costs) for the period 1998-2010 were € 2.5 billion annually, with €1 billion annual indirect costs to transport disruptions. Rail was the most affected transport mode, specifically in Eastern Europe and Scandinavia. The effects on roads were more evenly distributed.

The EWENT Project assessed average annual costs from weather extremes for the current and future (2041–2070) periods. Costs from extreme climate events in the baseline period (1998–2010) were estimated at more than €15 billion and dominated by the costs of road accidents.

Other studies (e.g. Perherin et al., 2010) also projected substantial impacts on coastal transport infrastructure. It has been estimated that a 1 m increase in sea level above the inundation level of the current 1-in 100 year-storm event, and assuming an average linear property cost at €10 million/km of road surface and repair costs at about €250 thousands/km, would amount to asset costs (i.e. excluding operational and connectivity costs) for mainland French A-roads of up to €2 billion. Such sea level rise could potentially inundate 2.9 per cent of motorways, 1.7 per cent of national roads, and 6.3 per cent of the railway network. Another study (EC, 2012b) provided an initial estimate of the future risk on European coastal transport infrastructures from Mean Sea Level Rise (MSLR) and storm surges. The study compared the coastal road elevation and the combined levels of 1-m MSLR and the 100-year storm surge height; it found that coastal roads represent 4.1 per cent of the total risk, with an asset value of about €18.5 billion.

[157] See www.weather-project.eu

[158] See www.weather-project.eu/weather/inhalte/research-network/ewent.php

Changes in precipitation may change stream flows. River floods are likely to be particularly catastrophic for transport networks as major roadways and railways are located within/or cross flood plains (for example Figure 7.10); effects can also be significant on bus/coach stations, train terminal facilities and inland waterway transport operations. Direct damages may occur during and immediately after heavy precipitation, require emergency responses, as well as deleteriously affect the structural integrity of roads, bridges, drainage systems and tunnels, and maintenance (USDOT, 2012). An area of special concern is the potential increase in winter precipitation, which often leads to failure of drainage systems (Galbraith et al., 2005) and extensive flooding in urban areas. A study in the United Kingdom (DEFRA, 2012) suggested that transportation infrastructure will be affected by both extreme weather events and long-term gradual changes in the climate. Road and railway networks could face significant flood risks along with bridge scouring. Increased heavy precipitation and flooding also leads to accidents caused by vehicle and road damage, poor visibility, delays and traffic disruptions (e.g. Potter et al., 2008; Hambly et al., 2012).

Regions where flooding is already common will obviously face more problems. Standing flood waters could have severe impacts on roads; for example, damages due to long-term road submersion in the state of Louisiana in the United States of America have been estimated at US $50 million for 200 miles of state highways (e.g. Karl et al., 2009). Inland waterways can be affected by suspension of navigation, silting and changes in the river morphology and damage of banks and flood protection. Wright, et al. (2012) studied the potential impacts of climate change-induced river floods on the continental bridges of the United States of America. The adaptation costs of vulnerable bridges were been estimated at US$ 140 – US$ 250 billion in the twenty-first century. Estimations for EU-27 bridges (EC, 2012a) were lower. The cost for protection from bridge scouring been estimated at €380 – €540 million per year of which 80 per cent is for road and 20 per cent for rail (see also UNECE, 2013).

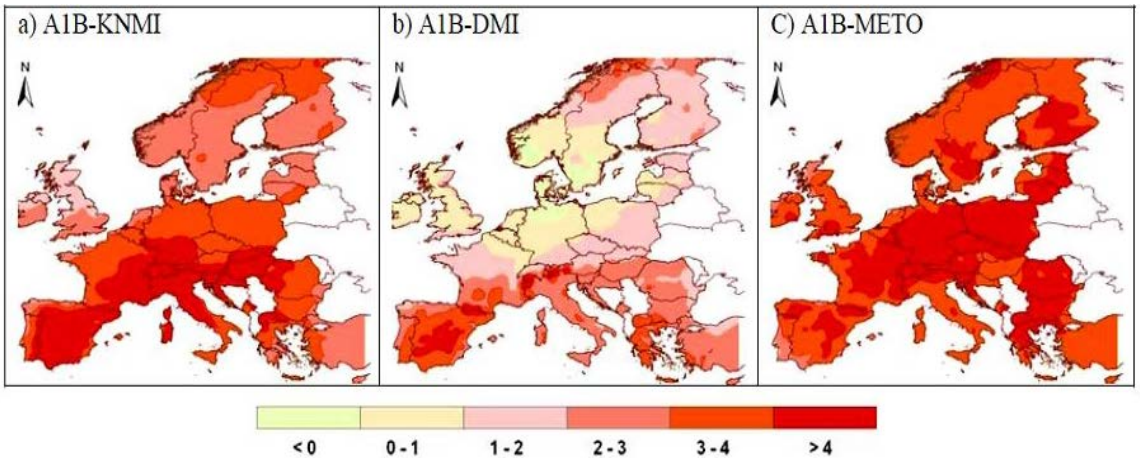
Studies of climate change on the British railway network also suggest that infrastructure will be severely affected (i.e. track and line side equipment failure, bridge and embankment scouring, culvert washouts, landslides, problems of personnel safety and inaccessibility of fleet and maintenance depots). Costs related to extreme precipitation, floods, etc., which are already estimated at £50 million a year, could increase to £500 million a year by the 2040s (Rona, 2011). Road networks are expected to incur heavy damages with heavy rainfall and flooding. Impacts on asphalt and concrete pavement would be divers and require, for example, construction of adequate drainage, permeable pavements or polymer modified binders (e.g. Willway et al., 2008). In addition, the cost of flood-related traffic disruption on roads has been estimated at a minimum of €123,000 per hour of delay on each main road affected (Arkell and Darch, 2006). If flooding is more frequent in the future as a result of increased heavy precipitation, then it is likely that these costs will increase significantly (Hooper and Chapman, 2012).

Extreme winds are also projected to be more catastrophic in the future (e.g. Rahmstorf, 2012). These can cause overtopping on defences and flooding at coastal and estuarine railways (RSSB, 2010), damage port and airport facilities and severely affect road and rail infrastructure and services through wind-generated debris (e.g. Karl et al., 2009).

Heat waves over extended periods or days or weeks may have devastating impacts on transport services and infrastructure (Hooper and Chapman, 2012). For example, the 2003 heat wave in Europe affected the water levels of many major rivers (e.g. Po, Rhine and Loire rivers), resulting in disruptions of inland navigation, irrigation and power-plant cooling (Beniston and Díaz, 2004). Long or repeated periods of extreme heat with temperatures

above 32°C) can soften asphalt and lead to rutting under heavy traffic (Field et al., 2007). Extreme heat waves can deform rail tracks, cause derailments and restrict speed (e.g. Baker et al., 2010). A European study (EC, 2012b) estimated significant increases in the twenty-first century of the number of days per year that the maximum temperatures (Tmax) in Europe will exceed CRT30[159], suggesting increases in delays/operational costs.

Figure 7.11 Change in the 7-day maximum pavement temperature in different European climate zones (in the case of the A1B scenario: comparison between 2040-2070 and 1990-2010)



Source: EC, 2012b

Temperatures above 100 °F (≈38 °C) can lead to other transport component failures. Dry, hot summers will lead to road pavement deterioration/subsidence, affecting pavement performance and resilience (e.g. PIARC, 2012; DEFRA, 2012). A European study (EC, 2012b) used model predictions (Figure 7.11) to estimate the annual costs of upgrading asphalt binder for different climate temperature scenarios. The study suggested that, according to one scenario, the additional cost for EU-27 would be €38.5 – €135 million per year by 2040–2070 and €65 – €210 million per year by 2070–2100. Nevertheless, it must be noted that as road surfaces are normally replaced every 20 years, climate change effects could be considered at the time of replacement (SREX, 2012).

Inland waterways can also be affected by low water levels during heat waves. Recent research (the EU FP7-ECCONET Project[160]) assessed impacts of climate change on inland waterway transport, as well as potential adaptation**.** The project used the Rhine–Main–Danube (RMD) corridor as a case study, focusing on low water conditions. It found that over a period of 20 years, the average annual loss due to low water levels has been about €28 million, with the 2003 extreme low water conditions associated with a loss of €91 million (see also Jonkeren et al., 2007). Results based on projections from different climate models have shown no significant effects on low flow conditions for the RMD corridor until 2050, whereas the upper Danube might experience a moderate increase in such conditions. The study also estimated that dry years may lead to a 6–7 per cent increase in total transport costs compared to 'wet' years (see also EEA, 2012).

[159] Critical Rail track Temperatures (CRT) denote the critical temperatures above which speed limits apply; for example CRT70 and CRT30 denote the critical temperatures above which speed restrictions of 70 km/h and 30 km/h, respectively, should be applied.

[160] See www.tmleuven.be/project/ecconet/home.htm

Permafrost thaw (e.g. Streletskiy et al., 2012; Zhang et al., 2012) presents serious challenges for transportation (e.g. Qingbai et al., 2008), such as settling or frost heaves of roads that can affect their structure and capacity for carrying loads. In polar areas, many highways are already located on discontinuous, patchy permafrost, with substantial maintenance costs as well as use restrictions; for example, the number of days when travel is allowed has decreased from 200 to 100 days per year in certain Alaskan regions (United States of America) in the past 30 years (Karl et al., 2009).

Finally, it should not be forgotten that the transport industry is a demand-driven industry. Climate change can have significant effects in, almost all, sectors of economy, and thus affect indirectly transport services by e.g. changes in demand for commodities and tourism transportation (see UNECE, 2013).

7.4 Challenges and Best Practices

7.4.1 Environmental impacts of transport

Mitigation of the environmental impacts of transport constitutes a major challenge. Major steps should be taken in carbon emissions to reduce the carbon footprint of transport and, particularly, of road transport. These steps, however, might be significantly different in different regions. [161] Africa's total ecological footprint is expected to double by 2040 and require about US $ 675 billion by 2030 to achieve low-carbon sustainable growth, a cost that the current carbon market for mitigation cannot bear, as the Clean Development Mechanism, the Reducing Emissions from Deforestation and Forest Degradation programme and the voluntary offset programme have not been fully utilized. Reafforestation, saltwater agriculture along the coasts, and solar energy in the Sahara could be effective sources of sustainable growth. The Asia-Pacific region has half of the world's megacities — poor, densely populated urban areas, which are more vulnerable to climatic changes and extremes. The rapid application of innovative urban system changes will be vital for the sustainable development of the region.

About half of the carbon stored in tropical forests worldwide is found in Latin America. Deforestation rates are currently falling in Brazil (by 75 per cent since the last peak in 2004), but growing demand for hydropower and bio-fuels may further impact the tropical forests. Recycling in Brazil generates US$ 2 billion a year and reduces GHG emissions by 10 million tons, whereas Mexico's new Climate Change Law (2012) has set legally binding goals to reduce CO_2 emissions by 30 per cent in 2020, provided that it obtain the necessary international technological and financial assistance. [162] Without a successful green technology transition, the United States of America GHG emissions may increase by 6 per cent between 2005 and 2035. In addition to a federal investment of US $ 880 million to clean up the Florida Everglades, the Bank of America announced in 2012 a 10-year, $50-billion green investment programme. [163]

The EU is close to achieving its 2020 climate target to cut CO_2 emissions by 20 per cent below 1990 levels, but the Euro debt crisis might create a climate funding gap of US $45 billion by 2015. Due to allowance excesses and sluggish economies, the EU carbon price dropped to around € 3 per tonne in early 2013 (down from its peak of over € 30 per

[161] Further details are available at www.millennium-project.org/millennium/Global_Challenges/chall-01.html

[162] See for example www.nature.com/news/mexico-passes-climate-change-law-1.10496

[163] See http://about.bankofamerica.com/en-us/global-impact/environmental-sustainability.html#fbid=-87AqVQcCf7

tonne), undermining the role of the Emissions Trading Scheme [164] in encouraging industry in the EU to decarbonize. The EU is discussing a new gas emission reduction objective for 2030 to compensate for the delays in achieving Europe 2020 climate/energy objectives (GHG emissions 20 per cent lower than 1990: 20 per cent of energy from renewables; 20 per cent increase in energy efficiency). Finally, the Russian Federation aims to reduce GHG emissions by 22–25 per cent before 2020 compared with 1990 levels.

SolaRoad – A solar bicycle road in the province of Noord-Holland, the Netherlands

In the village of Krommenie, 25 km from Amsterdam, 2,000 cyclists use a SolaRoad path daily. The pavement harvests incident solar energy and converts it to electricity. Inaugurated in November 2014, the stretch of approximately 100 m is the world's first public road embedded solar cells. As a field operation test of SolaRoad, an evaluation of the performance will serve as a basis for further development with subsequent large-scale deployment on roads in the Netherlands and eventually worldwide. (More info at: www.solaroad.nl/en)

SolaRoad, the two-lane bicycle path consists of interconnected concrete elements of 3.5 m x 2.5 m. In one lane, solar cells are embedded beneath a translucent top layer. The protective top layer is one of the innovative features of SolaRoad; its efficiency is measured by the watts generated, repel dirt, offer sufficient road grip for safe use by cyclists and be, generally, strong. The solar electricity from the road feeds into the grid, and energises, for example, traffic lights, households, electric cars. Approximately 50-70 m2 of SolaRoad are estimated to provide sufficient electricity for one average Dutch household (3,500 kWh/year).

The Netherlands transport network [165] consists of 140,000 km of roads and over 30,000 km of bicycle roads. The total area of Dutch roads is greater than rooftops. Rooftops are frequently installed with solar panels. Road tops are to be the next step in contributing to the renewable energy of the EU. The integration of solar technology in roads would not claim further space, not impact the landscape and would make road use multi-functional. Thus SolaRoad is an option of great interest for application in densely populated regions, such as the Netherlands.

SolaRoad's developer is a public-private Dutch consortium consisting of TNO, an applied research organization in the province of Noord-Holland, Ooms Civiel, a road construction company and Imtech, a technical service provider. The consortium intends to build more solar roads over the next years and develop the technology for large-scale production and application. Research is advancing on the version for vehicle roads. The fraction of the Dutch road network that could economically and practically be equipped with SolaRoad technology is estimated at 10-20 per cent. This could, annually, produce the power for 2-3 million electric cars (the total number of motor vehicles in the Netherlands is currently 8 million).

A large step towards a more sustainable, low-carbon mobility system can be made by powering electric vehicles with the green electricity from the road. Moreover, the electricity is used where it is generated. This favours matching supply and demand of electricity when SolaRoad is applied on large scale, and reduces distribution losses. Thus, the possibilities of integrating SolaRoad with electric mobility and EV-charging systems are being investigated. The primary focus is on applications for electric buses. Explorations of potential system solutions and the associated total cost of ownership can be found in Bolech et al., (2013)

An obvious way to decrease the carbon footprint in transport is to increase the price of energy, thereby encouraging road users to adopt more energy-efficient driving behaviours or to consider other transport modes. In the UNECE region, most member States have introduced fuel taxes of more than 50 per cent of the total fuel price (UNECE, 2012). However, high fuel taxation can have important implications on mobility[166], if not complemented by measures promoting viable alternative transport options such as adequate public transport. It must be also noted that fuel taxation should be used as a financial instrument that gives the transport sector/road users incentives for energy efficiency and not as a means to balance public finances (Musso et al., 2013).

Taxation of new cars can promote the use of energy-efficient and low-emission vehicles. Austria, in the last decade for example, introduced a differentiated tax system on the purchase of new vehicles. The system taxes cars by CO_2 emission levels; as a result, the number of cars emitting less than 120gr/km tripled in this period. In Moscow, a transport tax is based on car engine power, however, trucks and buses are taxed by age to promote fleet renewal.

[164] http://ec.europa.eu/clima/policies/ets/index_en.htm

[165] and 6,237 km of inland waterways navigable for ships of 50 tons.

[166] Fuel taxation is considerably lower in Canada (32 per cent) and the United States of America (about 20 per cent) (UNECE, 2012). These countries are among those with the highest mobility levels.

Replacing cars with newer, more environmentally friendly versions can be promoted by bonus-penalty programmes, such that of Belgium, according to which car owners receive bonuses for replacing old cars with cars that produce CO_2 emissions lower than 146gr/km and penalties for replacement cars with higher emissions than their old car. A frequently used financial instrument in urban areas is congestion charges. For example, Stockholm has congestion charges for vehicles other than electric vehicles. In other countries, highway road tolls depend also on emission levels (UNECE, 2012).

Kapsch TrafficCom solution for Rome:
A Limited Traffic Zone, a pioneering project in City Access Management

Rome today, has nearly 4.2 km2 of access restrictions, thus making it the world's second largest traffic managed urban area after London. The aim is to protect an immense historical and archaeological heritage, protect the quality of citizens' lives, and promote the use of public transport to reduce environmental pollution.

The law on Limited Traffic Zones (LTZ) in Italy dates back to the 1970s. Rome's system for reducing the number of cars in the central historic area dates to 1989. Originally, LTZ was controlled by paper permits, physical gates and police-manned access points, however, this required a great deal of resources. But eventually Rome became a pioneer by implementing prototypes, creating procedures and testing technological processes. The access control system of Italy's capital, created by Kapsch TrafficCom, was the first, authorized by the relevant authorities, to operate in 1999 and began operating in 2000 (270 systems are in operation in Italy today).

A flexible and scalable solution

The entire LTZ system is operated by Roma Agenzia per la Mobilità s.r.l., a private company under the management of Roma Municipality. Residents and other drivers who want to access the city centre must register, and non-residents must pay an annual fee. The controls are carried out by an Automatic Number Plate Recognition (ANPR) process operated by the cameras placed on the gantries at LTZ access points, while enforcement is under police jurisdiction.

The "Centro Storico", Trastevere and "Tangenziale Est" areas use the system. The system can authorize (or not) a driver to enter the restricted area by plate recognition and by matching the collected data with a municipal registry of authorized vehicles. With this technology, it is possible to define access restrictions at different times of the day, (for example, 24-hours for the historic centre or night hours in the nightlife areas). The flexibility of the technology allows the urban mobility planners to easily apply control strategies, and quickly adapt the system to the changing needs of the city.

An example of how this technology can be successfully used to benefit the local public transportation company (ATAC) was the application of the city's access solutions to monitor bus lanes. In the past, unauthorized private vehicles in designated bus lanes generated traffic jams and caused delays of public transport. The access management system was extended to include 17 bus lanes and increases the public transportation speed by 20 per cent in the managed area.

Achievements

In the first year of application for LTZ — 2000 — the use of public transportation increased by 10 per cent. From 2000 to 2010, there was a progressive annual reduction of vehicles entering the historic town centre, and stabilized at 11 million vehicles per year not accessing LTZ due to the restrictions applied and to more effective controls. The reduced damage to the historic centre, its architecture and to the global protection of the city's heritage is almost impossible to measure.

The future of Rome

In 2014, the New General Plan (Nuovo Piano Generale del Traffico Urbano di Roma Capitale) to regulate urban traffic in Rome was approved by the City Council. With the implementation of future strategies for urban mobility control, it has been estimated that the environmental pollution will be reduced by an average of 14 per cent.

Non-financial instruments exist that also promote environmentally sustainable transport. These include (UNECE, 2012):

- rules for governments and public authorities that serve as good examples for road users (for example, in Sweden, government agencies can only buy environmentally friendly vehicles); eco-labelling of vehicles by emission levels; [167]
- promoting vehicle fuel efficiency by improving driver behaviour (by maintaining steady speeds, anticipating traffic, slow, smooth accelerations or maintaining correct tyre pressures) ; and
- national initiatives to promote eco-friendly transport, such as in Canada. [168]

[167] For more information, see Codagnone et al. (2013).

[168] For more information, see Codagnone et al. (2013).

In addition, regulations on the maximum emission levels of new vehicles have been introduced. For example, EU has defined emissions standards for new vehicles (mainly through several secondary legislation instruments, Directives).[169] Important regulations are also discussed and adopted by the Inland Transport Committee World Forum for Harmonization of Vehicle Regulations serviced by UNECE.

The World Forum for Harmonization of Vehicle Regulations – The World Forum (WP.29) Part of the Inland Transport Committee

WP.29 is the worldwide leading institution for standardisation of safety and environmental provisions for road vehicles. It administers three agreements: [170]

- 1958 Agreement concerning the Adoption of Uniform Technical Prescriptions for Wheeled Vehicles, Equipment and Parts which can be fitted and / or be used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these Prescriptions;
- 1997 Agreement Concerning the Adoption of Uniform Conditions for Periodical Technical Inspections (PTI) of Wheeled Vehicles and the Reciprocal Recognition of Such Inspections; and
- 1998 Agreement concerning the Establishing of Global Technical Regulations (GTR) for Wheeled Vehicles, Equipment and Parts which can be fitted and / or be used on Wheeled Vehicles.

Today, the Agreements cover 133 UN Regulations, 16 Global Technical Regulations and 2 Rules for PTI, thus providing a legal framework for the highest standards for road vehicles and their safety and environmental performance.

Fifty-three countries (including EU member States) are Contracting Parties to at least one of two United Nations Agreements on vehicle regulations (1958 and 1998 agreements). The countries applying WP.29 vehicle regulations cover five continents: almost all the European countries, Australia, Canada, China, India, Japan, Malaysia, New Zealand, Republic of Korea, South Africa, Thailand and the United States of America. They manufacture more than 80 per cent of the vehicles worldwide. Other countries and associations (e.g. Argentina, Brazil, Cambodia, Mexico, Philippines, Viet Nam, the Community of the Arab Gulf Countries, the Southern African Developing Community (SADC), the Association of South East Asian Nations (ASEAN)) are either in the process of acceding to the 1958 and 1998 agreements or have shown interest in accession. The World Forum and its subsidiary Working Parties have considered measures to reduce the GHG emissions in the transport sector and to improve the energy efficiency of the vehicle fleet.

[169] In EU, pollutant emissions from road vehicles are regulated separately for light-duty vehicles (cars and light vans) and for heavy-duty vehicles (trucks and buses). For light-duty vehicles, emission standard Euro 4 (Directive 98/70/EC) was replaced by Euro 5 in September 2009. The main effect has been to reduce emissions of particulate matter from diesel cars. Euro 6 is scheduled for 2014 and will further reduce emissions from diesel cars. For more information, see http://ec.europa.eu/environment/air/transport/road.htm

[170] See www.unece.org/trans/main/welcwp29.html

Focus on UNESCWA - Adopting standards and regulations

Significant achievements have been observed in the past two decades in the evolution of regulations addressing the sustainability of transport:

Emission control and fuel specifications

Environmental laws and regulations in the Arab countries usually include articles prohibiting the use of machines, engines or vehicles that produce emissions exceeding established limits. In many cases, however, the regulations are either not yet sufficiently developed or enforced and/or the standards are not adequately defined. Countries in the region have revised, updated or issued many regulations and standards and included one or several of the following emission control abatement regulations and standards.

(i) **Fuel specifications and emission performance standards:** In the Arab countries, several standards and regulations on fuel quality have been established during the last years, including

Bahrain, Qatar, Saudi Arabia, the Syrian Arab Republic, Sudan and the United Arab Emirates.

(ii) **Technological standards:** This category includes electric and fuel-cell vehicles, natural gas vehicle technologies, and vehicle pollution control technologies. Since the use of advanced transport technologies are limited in the Arab region, regulations and standards on these technologies are also limited. However, standards for Compressed Natural Gas (CNG) vehicle and CNG refilling station were established by the Egyptian Organization for Standardization and Quality Control and the CNG programme in 2002.

(iii) **Standards on transport practices:** In this category, the standards aim to moderate the growth of road traffic and the environmental impact of transport activities. They include: fuel pricing; clean fuels; removal of old or polluting cars from the vehicle fleet; import restrictions on high pollution or high fuel consumption cars; restrictions on vehicle use and ownership; road and traffic taxes; and regulations on driver training. Many such Arab countries as GCC countries, Egypt, Iraq, Jordan, Lebanon, Sudan, Syrian Arab Republic and Yemen achieved remarkable progress issuing standards and regulations on transport practices, but these standards and regulations need revision, updating and activation.

a. Improving vehicle maintenance and implementing inspection programmes

In many Arab countries, vehicle efficiency is low and fuel consumption is high. Regular maintenance and inspections can improve fuel consumption and reduce exhaust emissions, optimize fuel efficiency, extend the life of vehicles, increase vehicle resale value and reduce running costs. More than 70 per cent of the light-duty vehicle fleet in a developing country is regularly maintained or diagnostically tested. The average age is about 15 years. In certain cases, the most technically advanced testing and repair programmes can reduce air pollution by as much as 30 per cent.

b. Replacing old vehicles with new ones

Wear and tear makes vehicles more polluting and less roadworthy over time. Older vehicles are more likely to break down on the road, causing congestion and posing a danger to other road users. In Arab countries, replacement of old vehicles would impose a heavy economic burden, making implementation very difficult. Therefore, it is recommended that Governments take appropriate measures, especially incentives, to encourage car owners to replace old vehicles with new ones. Since Arab countries import most of their vehicles, it will be necessary to modify their importing specifications in order to introduce vehicles of better quality and with low emission engines to replace older ones. However, this would have a major economic cost and need long-term plans.

c. Vehicle emissions testing and tuning

Many Arab countries (e.g. Egypt, Jordan, Kuwait, Lebanon, Saudi Arabia and the Syrian Arab Republic) have regular Vehicle Emission Testing programmes. It is estimated that the average emission reduction due to emissions tuning would be 62 per cent for CO and 35 per cent for HC, while fuel saving would be about 15 per cent.

d. Noise pollution

In the Arab region, noise from traffic is not yet considered a major environmental problem that should be strictly measured. Furthermore, there are no fully satisfactory means to measure noise and the nuisance it causes. However, with the increasing dependence on road transportation and the subsequent rise in the number of operating vehicles, noise pollution will definitely require more attention and regulatory steps. Some Arab countries such as Egypt and Lebanon have certain regulations related to noise intensity limitation.

Finally, there have been initiatives on a more environmentally friendly transport of refrigerated foods (UNECE, 2012) as well as on establishing freight transport corridors for vehicles using compressed natural gas instead of diesel because of the economic and environmental advantages (the Blue Corridor Project). [171]

[171] See www.bluecorridor.org/

A global project 'For Future Inland Transport Systems (ForFITS)'

This UNDA project led by UNECE, involves all five United Nations regional commissions. The project aims to develop a decision-making support tool for mitigating climate change impacts by calculating a country's inland transport emissions of CO_2. Sustainable transport can be assessed in ForFITS by creating simulations of policy choices and allowing policy makers to easily visualize and compare their impacts on CO_2 emissions.. [172]

Five capacity-building workshops — one in each of the regional commissions — were held in 2013 to raise awareness and disseminate technical information on using the tool. At each workshops, at least one regional pilot case study was developed for selected countries of the region.

In 2014, following the completion of the development of the tool, the project continued to grow. Analytical activities in 2014 included its use as a policy tool for countries and cities, namely the tool was used to assess CO_2 emissions in Kaunas city and also for the country of Lithuania. It was also used as part of the Enviromental Performance Reviews of Georgia and Belarus.

7.4.2 Environmental impacts on transport

Although climate change impacts on human activities have been considered by both Governments and international organizations for some time now, relatively little consideration has been given to the assessment of climate change impacts on transport infrastructure and operations or on potential adaptation measures. Recent work undertaken by Governments, international organizations and the transport industry has shown that climate change–induced weather conditions may have significant implications for transport (UNECE, 2013) and, thus, for the sustainability of the global and regional economy and livelihood.

There is no globalization without efficient transport networks and services. Efficiency can be better achieved by an optimal combination of different transport modes in the transport chains, that would promote technical innovation and a shift towards the most sustainable, energy efficient and least polluting modes of transport.[173] At the same time, sustainable transport strategies should consider the significant impacts that climate change and variation have on transport infrastructures and services, and plan for effective adaptation measures.

Adaptation measures aim to reduce vulnerabilities and increase the resilience [174] of transport systems to climatic impacts. It must be noted that adaptation to climate change involves risk management and, perhaps, also opportunities for innovative transport infrastructure systems and services. Most of the present transport infrastructure had been developed in national policy regimes. There are several factors that determine national and regional adaptation options, including, among others, risk assessments and short, mid- and long-term financial implications. To identify priorities for climate change adaptation, facilities must be first classified in terms of their criticality within the transport network and according to the difficulties and costs of making them climate resilient (e.g. USDOT, 2012). At the same time, adaptation options will rely on financing, the availability of which may prove to be an important determinant of the adaptation policy approaches.

[172] See www.unece.org/trans/theme_forfits.html

[173] Emissions for freight by transport mode (in kg CO^2 by ton per km): road transport (> 35 t lorries) 0.051-0.091; diesel trains 0.017-0.069, electric trains 0.019-0.040; bulk carriers 0.0025-0.008, container ships (< 8000 TEU) 0.013-0.020; Ro-Ro vessels, 0.050-0.060; air long haul transport (> 1600 km) 0.57-0.63 (see also www.airportwatch.org.uk/?page_id=3262). Emissions for passengers by mode (in kg CO^2 by passenger per km): Passenger cars 0.124, two wheel vehicles 0.083, city buses 0.067, coaches 0.034; rail transport 0.045; maritime transport 0.043; air transport 0.130 (http://knowledge.allianz.com/mobility/ transportation_safety/?813/which-transport-methods-produce-most-emissions).

[174] Resilience refers to the ability of a system to withstand negative environmental impacts without losing its basic functions. In the transport context, resilience does not only concern the physical robustness and durability of infrastructure, but also the ability of the transport system to recover from an incident quickly and at minimal cost.

A prerequisite for the development and formulation of effective climate change adaptation strategies should be a clear understanding and systematic mapping of the transport sector vulnerabilities to climate change. These are determined by three main factors: the nature and the extent of climate change, the sensitivity of the transport system and the required capacity to adapt to changes. It appears that concrete steps should be made by Governments, in collaboration with the owners and operators of transport infrastructure and international organizations to: (i) establish inventories of critical and sensitive nodes of the transport infrastructure and supply chains; (ii) incorporate climate change effects into the long-term capital improvement plans, facility designs and engineering practices, operations and emergency response plans; (iii) promote necessary institutional and regulatory adaptation; (iv) incorporate climate change adaptation measures into integrated natural hazard management frameworks; and (v) create national and international databases on disruption hotspots and incidents, management and maintenance plans and asset management practices. These databases could eventually form the core of an efficient natural hazard management system for the transport sector.

Practices in transport adaptation measures obviously depend on the transport mode. Roads and railways face major threats from prolonged rainfall and downpours, floods, heat waves, droughts, snow and frost, extreme winds and fogs and, in the coastal areas, from storm surges. Underground railways in coastal areas may be also vulnerable to storm surge and/or river flooding. Finally, inland waterway transport can be affected by both river floods and droughts. Different approaches should be taken which should also take into consideration national and/or regional particularities and regulatory frameworks as well as financial constraints.[175]

[175] The UNECE report 'Climate Change Impacts and Adaptation for International Transport Networks' lists best practices in adaptation measures that will promote transport sustainability. United Nations Economic Commission for Europe, ECE/TRANS/238, (www.unece.org/fileadmin/DAM/trans/main/wp5/publications/climate_change_2014.pdf) .

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8. Intermodal Transport and Modal Shift

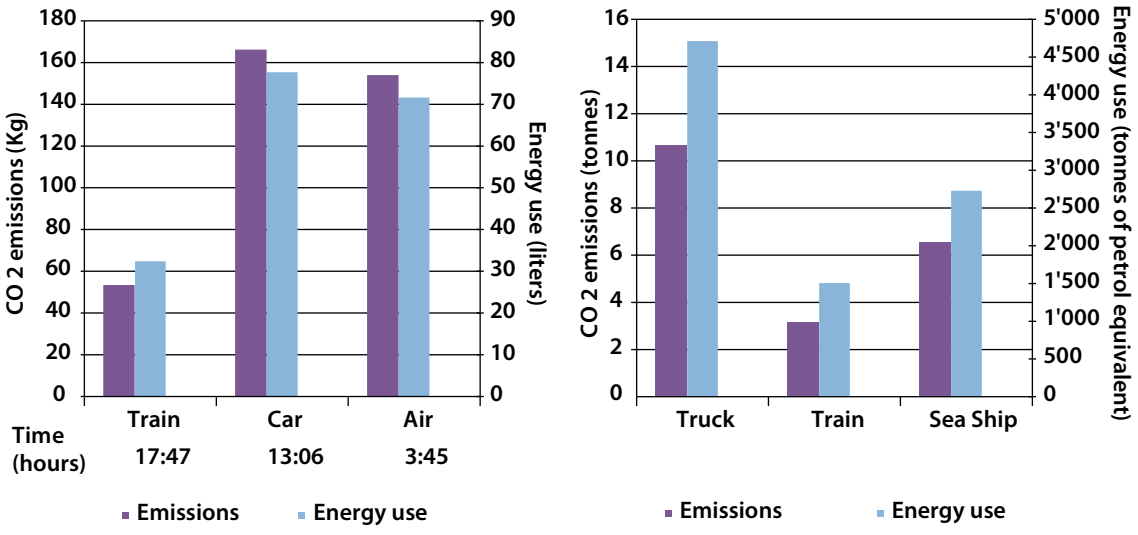
Economic, social and environmental sustainability can only be achieved with an integrated transport system. When water, road and rail transport work together, the comparative advantage of each mode can be exploited optimally. For example, containerization, which allows for multi-modal transportation of goods, has enabled stakeholders to benefit from the advantages of different modes of transport. Integration of transport systems is a complex task with many dimensions.

The optimal modal split of freight and passenger transport depends on a country's geographic, demographic, economic and historic conditions. Cooperation across transport modes, regions and borders as well as between public and private operators is needed. Creating an efficient integrated transport network requires international cooperation for which the United Nations regional commissions can provide a framework.

8.1 Trends in Freight and Passenger Transport

Each transport mode has comparative advantages. It is important to note that there is no optimal modal split for all requirements. Different modes can have economic, environmental and/or operational advantages in different situations. For example, rail transport has environmental advantages over road transport for both passengers and freight (Figure 8.1), though other considerations can determine transport mode choice, such as costs, speeds, convenience and operational advantages. Road transport, though less environmentally friendly, can provide increased accessibility for individuals and freight and be more economical for low volume freights and more flexible.

Figure 8.1 Energy use and CO_2 emissions across the transport alternatives for the Berlin-Rome route (for passenger (www.ecopassenger.org) and freight (www.ecotransit.org) transport)



Source: *UNECE, 2012*
Note: *Calculations include transport to and from airports, as well as intermodal transfers for train and maritime transport.*

8.1.1 Freight transport

Each of the different modes provides freight transportation options that have both advantages and disadvantages in terms of speed, reliability, accessibility, affordability, safety and security. In addition, capacity, cost, and service differences, combined with economic competition, compel each mode to target particular market niches. Consequently, road and air transport are generally used for high-value and low volume/weight freight that is also more time-sensitive, whereas the rail and inland waterway modes usually move lower-value, higher volume/weight and less time-sensitive freights.

The UNECE region[176]

UNECE governments have been spearheading the development of inter-modal freight transport. The first successful intermodal projects in the UNECE countries were brought around by protectionist transport policies, when some governments decided to limit international road freight transit in their territories. E.g. the "Rollende Landstrasse" projects in Central Europe, as well as the ro-ro ships on the Danube mark this era. At the same time, multi-modal hubs and logistics centres – often referred to as "freight villages", "Güterverkehrzentrum", "interporto" etc. – emerged to cluster transport, warehousing, goods distribution and other logistics services. Progressively, the evolving service culture particularly in freight forwarding to support local and global supply chains, as well as the liberalization of transport services and access to international transport markets have been paving the way for modern intermodal transport.

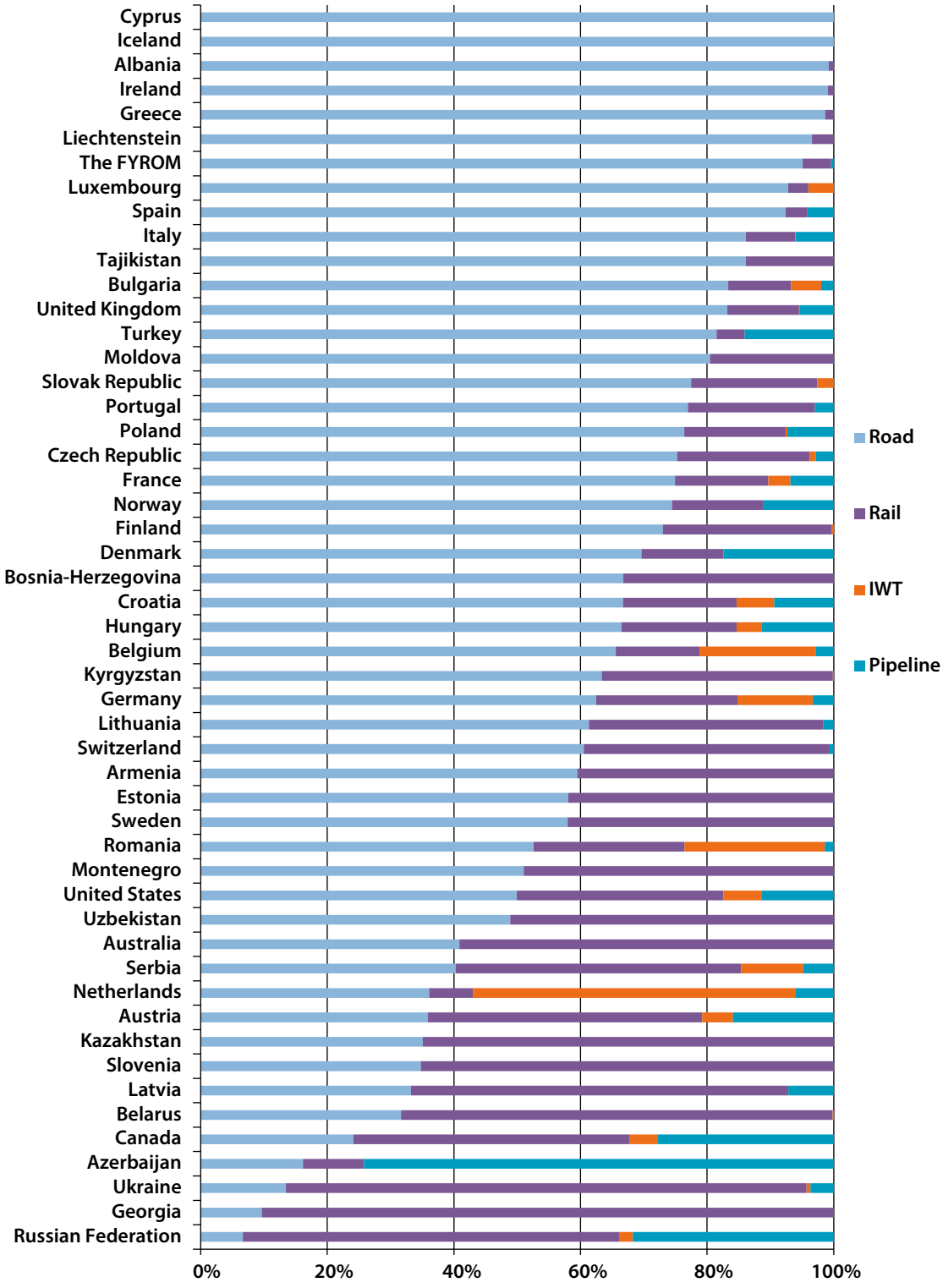
To move however from a modal based to a mode-independent framework, where smooth and efficient inter-faces facilitate seamless transport, requires more than a coherent network of modes and inter-connections, technical interoperability between and also within modes at an international scale, harmonized norms and standards for vehicles etc. Information and data exchange, transparent and one-stop-shop administrative procedures, as well as inter-connected liability regimes are also warranted.

It is a broadly shared view that sustainable freight transport cannot be the continuation of "business as usual" whereas modal split trends over the past decades have been largely favoring road transport, with significant market share loss by railways.

Figure 8.2 below shows the modal split of freight transport in 45 UNECE member States. In most countries, inland freight transport appears to be dominated by road transport, whereas in Canada, the Russian Federation and the United States of America, rail takes a more prominent role in transporting goods. The large distances to be covered in these countries as well as the need to move large freights of high volume/low value commodities may explain these trends. It should be also noted that for some countries (e.g. the Netherlands, Romania and Belgium) the share of inland waterway transport can be significant.

[176] http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=tran_hv_frmod&lang=en

Figure 8.2 Modal split of inland freight transport in the UNECE region (in 2011 or latest available)

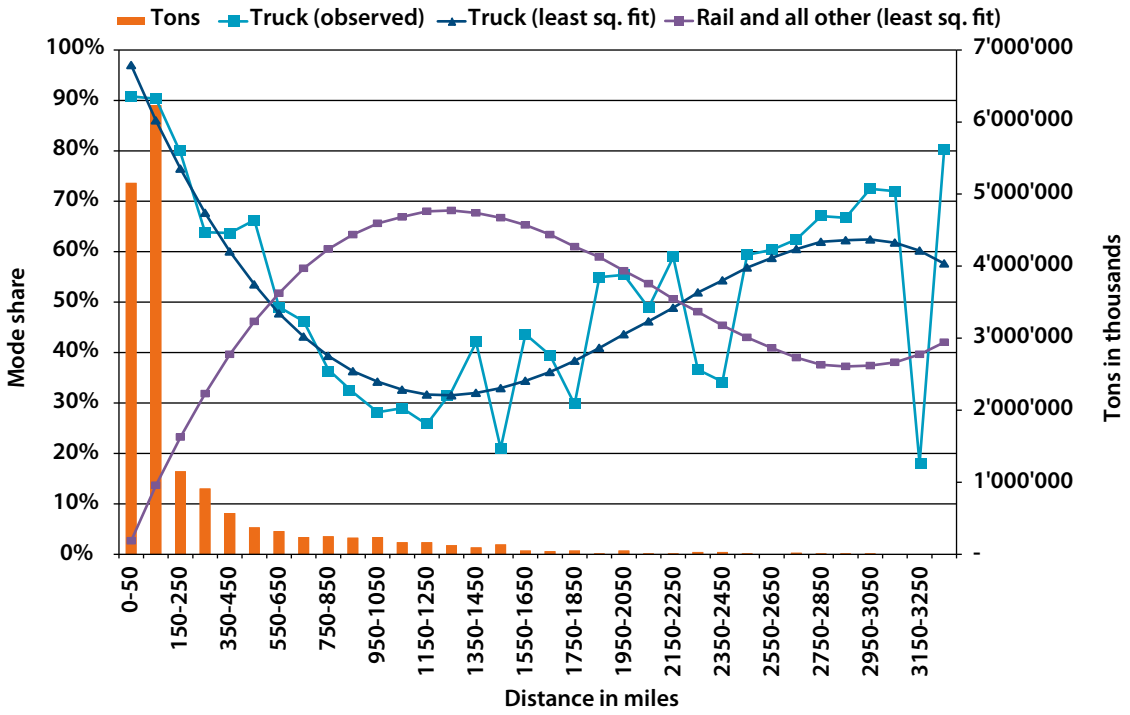


Source: *UNECE[177]/OECD[178]*
Note: *Percentages are estimated on the basis of the total freight transport in million tonne-km*

[177] http://w3.unece.org/pxweb/?lang=1
[178] http://stats.oecd.org/Index.aspx?DataSetCode=ITF_GOODS_TRANSPORT#

In 2012 (estimate figures), 19.65 billion tons of goods were moved in the United States of America, generating near 6 trillion ton-miles of transport, with a value approaching $ 17.4 trillion (FHWA, 2013). Road transport (trucks) accounted for about 67 per cent of all freight tonnage, 45 per cent of all ton-miles and 64 per cent of freight value. In comparison, rail transport accounted for only 10 per cent of tonnage moved, but about 29 per cent of ton-miles, and 3.1 per cent of total value; this reflects the cost-effectiveness of rail in transporting heavier commodities (e.g. coal and grain), but of lower-value, over long distances.

Figure 8.3 Freight modal share and freight transport weight by distance in the United States of America in 2007



Source: Brogan et al., 2013
Note: Lines represent the least squares fits

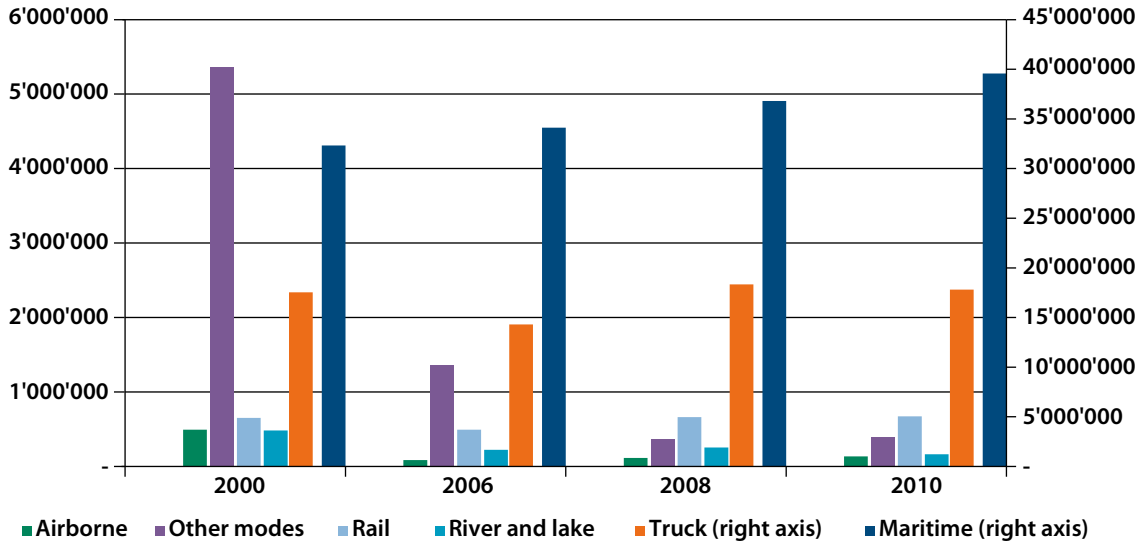
In terms of distance, in 2007 road transport dominated the market for shipments under 550 miles, which account for almost 80 per cent of all domestic freight tonnage. Figure 8.3 compares modal shares in tons by shipment distance for road and rail and other inland transport modes (2007 data). The amount of tonnage that is moved for distances of 500-1,500 miles is much less than the amount being moved under 500 miles. Thus, although there is potential to shift some long distance freight from road to rail or water, the small volumes of freight to be transported over 500 miles limits this potential (Brogan et al, 2013).

The UNECLAC region

The value of intraregional trade in South American countries in 2010 represented nearly a quarter of the total trade (UNECLAC, 2013). Not all countries collect and publish statistics on the modal split in the transport of goods. Intraregional trade in South America is almost exclusively dependent on maritime and road transport modes. This trend was stable during the period 2000-2010. Road transport was the dominant inland transport mode in terms of both freight volume and value of import and export operations, amounting respectively to 34.64 per cent and 41.75 per cent of total trade in 2010 (UNECLAC International Transport Database). Rail and inland waterway transport

represent only a fraction of intraregional trade during the same year, namely 1.3 per cent and 1 per cent of volume and 0.7 per cent and 0.4 per cent of value respectively. The total volumes split by transport mode are set out in the figure below.

Figure 8.4 Transport modal split in South American countries (volume in tons)

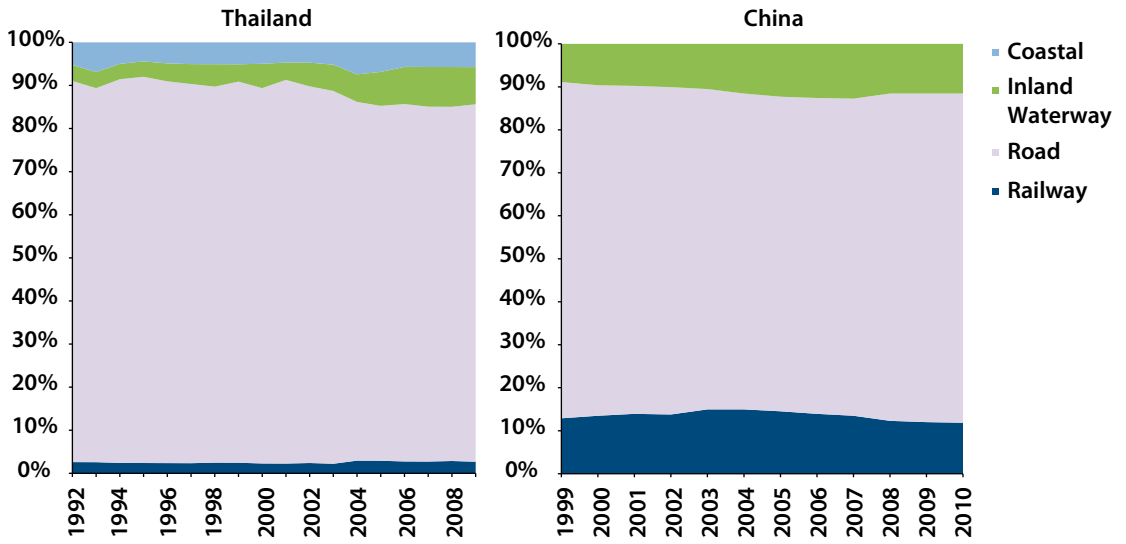


Source: UNECLAC International Transport Database

The UNESCAP region

One of the key policy challenges for sustainable transport development in the UNESCAP region is to increase the modal share of "greener" modes of transport such as railways and waterways by increasing the use of multimodal transport in integrated transport networks. Figure 8.5 illustrates the freight modal split of China and Thailand. The figure also shows that road transport has a major share of total tons of freight carried with a slight growth of freight carried by inland waterways in the two countries.

Figure 8.5 Modal share of freight transport volume in China and Thailand



Source: UNESCAP, 2011

Total freight transport was 11,030 billion tonne-km in 2009 in China, including maritime transport. Highways accounted for 30 per cent, railway for 21 per cent and water transport for 47 per cent. In India, total freight was 1,410 billion tonne-kilometres in fiscal year 2007, of which road accounted for 50 per cent, railway 36 per cent and water transport 6 per cent (UNESCAP, 2011).

The UNESCWA region

It is estimated that around 85 per cent of trade in the countries of the Arab region is transported by inland transport. Geographic proximity and underdevelopment of the other modes of transport such as maritime and rail make it the preferred means for trade in the region. Five per cent of the total weight transported in the Arab region was by rail in the 1990s, 2.4 percent in 2005 (UNESCWA, 2009).

8.1.2 Passenger transport

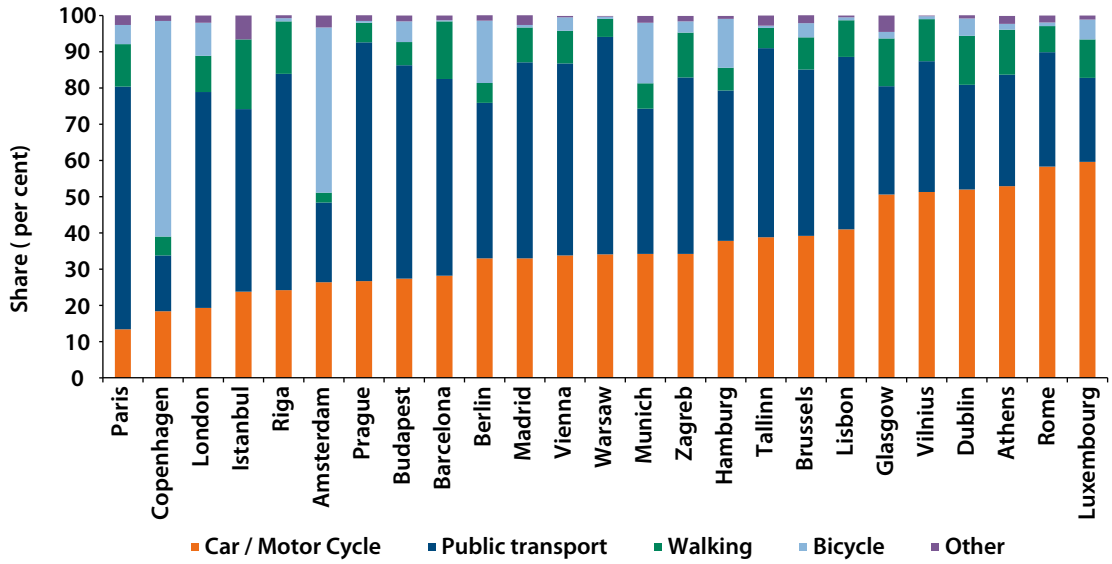
Private motorisation (cars) generally dominates inland passenger transport. In the UNECE region, modal shares of private cars, buses/coaches and railways have been, more or less, stable in the period 1999–2008.. In most European countries, bus/coach transport constitutes less than 15 per cent of the total passenger transport, whereas in Canada and the United States of America bus/coach transport is less, as private motorization is preferred; in the United States of America more than 90 per cent of all inland passenger transport is by private car (UNECE, 2012).

In the EU, the private car share of passenger transport was about 83.3 per cent in 2008, slightly higher than its share in 2000 (83.1 per cent); there has been no indication of a shift towards more environmentally friendly modes. [179] In the same period, GDP grew at about 2.0 per cent per year, exceeding the growth of passenger transport volumes (1.1 per cent), possibly indicating a 'decoupling' effect. However, this could have also been a result of the economic crisis (as in the freight transport) rather than a sustained trend.

In urban areas, public transport (usually by buses and/or electrified rail) is much more significant. As seen in Chapters 3 and 4, accessible and affordable mass public transport is important for the management of traffic congestion and for the environment, particularly in the growing cities in emerging economies (Wang and Yuan, 2013; Chee and Fernandez, 2013), and also for the economic and social inclusion of the low-income households, the elderly and people with special needs (e.g. Lucas, 2010). Nevertheless, although overall passenger transport has been increasing over the past few decades, the mass public transport share has been declining. For example, in Latvia public transport usage has declined by about 60 per cent since the early 1990s and in the Russian Federation by 50 per cent (UNECE, 2012).

[179] See http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Sustainable_development_-_transport

Figure 8.6 Modal split for transport to work/training in selected European cities in 2009



Source: UNECE, 2012

Despite this decline, traffic congestion as well as particular policies aiming at constraining private motorization in urban areas have resulted in the uptake of alternative modes of transport in many European cities (Figure 8.6). These results show the modal split in selected European cities and indicate that urban public transport shares depend on many factors, with the most dominant being the availability of effective transport systems as well as targeted policies (e.g. congestions charges); this may explain why 67 per cent of all passengers in Paris use public transport whereas, in Luxembourg, the figure is only about 20 per cent. Copenhagen leads by far when it comes to the use of alternative transport modes, with about 60 per cent of transport by bicycle.

In the cities of Latin America, public transport is still the predominant mode of urban transport. In the main fifteen cities of the region, in 2007, public transportation was used – on average – by 43 per cent of the daily users, 26 per cent used private transport (American Development Bank, 2010). [180] More recent data, compiled by UNECLAC based on the national statistics, confirms the continuing predominance of public transportation.

Table 8.1 Modal split in the transport of passengers, selected Latin American cities, per cent, 2010

	Bogotá	Buenos Aires	La Paz	Lima	Montevideo	Quito	Santiago
Collective motorized transport	57	40	75	53	54	51	36
Individual motorized transport	25	51	15	21	19	29	27
Walking and cycling	18	9	10	26	27	20	37

Source: Survey FTSUNCRD / BID 2011 and CELADE/ECLAC (www.uncrdlac.org/fts/)

Nevertheless, in most cases the quality of public transportation together with ever increasing motorization in the Latin American cities suggests that this prima facie sustainable modal split in passenger transport may not be maintained in the long term. Moreover, the high externalities generated by the existing public transport systems in the region, particularly in terms of their environmental impact, means that even with the predominant

[180] "Observatorio de movilidad urbana para América Latina", CAF, Caracas, Venezuela, http://omu.caf.com/

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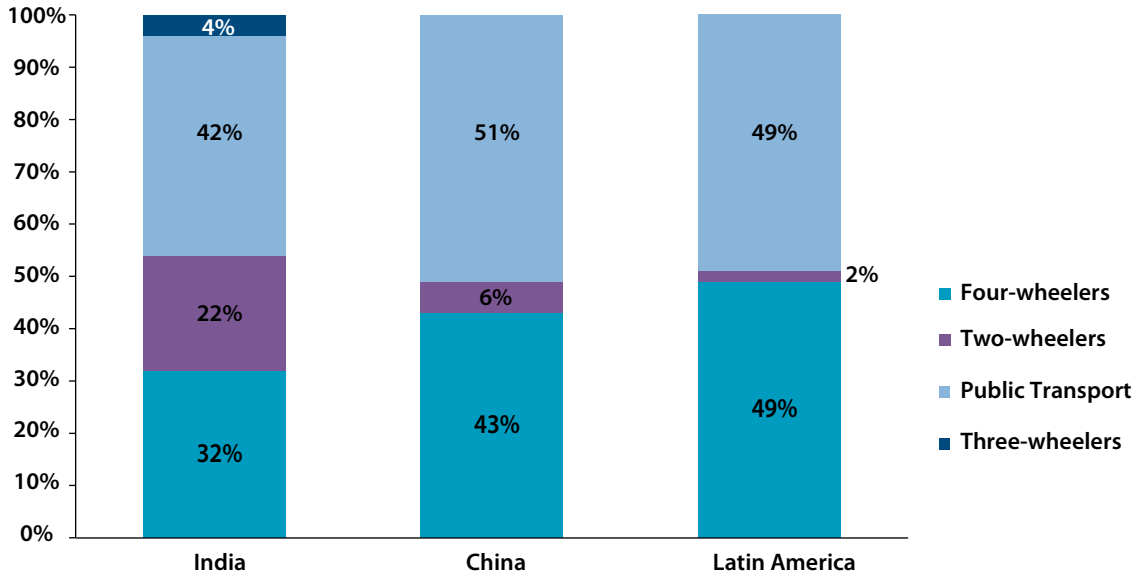
use of public transport, the sustainability of the urban transport in the region has not been achieved.

The average modal split in urban agglomerations varies across countries and regions due to factors such as development of road infrastructure, GDP per capita, availability of accessibility to public transport as well as existing transport policies in cities. In its recent study, ITF estimated modal shares in urban transport in Latin American, Chinese and Indian cities (Figure 8.7). Currently public transport accounts for between 32 and 49 per cent of passenger transport.

Figure 8.7 Transport modal split in cities of Latin America, China and India (2010)



Source: ITF, 2014

On the basis of the 2010 baseline passenger-kilometre modal split data, projections were developed for 2050 based on an estimated development in urban infrastructure, GDP growth and public policies. Private four-wheeler motorization levels are forecasted to reach 40-67 per cent in India, 55-78 per cent in China and up to 88 per cent in Latin America, while public transportation shares in passenger-kilometres are projected to be between 11 per cent and 39 per cent, 9 per cent and 34 per cent and 11 per cent and 50 per cent in 2050.

8.1.3 Modal shifts and intermodal transport

Shifts of freight traffic, wherever possible, from roads to railways and inland waterways would be beneficial by freeing up road capacity, decreasing congestion and alleviating the carbon footprint for inland transport. However, road transport is indispensable for most transport operations to ensure door-to-door transport, particularly for consumer products. It should be always kept in mind that different transport modes offer different services, this constrains opportunities for shifting freight from one mode to another.

Certain policies (i.e. fuel taxes, investments that reduce modal travel times and costs associated with more stringent environmental regulations) can affect the pricing of the different transport modes. Nevertheless, recent elasticity studies (Brogan et al., 2013) have indicated a high level of uncertainty in the modal shifting potential in response to price, suggesting that the effectiveness of modal shifting policies will vary by goods and by market. It appears that although opportunities for transport modal shifts may exist, not

all freight can be moved effectively by all modes. Nevertheless, the best opportunities for modal shifts in freight transport can be between road (trucks) and rail intermodal services (Figure 8.8), and in particular when it relates to long journeys of standard freight units. An example is the transport of containers where part of the journey can be by rail and another by road, thereby maximising the comparative advantage of the two transport modes.

Figure 8.8 Freight modal shift potential

From \ To	Truck	Rail Carload	Rail Intermodal	Air	Water
Truck	-	◑	●	○	◑
Rail Carload	◑	-	○	○	◑
Rail Intermodal	●	○	-	○	◑
Air	○	○	○	-	○
Water	◑	◑	◑	○	-

key: Limited Potential ○ → ◑ → ● Strong potential

Source: Brogan et al., 2013

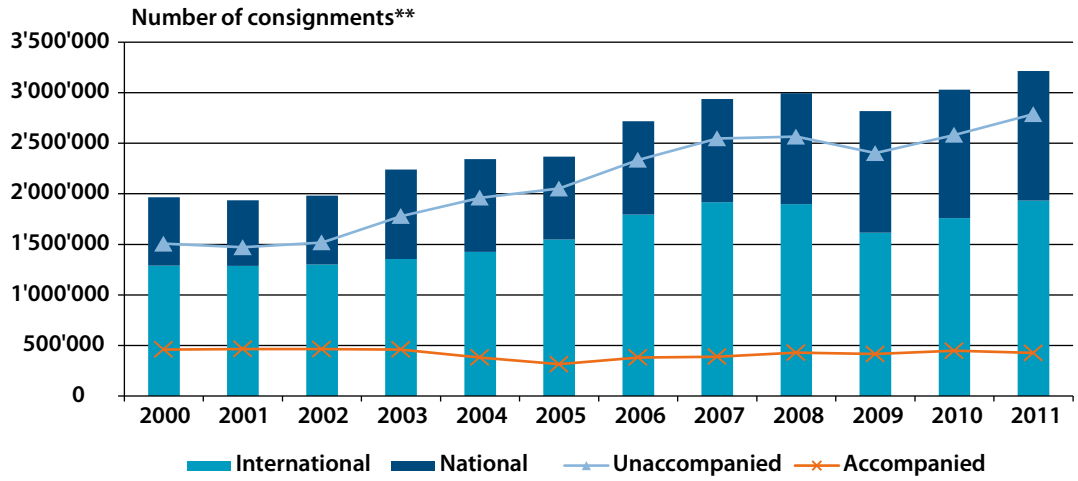
Another factor limiting the potential for large-scale shifts among freight modes is the demand growth in different types of freights. In the United States of America, projections for 2040 show growth in overall freight movements (66 per cent by weight and 145 per cent by value between 2009 and 2040), but declining market shares for non-road (truck) modes (FHWA, 2012).

Road transport share has been projected to increase by weight but to decline by value, and rail and inland waterway transport shares to decline by both weight and value; in comparison, air transport share is projected to increase marginally by weight but quite considerably (8–16 per cent) by value. These changes in modal share may be due to (i) qualitative changes in freight i.e. a movement from low value/large weight freight to high value/lighter weight freight, and (ii) shifts in the economy of the United States of America which may reduce the haul distance of many shipments. It should be noted, that such modal shifts may have significant implications for (fossil) fuel use and GHG emissions, as well as for traffic congestion.

Rail and inland waterway transport often entails trans-shipment operations using containers and other intermodal transport units that can be shifted swiftly and safely from one mode to the other. Nevertheless, integration of transport systems is a complex exercise at many levels; cooperation across transport modes, regions and borders as well as transfers between public and private operators is required.

The objective of improving modal split is an integration of the transport system so that each mode is used in an optimal manner and to benefit from economies of scale and comparative advantages. The optimal modal split of freight and passenger transport depends also on a country's geographic, demographic, economic and historic conditions.

Figure 8.9 Development of intermodal road/rail transport in Europe, 2000-2011



Source: UIRR
** International Union of Combined Road/Rail Transport Companies;*
*** One consignment is equivalent to two (2) twenty-foot units (TEU)*

The development in intermodal road/rail transport in Europe is illustrated in Figure 8.9. It shows that 2009 was the first year since 2001 when the total amount of combined transport declined compared to the previous year. Total combined transport was reduced by 17 per cent in 2009 to 5 million TEU, compared to 6 million in 2008 as a result of the 2008-2009 financial crises. International combined transport declined slightly less (16 per cent) than national combined transport (18 per cent). The major part of the decline was associated with unaccompanied transport, which experienced a reduction of 19 per cent. Accompanied combined transport was reduced by only 3 per cent in 2009 compared to 2008. The average annual growth in combined transport from 2000 to 2011 was 5 per cent, with a drop of about 6 per cent in 2009. Combined transport grew rapidly from 2002 to 2007 at an average annual growth rate of 11 per cent.

Major modal shifts are unlikely without substantial changes in costs/pricing or strong regulatory measures. Road-to-rail modal shifts have the greatest overall potential for energy reduction, as trucks are the dominant mode in terms of freight tonnage and value and rail can serve many of the same routes, using substantially less energy taking advantage of economies of scale.

8.2 Challenges and Best Practices

8.2.1 Freight transport

The present modal share in freight transport has developed in accordance with technological improvements, economic and demographic conditions, and the regulatory framework. Future modal shift will be dependent on changes in the underlying drivers of modal choice, such as logistical constraints, time sensitivity of shipments, increasing congestion on the roads and the quality of flows. It is expected that the energy efficiency of transportation could be improved, especially in urban areas, but shifting the transport of longer haul freight from one mode to another has a relatively small potential to reduce energy use.

Freight transportation markets match service needs to modal characteristics. Road, rail, water and air transport offer different advantages/disadvantages in speed, reliability, accessibility, affordability, security, and safety. These differences mean that, while modes

do compete, they are also complementary, since each mode targets the commodities and markets that it serves most effectively. Higher-value, lower-weight, and more time-sensitive freight generally uses road (and air) modes, whereas low value, large weight and less time-sensitive freight uses rail and inland waterway transport. Service differentiation limits the potential of modal shifting, as different modes are not perfect substitutes for one another. Road to rail modal shift appears to have the greatest overall potential for energy reduction, because trucks are the dominant mode in terms of freight tonnage and freight commodity value, while rail serves many of the same routes and uses substantially less energy (both when the locomotive that is hauling the cargo is diesel powered and electric powered).

It appears that major modal shifts are unlikely without substantial changes in costs/pricing, strong regulatory measures and, in some cases, changes in the governance structure. Policy measures that may affect transport mode choices include economic instruments (e.g. fuel taxes, congestion and/or emission charges), labour and safety regulations and investments in infrastructure and service improvement.

Until recently, public sector investment in the rail industry was rather small, with much of its focus on upgrading. It may require a radical increase in rail investment to reduce prices and improve services, allowing rail to increase its market share. For example, a study of a US $12 billion investment programme for a Norfolk rail corridor in Virginia (United States of America) determined that the project could transfer to rail about 17 per cent of road freight hauls longer than 500 miles and 6 per cent of all road freight hauls (Brogan et al., 2013).

There have been many national initiatives to increase freight transport intermodality. For example, Austria has committed public funding for intermodal terminals and infrastructure. It has also introduced subsidies for transport across the Alps and possible reimbursements of vehicle taxes for road vehicles used in intermodal transport. In addition, the Austrian ban on the use of heavy road vehicles on Saturday evenings and Sundays is lifted if vehicles are part of an intermodal transport chain. There are similar strategies for the promotion of intermodal transportation also in other countries (e.g. Croatia[181] and Switzerland).

The Inland Transport Committee serviced by UNECE compiles and regularly updates data on national policies and initiatives in its member States[182] that favour intermodal freight transport. The database highlights that many countries have some form of assistance on their territory to facilitate the use of intermodal transport. The assistance can be in the form of facilitating the investment in intermodal facilities, providing subsidies to intermodal operations or relaxing regulations, as in the Austrian example above. Given the significant sunk costs of intermodal infrastructure, funding is also provided by the European Union in its efforts to pursue Directives and policies aimed at facilitating modal shift and the use of intermodal transport.

One of the investment projects that is receiving funding also to help develop intermodal transport is the Seine-Nord Europe Canal project implemented by "Voies Navigables de France", which will remedy one of the major missing links within European inland waterways. It will connect the Seine basin, with its high-traffic capacity, and the rest of the European network of inland waterways of international importance. The canal will connect seven major ports in the north of Europe (Havre, Rouen, Dunkirk, Ghent, Zeebrugge, Antwerp and Rotterdam) and raise their competitiveness in the context of increasing maritime traffic.

[181] Information provided by Croatia in the questionnaire on Transport for Sustainable Development, December 2010.

[182] See: http://apps.unece.org/NatPolWP24/

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The project will comprise four multimodal platforms with loading/unloading, storage and transhipment capacities to enable the integration of rail and water traffic in the global logistics chain (UNECE, 2012).

8.1.2 Passenger transport

EuroTest [183] has evaluated the quality of mass public transport in 23 European cities (see also UNECE, 2012). Twelve cities (among them Paris, Brussels, Amsterdam, London and Oslo) were assessed to have acceptable levels of public transport for travel time, efficiency of the transfer between transport modes, information and ticketing. However, almost half of all examined cities performed modestly or poorly, with user information being an issue in most cities.

The 'Transport Policy for the Czech Republic 2005-2013' [184] includes specific targets for both freight and passenger transport. [185] An integrated passenger transport system will service at least 50 per cent of all municipalities by 2013. The share of private and public passenger transport should be maintained and the use of rail for passenger transport in urban areas should be increased. Sweden aims to double public transport by 2020 compared to 2006. Austria introduced a national cycling strategy in 2006 ('Masterplan Radfahren') that aims to double the share of cycling from 5 to 10 per cent. The plan involves investment in cycling infrastructure; free cycling consultations; bike2business awards for cycling friendly companies, cyclist competitions, and introduction of cycling coordination in national agencies. In Belgium, firms with more than 100 employees are obliged to survey employees on their travel to work pattern every 3 years and consider measures to improve sustainable transport. This allows the identification of solutions to environmentally unsustainable travel habits. In Moscow, the START traffic management system was introduced to increase the capacity of the city's roads. A computer collects data from traffic detectors and optimizes traffic lights for the entire network. The system includes video cameras and dynamic traffic signs as a means to communicate with drivers. The estimated impact of the system is an increase in road capacity of about 10–12 per cent (UNECE, 2012).

Modal shifts can be driven by environmental policies and regulations. [186] For, example, Freiburg has been known as Germany's ecological capital since the 1970s. The old town centre became car free in 1973 and public transport is paid by a low monthly fee. About one-third of the population use the 1970 cycling plan and do not own cars; currently 500 km of cycling paths cover the city. The plan aims at giving communities incentives and tools for sustainable energy policies. [187] Other examples of good practices in modal shifts in urban transport include Strasbourg (France), the Jubilee Line extension in London (UK), the Metro tram in Volgograd (Russian Federation) and the The Marmaray project in Istanbul (Turkey) (for more details see UNECE, 2012). In Canada, over 60 examples of best practices have been implemented in Canadian communities to promote sustainable development in urban transport[188]; a database provides a description of best practice projects, costs and policy contexts.

[183] See: www.eurotestmobility.com

[184] See www.mdcr.cz/en/Strategy/Transportation+Policy+for+2005+%e2%80%93+2013/default.htm

[185] According to the information given by the Czech Republic in the questionnaire on Transport for Sustainable Development, December 2010.

[186] See e.g. The European Energy Award initiative www.european-energy-award.org

[187] www.c40.org

[188] See also the website at www.ec.gc.ca/financement-funding/

Buses and coaches: A Smart Move for sustainable mobility and development

Initiated by IRU and Busworld, Smart Move is a long-term awareness and advocacy campaign that aims to provide policy and opinion makers with accurate and reliable facts and figures, to ensure informed legislation and induce policies for doubling the use of buses and coaches.

Placing buses and coaches at the centre of the political debate and facilitating their use is the smartest way to achieve sustainable mobility for all. Buses and coaches are the backbone of a safe, environmentally friendly, affordable, user-friendly and efficient public transport system. As such, they constitute an optimal response to current and future mobility and travel challenges.

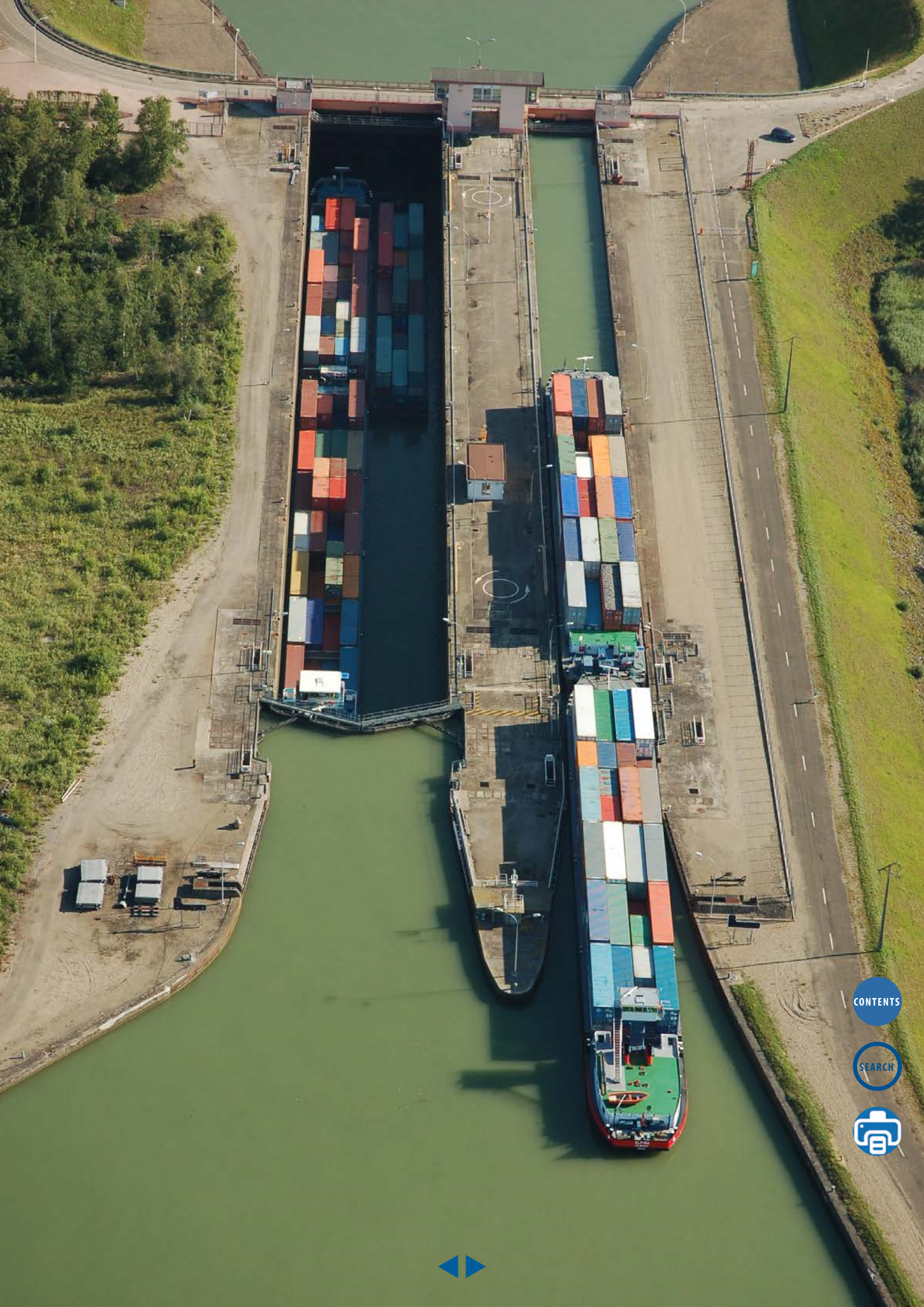
The campaign also uses strong arguments to encourage citizens to switch from private cars to collective passenger transport whenever possible. By documenting and advocating the implementation of policies that support, promote and incentivise a greater use of bus and coach transport at local, national, regional and global level, hundreds of millions of cars can be taken off the road, thus dramatically contributing to carbon reduction targets of governments worldwide.

In Europe alone, achieving the Smart Move objective and doubling the use of bus and coach transport would:

- reduce CO_2 emissions by at least 50 million tonnes per year;
- reduce road fatalities by over 3,000 per year;
- cut congestion in cities at zero cost for taxpayers subsequent to an estimated 10-15 per cent reduction in car traffic;
- create 4 million new jobs.

The use of intermodal facilities by passengers can be encouraged by ensuring that there are appropriate alternatives to the car and by providing appropriate infrastructure to allow travellers to use different modes. Given that for many people the car needs to be used for at least the so-called "last mile" a well-integrated transport interchange providing good park and ride facilities and a frequent public transport connection to the centre of a town or city will encourage people to take the car only for the essential part of the journey. Well designed and organized interchanges where there is seamless transfer from one mode to another will also facilitate the transfer of passengers from the car to public transport as well as increase social inclusion discussed in previous chapters.

National authorities can facilitate the passenger use of intermodal transport by financing transport interchanges, subsidising park and ride facilities and generally improving the public transport accessibility of urban centres. In some cases, this "carrot" will not be enough and may need to be accompanied by a "stick" which includes such things as higher road costs for car users and road calming preferential lane measures leading to longer journey times for those using the car.



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9. United Nations International Transport Agreements and Conventions

Transport is a key sector for sustainable development. It plays an essential role in the economic development and social well-being of countries but also has a major impact on the environment. As described in detail throughout this review, transport is indeed vital for the functioning of economic activities, for the production and distribution of goods, as well as for trade. It also plays a role in reducing imbalances between regions and for their integration. Transport affects the everyday lives of populations, their safety, their health and the environment. Governments have a major role in developing transport by developing infrastructures and establishing a regulatory framework within which transport services can develop efficiently and under the best possible conditions of safety and protection of the environment.

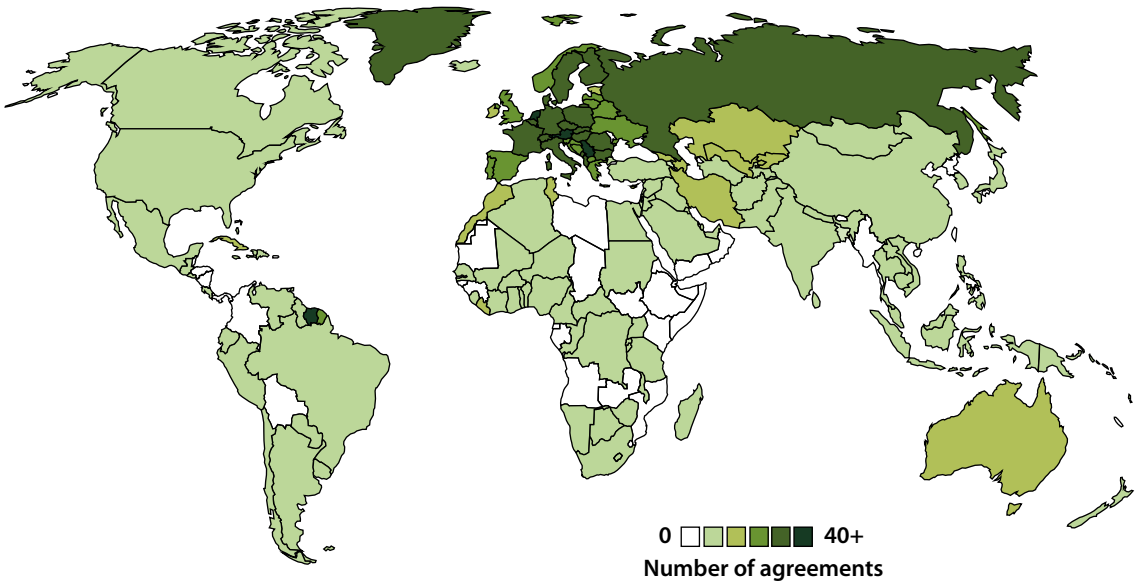
At the international level, transport is essential for developing international trade or export and import, which is an increasing part of the economic development of countries. It is also essential for reducing economic and social disparities between countries. This is particularly true for peripheral or landlocked countries. Furthermore, transport is a prerequisite for developing international tourism. Facilitation and development of international transport have, in this way, always been a major objective of Governments. However, increasing cross border transport raises specific problems, the solution of which requires cooperation and agreement among Governments. The objective is to develop coherent international infrastructure corridors and networks, simplified border crossings and uniform rules and regulations that enable a high level of efficiency, safety and environmental protection in transport.

This section provides an overview of international agreements in the field of transport administered by the United Nations regional commissions. Further information on the status of agreements and of the countries that have signed and ratified is in **Annex I**.

9.1 United Nations Economic Commission for Europe

Since its creation in 1947, the United Nations Economic Commission for Europe (UNECE), in particular its Inland Transport Committee, has provided the framework for intergovernmental cooperation and agreement aimed at the facilitation and development of international transport while improving its safety and environmental performance. The main results of the quiet, unspectacular but persevering and useful work of Governments, acting together for more than seven decades now within the framework of the Inland Transport Committee, are reflected in 58 UN agreements and conventions which provide the international legal framework and technical regulations for the development of international road, rail, inland waterway and combined transport. These conventions and agreements are kept constantly updated and are legally binding for the States who become Contracting Parties to them. Many of these conventions and agreements are based on a global mandate or have become global over the years. Some started and remained relevant regionally, i.e. for the UNECE Member States.

Figure 9.1 Number of UN Transport Conventions and Agreements adhered to per country. The darker the colour, the higher number of UN Transport Conventions a country has acceded to.



Source: UNECE

A. TRANSPORT INFRASTRUCTURES

1. **European Agreement on Main International Traffic Arteries (AGR), of 1975**
2. **European Agreement on Main International Railway Lines (AGC), of 1985**
3. **European Agreement on Important International Combined Transport Lines and Related Installations (AGTC), of 1991**
4. **European Agreement on Main Inland Waterways of International Importance (AGN), of 1996**
5. **Protocol on Combined Transport on Inland Waterways to the European Agreement on Important International Combined Transport Lines and Related Installations (AGTC) of 1997,**

These are infrastructure agreements for the construction and development of coherent international networks for all modes of inland transport in the UNECE region.

1. **The European Agreement on Main International Traffic Arteries (AGR), of 1975,** provides the international legal and technical framework for developing a coherent international road network in the UNECE region. The AGR defines the E-road network which is the arteries channelling major international road traffic flows in Europe, and the infrastructure parameters to which those arteries should conform. The AGR has undergone major revisions to include the international roads of the countries in the Caucasus and Central Asia. States that become Contracting Parties to the AGR commit themselves to its implementation, including the construction or upgrading of the E-roads in their territories, within their national investment programmes, although they are given latitude as to the timing for the completion of construction. Contracting Parties at 7 March 2015: 37 States.

2. **The European Agreement on Main International Railway Lines (AGC), of 1985**, similarly provides the legal and technical framework for the development of a coherent international rail network in the region. The AGC identifies the rail lines of major international importance, the E-rail network, and defines the infrastructure parameters to which they should conform. The AGC is also revised whenever necessary to take account of political and transport changes in Europe. It has undergone a major revision in recent years in order to also include the international rail networks of the Caucasus and Central Asian countries. In becoming Contracting Parties to the AGC, European States commit themselves to its implementation, including the construction or the upgrading of the E-rail lines in their territories, within the framework of their national programmes but without any time constraints. Contracting Parties at 7 March 2015: 27 States.
3. **The European Agreement on Important International Combined Transport Lines and Related Installations (AGTC), of 1991**, provides the technical and legal framework for the development of efficient international combined road/rail transport in Europe. Combined road/rail transport comprises the transport of containers, swap bodies and entire trucks on railway wagons to and from specially equipped terminals. The AGTC determines all important European railway lines used for international combined transport, identifies all terminals, border-crossing points, ferry links and other installations important for international combined transport services. It also establishes internationally acceptable infrastructure standards for those lines and related combined transport installations, and prescribes internationally acceptable performance parameters of trains and combined transport installations and equipment. European States who become Contracting Parties to the AGTC, commit themselves to its implementation in their territories within the framework of their national programmes but without any time constraints. Contracting Parties at 7 March 2015: 32 States.
4. **The European Agreement on Main Inland Waterways of International Importance (AGN), of 1996**, establishes the internationally agreed European network of inland waterways and ports, as well as the infrastructure and operational parameters of conformity. The E waterways network consists of navigable rivers, canals and coastal routes extending from the Atlantic to the Ural, connecting 37 countries and reaching beyond the European region. By acceding to the AGN, Governments commit themselves to the development and construction of their inland waterways and ports of international importance in accordance with the uniform conditions agreed upon and within their investment programmes. Contracting Parties at 7 March 2015: 18 States.
5. **The Protocol on Combined Transport on Inland Waterways to the European Agreement on Important International Combined Transport Lines and Related Installations (AGTC), of 1997,** establishes uniform requirements to be met by the infrastructures and services of combined transport using inland waterways. This Protocol has been signed by 12 States, of which 8 have deposited an instrument of ratification or acceptance. The Protocol will come into force upon ratification or acceptance by five States, three of which are linked in a continuous manner by the waterways identified in the Protocol.

B. ROAD TRAFFIC SAFETY

6. **Convention on Road Traffic, of 1968**

7. **Convention on Road Signs and Signals, of 1968**

8. **European Agreement supplementing the 1968 Convention on Road Traffic, of 1971**

9. **European Agreement supplementing the 1968 Convention on Road Signs and Signals, of 1971**

10. **Protocol on Road Markings, Additional to the European Agreements supplementing the 1968 Convention on Road Signs and Signals, of 1973**

These legal instruments cover internationally agreed upon road traffic regulations, road signs, signals and markings, uniform safety requirements for motor vehicles and other internationally compatible regulations. They aim at improving the efficiency and safety of international road traffic are are regularly revised and updated with a view to introducing strict safety requirements and new technological developments. These legal instruments provide Governments with the legal basis and the technical rules and regulations for their national traffic codes.

6. **The Convention on Road Traffic, of 1968**, aims at facilitating international road traffic and at increasing road safety through the adoption of uniform road traffic rules. The Convention sets up commonly agreed rules on all factors influencing international road traffic and its safety, including the driver and the vehicle. Contracting Parties must comply and ensure compliance with these rules. The Convention establishes - without affecting the right of a Contracting Party to make the admission of vehicles in their territory subject to an applicable national law - that Contracting Parties are bound to admit to their territories in international traffic motor vehicles and drivers that fulfil the conditions laid down in the Convention and to recognize vehicle registration certificates issued by other Contracting Parties. In addition, the Convention details the basic conditions for the admission of vehicles and drivers in international traffic. The Convention is crucial for facilitating international road traffic, international transport and trade as well as tourism. Contracting Parties at 7 March 2015: 73 States.
7. **The Convention on Road Signs and Signals, of 1968**, sets up a set of commonly agreed road signs and signals. It classifies road signs in three categories: danger warning, regulatory and informative, and provides for each of them definitions and physical appearance, including dimensions, shapes and colours, graphic symbols and norms for ensuring their visibility and legibility. The Convention also prescribes common norms for traffic light signals and signals for pedestrians. Moreover, the Convention prescribes uniform conditions for road markings, signs for road works and signals for level crossings. Contracting Parties at 7 March 2015: 63 States.
8. **The European Agreement supplementing the 1968 Convention on Road Traffic, of 1971**, sets up more specific provisions than the Convention in order to further enhance road safety. Contracting Parties at 7 March 2015: 35 States.
9. **The European Agreement supplementing the 1968 Convention on Road Signs and Signals, of 1971**, similarly establishes more specific rules for signs and signals to increase safety. Contracting Parties at 7 March 2015: 32 States.
10. **Protocol on Road Markings, Additional to the European Agreements supplementing the 1968 Convention on Road Signs and Signals, of 1973**, sets up the rules according to which marking should be placed on the roads to better organize road traffic and prevent road accidents. Contracting Parties at 7 March 2015: 27 States.

C. VEHICLE HARMONIZATION

11. **Agreement concerning the Adoption of Uniform Technical Prescriptions for Wheeled Vehicles, Equipment and Parts which can be fitted and/or be used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals granted on the Basis of these Prescriptions, of 1958**

12. **Agreement concerning the Establishing of Global Technical Regulations for Wheeled Vehicles, Equipment and Parts which can be fitted and/or be used on Wheeled Vehicles, of 1998**

13. **Agreement concerning the Adoption of Uniform Conditions for Periodical Technical Inspections of Wheeled Vehicles and the Reciprocal Recognition of Such Inspection, of 1997**

    11. **The Agreement concerning the Adoption of Uniform Technical Prescriptions for Wheeled Vehicles, Equipment and Parts which can be fitted and/or be used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals granted on the Basis of these Prescriptions, of 1958**, provides the legal framework for the development of the safety and emissions regulations according to which motor vehicles must be. Altogether more than 135 such regulations have been developed. These regulations and the successive amendments they have undergone have considerably increased vehicle safety and drastically reduced vehicle emissions. Contracting Parties at 7 March 2015: 50 States and the European Union.
    12. **The Agreement concerning the Adoption of Uniform Conditions for Periodical Technical Inspections of Wheeled Vehicles and the Reciprocal Recognition of Such Inspections, of 13 November 1997**, provides the legal framework for the technical inspections of vehicles. Its annex comprises two Rules, which aim at maintaining vehicle safety. Contracting Parties at 7 March 2015: 12 States and 17 signatories pending ratification.
    13. **The Agreement concerning the Establishing of Global Technical Regulations for Wheeled Vehicles, Equipment and Parts which can be fitted and/or be used on Wheeled Vehicles, of 1998**, provides the framework for the development of global technical regulations for vehicles. Sixteen global technical regulations have already been adopted. Contracting Parties at 7 March 2015: 32 States and the European Union.

D. BORDER CROSSING FACILITATION

14. **The International Convention to Facilitate the Crossing of Frontiers for Passengers and Baggage carried by Rail, of 1952**

15. **The International Convention to Facilitate the Crossing of Frontiers for Goods Carried by Rail, of 1952**

16. **The Convention concerning Customs Facilities for Touring, of 1954**

17. **The Additional Protocol to the Convention concerning Customs Facilities for Touring, relating to the Importation of Tourist Publicity Documents and Materials, of 1954**

18. **Customs Convention on the Temporary Importation of Private Road Vehicles, of 1954**

19. **Customs Convention on the Temporary Importation of Commercial Road Vehicles, of 1956**

20. The Customs Convention on Containers, of 1972

21. Customs Convention on the International Transport of Goods under Cover of TIR Carnets (TIR Convention), of 1975

22. International Convention on the Harmonization of Frontier Controls of Goods, of 1982

23. Convention on Customs Treatment of Pool Containers Used in International Transport (Container Pool Convention), of 1994

These Conventions aim to facilitate border crossing by simplifying and harmonizing the procedures at borders, i.e. Customs, administrative procedures and inspections.

14. **The International Convention to Facilitate the Crossing of Frontiers for Passengers and Baggage carried by Rail, of 1952**, facilitates border crossing by providing procedures for the control of entry and exit of passengers and their baggage by competent authorities of adjoining countries. Contracting Parties at 7 March 2015: 10 States.
15. **The International Convention to Facilitate the Crossing of Frontiers for Goods Carried by Rail, of 1952**, facilitates border crossing by providing procedures and conditions for harmonizing and ensuring a high level of efficiency in the control of goods carried by rail between two adjoining countries. Contracting Parties at 7 March 2015: 12 States.
16. **The Convention concerning Customs Facilities for Touring, of 1954**, facilitates the development of international touring by providing temporary admission of the personal effects imported by a tourist, free of import duties and import taxes, provided they are for the personal use of the tourist. Personal effects must be carried on the person or in the luggage of the tourist, that there is no reason to suspect abuse, and that these personal effects will be re-exported by the tourist on leaving the country. Contracting Parties at 7 March 2015: 79 States.
17. **The Additional Protocol to the Convention concerning Customs Facilities for Touring, relating to the Importation of Tourist Publicity Documents and Materials, of 4 June 1954**, establishes special conditions for documents and materials. Contracting Parties at 7 March 2015: 74 States.
18. **The Customs Convention on the Temporary Importation of Private Road Vehicles, of 1954**, facilitates the temporary admission of private road vehicles between Contracting Parties without payment of import duties and taxes. The Convention defines the concept of private road vehicle and establishes the principle of temporary importation of such vehicles under the international "Carnet de passage en douane". The Carnet guarantees payment of import duties and taxes to national competent authorities if the vehicle is not re-exported. Authorized organizations or associations issue the Carnets and guarantee the payment. The Convention describes in detail the functioning of the temporary importation procedures, the necessary documents and the claims procedures when in default. The Convention is open to all United Nations Member States. The procedure and internationally recognized document replaces national procedures and documents which often differ between countries. The procedure also avoids the operation of national guarantee systems, as all taxes and duties are covered. In addition, it ensures accurate filling-in by competent authorities and associations or private vehicle drivers. As a result, the Convention helps minimize procedures and delays at border crossings. Contracting Parties at 7 March 2015: 79 States and the European Union.

19. **The Customs Convention on the Temporary Importation of Commercial Road Vehicles, of 1956**, functions in the same way as the Temporary Importation of Private Road Vehicles, given the change the vehicle type. Contracting Parties at 7 March 2015: 40 States and the European Union.

20. **The Customs Convention on Containers, of 1972** has two main objectives. First, it provides for the temporary importation of containers, free of import duties and taxes and free of import prohibitions and restrictions, subject to re-exportation within three months from the date of importation. Secondly, the Convention provides for approval of containers for transport under Customs seal. Containers approved by a Contracting Party and in compliance with the provisions of the Convention for the transport of goods under Customs seal shall be accepted by other Contracting Parties for any system of international carriage involving such sealing. Contracting Parties at 7 March 2015: 38 States

21. **The Customs Convention on the International Transport of Goods under Cover of TIR Carnets (TIR Convention), of 1975** establishes the procedure which permits the international carriage of goods by road from a customs office of departure to an office of arrival, and the passage through any required countries without recheck of the goods or deposit of a financial guarantee at each border. The TIR procedure includes standards on the use of secure vehicles or the approval of containers, and an international guarantee chain to cover duties and taxes throughout the journey. Vehicles must carry the TIR Carnet which certifies the contents of the cargo as checked at the customs office of departure. The customs authorities at intermediate borders recognize the TIR Carnets and acknowledge not to undertake checks unless deemed appropriate for any reason. Finally, the procedure foresees a controlled access to the TIR system and exclusion from the system for misuse or illegal reasons. An Administrative Committee, composed of all Parties to the TIR Convention, administers the Convention, which is open to all United Nations Member States. Through efficient control procedures and an international guarantee system, the TIR Convention of 1975 avoids physical inspections of goods in transit as well as payment of taxes and duties for the goods en route. It also avoids multiple national guarantee systems, national customs document and control systems. All this results in minimum procedures and delays at borders and in lower transport costs, which in turn results in lower export and import costs. Contracting Parties at 7 March 2015: 67 States and the European Union.

22. **The International Convention on the Harmonization of Frontier Controls of Goods, of 1982**, aims at facilitating border crossing in international transport of goods by harmonizing and reducing the requirements for completing formalities and the number and duration of border controls. The Convention establishes the procedures for efficiently carrying out all types of controls that may be necessary at borders, including customs controls, medico-sanitary inspections, veterinary inspections, phytosanitary inspections, controls of compliance with technical standards and quality controls. Procedures largely call for national cooperation and coordination of the various services among them, as well as for international cooperation between the respective border services of the adjacent countries. The Convention foresees measures that include joint controls of goods and documents through the provision of shared facilities, same opening hours and same types of services at the same border. These procedures apply to all goods being imported, exported or in transit and to all modes of transport. An Administrative Committee manages the Convention, which is foreseen for global application. The Convention provides for a reduction in the number and duration of all types of controls and best practices for efficient controls of goods at border crossings. It aims at promoting the one-stop-shop principle for border controls. As a result, the Convention reduces border delays, which results in lower transport costs and, therefore, in lower export and import costs. Contracting Parties at 7 March 2015: 56 States and the European Union.

23. **The Convention on Customs Treatment of Pool Containers Used in International Transport, of 1994**, aims at the duty- and tax-free admission of containers belonging to a Pool by simplifying the regime set up by the Customs Convention on Containers, of 1972. Contracting Parties at 7 March 2015: 14 States.

E. TRANSPORT OF DANGEROUS GOODS

24. European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR), of 1957

25. Protocol amending article 1(a), article 14 (1) and article 14(3)(b) of ADR, of 1993

26. European Agreement Concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN), of 2000

27. The European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN), of 2000

24. **The European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), of 1957**, aims at ensuring the highest possible level of safety for the transport of dangerous goods at an economically acceptable cost. It identifies substances which are considered dangerous and whether they can or cannot be transported in international traffic. The ADR establishes the conditions of carriage. These include the classification of substances according to specific types of danger (explosives, flammable liquids, flammable gases, corrosive substances, etc.), packing conditions, labelling, marking, placarding, documentation and special requirements for tanks. The ADR also contains requirements on transport operations, driver training, vehicle construction and approval; the most recent work is on provisions of security. The Annexes to the ADR are normally amended every two years.
25. **Compliance with the ADR obliges Contracting Parties to accept vehicles from other Parties in compliance**. The Agreement preserves the right of Contracting Parties to prohibit, for reasons other than safety during carriage, the entry of dangerous goods into their territory. Contracting Parties also retain the right to arrange less stringent conditions of international transport on their territories, by special bilateral or multilateral agreements. The ADR is open for accession to all United Nations Member States without any financial implications for countries. However, for exporting countries, it imposes administrative structures for testing and approval of packagings, tanks and vehicles, for driver and dangerous goods safety adviser training and for issuing the corresponding certificates. The ADR provides for a high level of safety and security during the international carriage of dangerous goods. It also facilitates transport and trade of such goods resulting from mutual recognition of packaging, tank, vehicle and driver training certificates. Being harmonized with the United Nations Model Regulations that serve as a basis for all modes of transport and most national regulations at worldwide level also facilitates compliance, enforcement and control. Annexes A and B are, used for also regulating domestic traffic in EU countries. Contracting Parties at 7 March 2012: 48 States.
26. **The Protocol amending article 1(a), article 14 (1) and article 14(3)(b) of ADR, of 1993**, simplifies the procedures for amending the annexes to the ADR, and harmonizes the definition of the term "vehicle" with the definition used in various EC directives. Contracting Parties at 7 March 2015: 33 States.
27. **The European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN), of 2000**, entered into force on 28 February

2008. It aims to ensurd a high level of safety at an economically acceptable cost. The Regulations annexed to ADN, which became applicable twelve months after the Agreement entered into force (28 February 2009) contain provisions on dangerous substances and articles, provisions on their carriage in packages and in bulk on board inland navigation vessels or tank vessels, as well as provisions on the construction and operation of such vessels. They also address requirements and procedures for inspections, the issue of certificates of approval, recognition of classification societies, monitoring, and training and examination of experts. Contracting Parties at 7 March 2015: 17 States.

F. TRANSPORT OF PERISHABLE FOODSTUFFS

28. Agreement on the International Carriage of Perishable Foodstuff and on the Special Equipment to be used for such Carriage (ATP), of 1970

28. The Agreement on the International Carriage of Perishable Foodstuff and on the Special Equipment to be used for such Carriage (ATP), of 1970, establishes uniform prescriptions for the preservation of the quality of the perishable foodstuffs during their international transport. It defines uniform norms and standards for the special transport equipment required as well as for the checking of insulation and sets up uniform distinguishing marks to be affixed to the special equipment. Uniform equipment and temperature conditions for deep-frozen and frozen foodstuffs are also specified. Contracting Parties at 7 March 2015: 48 States.

G. INLAND WATERWAY TRANSPORT

29. Convention on the Registration of Inland Navigation Vessels, of 1965

30. Convention on the Measurement of Inland Navigation Vessels, of 1966

31. European Agreement Concerning the Work of Crews of Vehicles Engaged in International Road Transport (AETR), of 1970

29. Convention relating to the Unification of Certain Rules concerning Collision in Inland Navigation of 1960 governs the compensation for damage caused by collision between vessels of inland navigation either to the vessels or to persons or objects on board in the waters of one of the Contracting Parties. This may be through the carrying out of/or failure to carry out a manoeuvre, or by failure to comply with regulations. Contracting Parties at 7 March 2015: 13 States.

30. Convention on the Registration of Inland Navigation Vessels of 1965 provides the conditions for registration of inland navigation vessels, for the transfer of a vessel from the register of one Contracting Party to the register of another, and for the cancellation of registration. Two Two Protocols are annexed to this Convention: Protocol No. 1 concerns the Rights in rem in Inland Navigation Vessels and Protocol No. 2 concerns Attachment and Forced Sale of Inland Navigation Vessel. Contracting Parties at 7 March 2015: 9 States.

31. Convention on the Measurement of Inland Navigation Vessels of 1966 provides a procedure for measuring inland navigation vessels, and the modality of certificates that are issued by designated measurement offices in each Contracting Party. The measurement of a vessel is designed to determine the maximum permissible displacement and, where necessary, its displacements corresponding to given waterlines. The measurement of vessels intended for the carriage of goods may also enable the weight of the cargo to be determined from the vessel's draught. Contracting Parties at 7 March 2015: 16 States.

H. OTHER CONVENTIONS

32. Convention on the Contract for the International Carriage of Goods by Road (CMR), of 1956

33. European Agreement Concerning the Work of Crews of Vehicles Engaged in International Road Transport (AETR), of 1970

34. Protocol to the Convention on the Contract for the International Carriage of Goods by Road (CMR), of 1978

32. **The Convention on the Contract for the International Carriage of Goods by Road (CMR), of 1956**, facilitates international road transport by providing a common transport contract, including a common consignment note and harmonized liability limits. The CMR fixes the conditions governing the contract for the international carriage of goods by road between the carrier and the shipper and sets the conditions of liability of the carrier in case of total or partial loss of goods. The CMR has no direct implications for governments as it regulates through private law. Transport operators take advantage of the Convention through national legislation. An additional Protocol to the CMR has entered into force to facilitate the use of an electronic consignment note. The CMR Convention helps to maintain fair competition between carriers and limits the costs of international road transport, including insurance costs. Contracting Parties at 7 March 2015: 55 States.

33. **The European Agreement concerning the Work of Crews of Vehicles engaged in International Road Transport (AETR), of 1970**, aims at preventing drivers and crews of commercial vehicles of more than 3.5 tonnes, or transporting more than 9 people, engaged in international road transport, from driving excessive hours. Driver fatigue is known to increase the risk of serious road accidents. Non-standardized working hours may create disparities in the working conditions of professional drivers and may impact a company's competitiveness. To this end, the AETR regulates the driving times and rest periods of professional drivers. The Agreement also defines control devices that are used to control those periods, and sets up technical requirements for the construction, testing, installation and inspection of these devices. Additionally, the AETR also sets up requirements for the checking of driving hours by competent authorities. By regulating the driving times and rest periods of drivers of commercial vehicles engaged in international transport, the AETR creates a level playing field in the road haulage industry and helps prevent road accidents. Contracting Parties at 7 March 2015: 51 States.

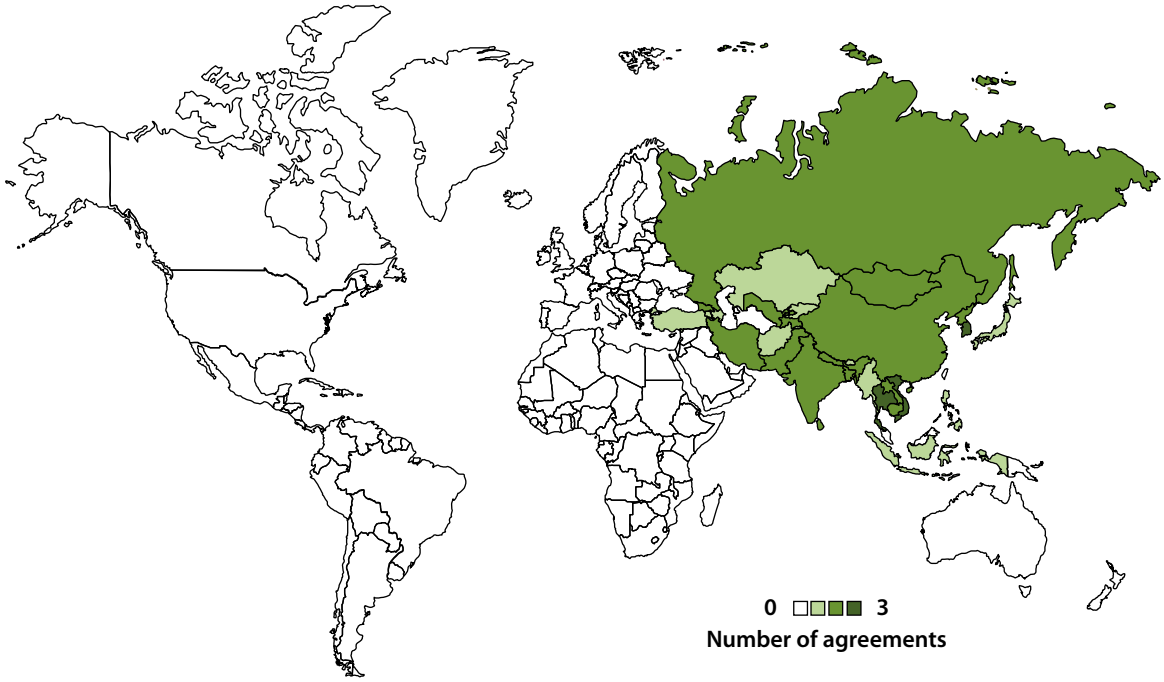
34. **The Protocol to the Convention on the Contract for the International Carriage of Goods by Road, of 1978**, modifies the provisions concerning the liability of the carrier for compensation in respect of loss of goods, set out in article 23 of the Convention. Contracting Parties at 7 March 2015: 42 States.

9.2 United Nations Economic Commission for Asia and the Pacific

UNESCAP was established in 1947 and, today, is the main economic and social development centre in Asia and the Pacific. Its mandate is to foster cooperation between its 53 member and 9 associate member States in Central Asia, North-Northeast Asia, Southeast Asia, South and Southwest Asia, and the Pacific. The overall objective of UNESCAP is to promote inclusive and sustainable economic and social development through inter-

governmental processes, norms, regional research and analysis, capacity-building and partnerships. By supporting the development of a regional intermodal transport network — the Asian Highway network, the Trans-Asian Railway network and a network of dry ports — UNESCAP supports its member States in strengthening connectivity, optimizing the use of existing infrastructure and increasing the level of integration between the different transport modes.

Figure 9.2 Number of UNESCAP Transport Conventions and Agreements per country



Source: UNESCAP

1. **The Intergovernmental Agreement on the Asian Highway Network,** of 2003
2. **The Intergovernmental Agreement on the Trans-Asian Railway Network,** of 1985
3. **The Intergovernmental Agreement on Dry Ports**, of 2013

1. **The Intergovernmental Agreement on the Asian Highway Network, of 2003** is the first treaty developed under the auspices of the UNESCAP secretariat and deposited with the Secretary-General of the United Nations. It provides a framework for the coordinated development of international highways in Asia, and between Asia and Europe. Member countries can use this framework to discuss technical and institutional issues, and improve the quality of the network or increase the efficiency of operations. The Agreement is an important tool to facilitate international trade and tourism, promote regional integration and enhance international cooperation. It was adopted on 18 November 2003 by an intergovernmental meeting held in Bangkok, was open for signature in April 2004 in Shanghai, China and entered into force on 4 July 2005.
2. **The Intergovernmental Agreement on the Trans-Asian Railway Network, of 2006** entered into force on 11 June 2009. The growth of international trade, the continued surge of containerized freight in the ports of the Asia-Pacific region and the recognition of the importance of greater regional integration encouraged countries to seek efficient connections through a transport network. For the railways

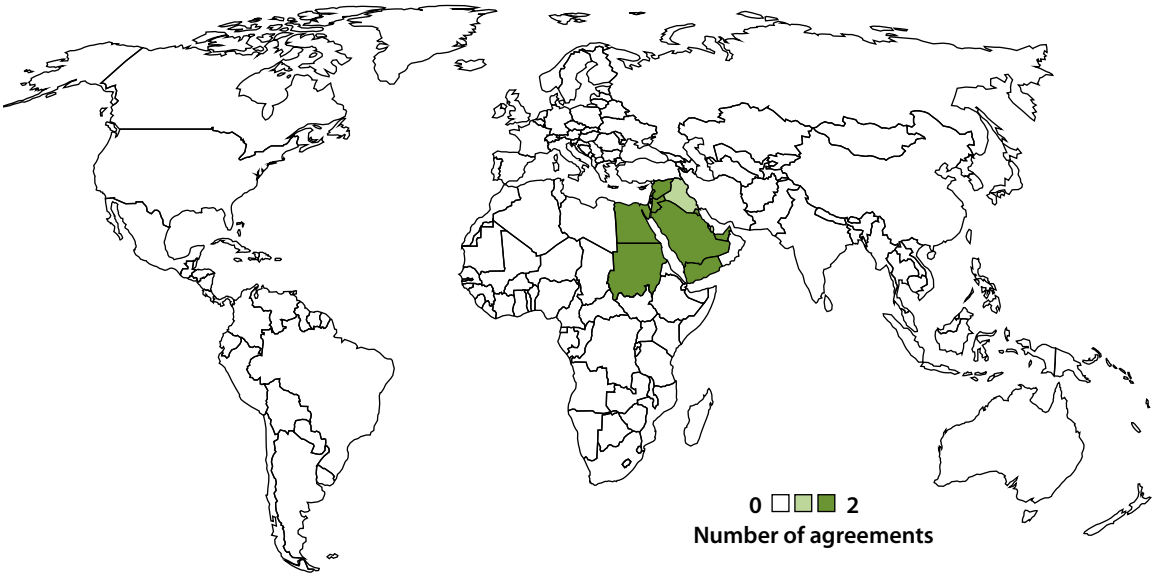
of the region, the new international environment offered an opportunity to upgrade existing infrastructure or construct new ones with the aim of defining and managing international corridors. It also calls for a higher level of cooperation to find synergies between national infrastructure projects and international corridors. With this in mind, countries opted to define a framework within which they could discuss and plan the future expansion, upgrade and operation of the Trans-Asian Railway network. At the sixtieth session of the UNESCAP Commission, it was agreed that an Intergovernmental Agreement on the Trans-Asian Railway Network would provide such a framework and requested the secretariat to take action.

3. **The Intergovernmental Agreement on Dry Ports, of 2013**, was opened for signature at Bangkok on 7 and 8 November 2013. While the economies of UNESCAP member States are still reliant on exports to developed countries, intra-Asia trade is increasingly important in the region's overall trade. In this context, the economic vitality of the region requires a collaborative vision for the establishment of an efficient region-wide transport and logistics system to enhance and support new intraregional trade flows.

9.3 United Nations Economic and Social Commission for Western Asia

The Economic and Social Commission for Western Asia was established on 9 August 1973 pursuant to the Economic and Social Council's resolution 1818 (LV). The Commission aimed to raise the level of economic activity, strengthen cooperation and promote development among its member countries. In 1999, UNESCWA member countries agreed to develop the Integrated Transport System in the Arab Mashreq (ITSAM) which facilitates trade and transport between countries of the region and enhances regional integration. The chief goals of ITSAM include reducing transportation costs, enhancing the exchange of trade and tourism in the region and facilitating multimodal transport.

Figure 9.3 Number of UNESCWA Transport Conventions and Agreements per country



Source: UNESCWA

1. **The Agreement on International Roads in the Arab Mashreq,** of 2001
2. **The Agreement on International Railways in the Arab Mashreq,** of 2003

    1. **The Agreement on International Roads in the Arab Mashreq of 2001**, was developed within ITSAM and mainly aims at identifying an international road network to link Arab Mashreq countries. It entered into force on 19 October 2003. This Agreement was the first United Nations treaty negotiated within UNESCWA. The provisions of the agreement provide for an international road network of 35,900 km. One asset of the agreement is a regional numbering system. The agreement had been ratified by 13 UNESCWA member States.
    2. **The Agreement on International Railways in the Arab Mashreq of 2003**, aims at identifying an international railway network to links Arab Mashreq countries. It entered into force on 23 May 2005. The network is expected to reach 20,896 km of track. The Agreement has been ratified by eleven countries in the region.

CONTENTS

SEARCH

10. Sustainable Development: The Current Situation and the Way Forward

Transport is an essential component of sustainable development. Sustainability of transport is affected by socioeconomic, demographic and environmental megatrends that affect people at all levels and transform societies. The present economic growth, which has been associated with a 'reversed' geographical fragmentation of production, has created particular transport patterns such as increasing transport volumes in the non-OECD regions. At the same time, the significant changes in global population size, age structure, household size and urbanization expected for the twenty-first century may have substantial implications for inland transport—in terms of transport patterns, energy use and GHG emissions. The increasing effects of climate change and climate variation on transport infrastructure and services will cause further complications.

10.1 Verdict - The Current Situation

Transport accessibility for individuals/households

The highest road density is in the developed countries, with rapid development in industrializing countries (e.g. China). Road density depends on physiography and demography, and other social and economic development factors.

An estimated 900 million rural dwellers do not have adequate access to a transport system, with the situation worse in the developing countries and, particularly, South Asia and Sub-Saharan Africa. This can negatively affect major development goals, such as poverty reduction.

In urban areas, the ever-increasing transport needs and the intensive land use of transport are the challenges for further transport infrastructure development. Increased urbanization may lead to traffic congestion and, thus, increased air pollution, traffic noise and nuisance as well as limited parking spaces. The mobility of groups with special needs is another challenge: children, young individuals, elderly and/or disabled individuals have specific transport requirements , which restrict their access to economic, cultural and social activities and health institutions.

Transport accessibility to international markets

Access to global supply chains is essential for attracting foreign investment and enterprises as well as human capital. Foreign trade is particularly important for small and land-locked economies, which depend on hinterland and/or sea connections and border crossings. Currently, total foreign trade appears to be the dominant economic activity for many countries in which domestic supply or demand are limited. At the same time, inland freight transport tends to involve higher volumes in developed and large countries, where the dependence on international trade is lower than that of the smaller and/or land-locked countries. In addition, international trade also depends on the efficiency and reliability of border crossings.

The available information shows that greater efficiency is required across the board. Many countries (mostly in Southeast Europe, the Caucasus, the Central and East Asia and Africa) demonstrate low efficiency at border crossings.

Affordability of transport services for individuals/households

Transport costs money and, thus, transport accessibility is controlled by the costs (and returns) of the passenger and freight transport services as well as by the sustainability of the investments associated with the up-grading and/or the planning and construction of transportation infrastructure. Affordable transport services depend on income and pricing. Generally, transport services tend to be more affordable for the citizens of countries with relatively low-income inequalities.

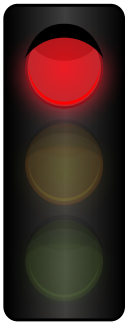
Nevertheless, there are additional affordability determinants, such as the pricing of other basic goods and services, the rural or urban location of households, the presence of adequate/affordable public transport services, and the existence of transport policies, plans and schemes that support transport affordability for the poorer population. The available information shows that transport has become more expensive in real terms during the last decade in the EU. More initiatives are needed to tackle these and other issues related to transport affordability (see chapter 4) especially in developing countries.

Affordability of transport services for societies

All available trends on passenger and freight volumes suggest a strong future growth in the non-OECD regions, which will require the planning and construction of new transportation infrastructure as well as the establishment of sustainable funding mechanisms for the transport sector. However, infrastructure development is generally planned and financed within macroeconomic constraints.

The 2008 financial crisis increased pressures on national budgets, consequently making private sector funding more important. In recent years, transport infrastructure investment in the most developed countries has been lower than that of the non-OECD countries. At the same time, private transport infrastructure investments have been also moderate, with the large majority of countries investing less than US$ 0.5 billion aggregate during the period 2000–2012. Road infrastructure has consistently accounted for the 'lion's share' of infrastructure investment in most of the countries for which data is available.

Transport safety



Over a million people are killed annually in road traffic accidents. Improvements can be made in driver behaviour, infrastructure quality and vehicle safety. Road safety performance differs widely between countries. Progress with road safety (measured in fatalities per 100,000 population) shows large variations. Trends in road fatalities are mixed. Some countries show sharp reductions in fatalities over the last decade (i.e. car drivers/passengers); however, the record has been less satisfactory for vulnerable road users (i.e. pedestrians, cyclists and users of powered two wheelers). Many emerging economies show rapidly increasing private motorisation and increasing road fatalities. When road traffic rules, road signs and signals are established, the data show that drink driving, speeding, non-use of seat belts and helmets, and use of mobile phones while driving are the highest risks.

Rail transport is a safer transport mode. The decline in accidents and fatalities has been continuous in the last three decades. Most fatalities were caused by rolling stock or at level crossings. Rail safety has improved with the new technologies and regulations. Cross-mode initiatives, such as the new CTU Code, are expected to increase transport safety for all those who work with containers across the transport modes.

Finally, inland waterway transport shows the lowest accident statistics. The lowest accident rates are associated with freight transport.

Transport security

The increasing volumes of transport are associated with elevated risks of terrorism and organized crime. So far, all transport modes have been vulnerable to terrorism and, particularly, in the large urban transport systems. Political cooperation through multilateral institutions can assist the international community to develop effective measures against cross-border security breaches. Transport related crime is also a challenging issue in many parts of the world, especially in Latin America. The initiatives to prevent crime in road freight transport are numerous in Europe.

Environmental sustainability of transport

Inland transport infrastructure is land dependant and incongruous with natural habitats. It also heavily dependent on non-renewable energy. In 2010, the transportation sector accounted for about 26 per cent of the total world delivered energy consumption and 55 per cent of the total liquid fuel consumption. According to the latest projections, global transport energy use should grow by 1.1 per cent annually over the period 2010-2040, with a high of 2.3 per cent annually in the non-OECD economies. In OECD countries, the average will decline by 0.1 per cent annually.

Transport also affects the environment at different spatio-temporal scales. Transport influences air quality, produces noise and consumes primary natural resources (e.g. metals and fossil fuels). It can also affect the quality of life: traffic may dangerous and can divide communities. Last, but not least, transport produces GHG emissions and affects the global environment.

Current CO_2 emissions from transport show significant spatial variability, with the highest emissions found in the United States of America, followed by the Russian Federation, China, Japan and Brazil, then Western Europe, Australia and India. Africa and the central Asia have the lowest transport-generated emissions. Transport is not only a major contributor to the observed carbon emission growth and, thus, a probable force of climatic changes; it is also a 'victim' of climatic change and the extreme events can have diverse impacts on transport infrastructures and services. The impacts depend on the mode and the climate change factor, on the local or regional circumstances and vulnerabilities, including those of the natural environment.

Annex 2 of this publication presents a statistical analysis of the interrelationships between different socioeconomic and environmental attributes pertinent to transport. Although there have been several constraints related to the available information (information gaps/synchronicity)[189] some correlations have been found. The correlations are significant

[189] Information has not been readily available for all attributes; available information does not have the same base year (see Annex Table A2). Rigorous statistical analysis was not always applicable, and multiple regression modelling has not been meaningful. If further (and synchronous) information becomes available, then the data statistics could be revised.

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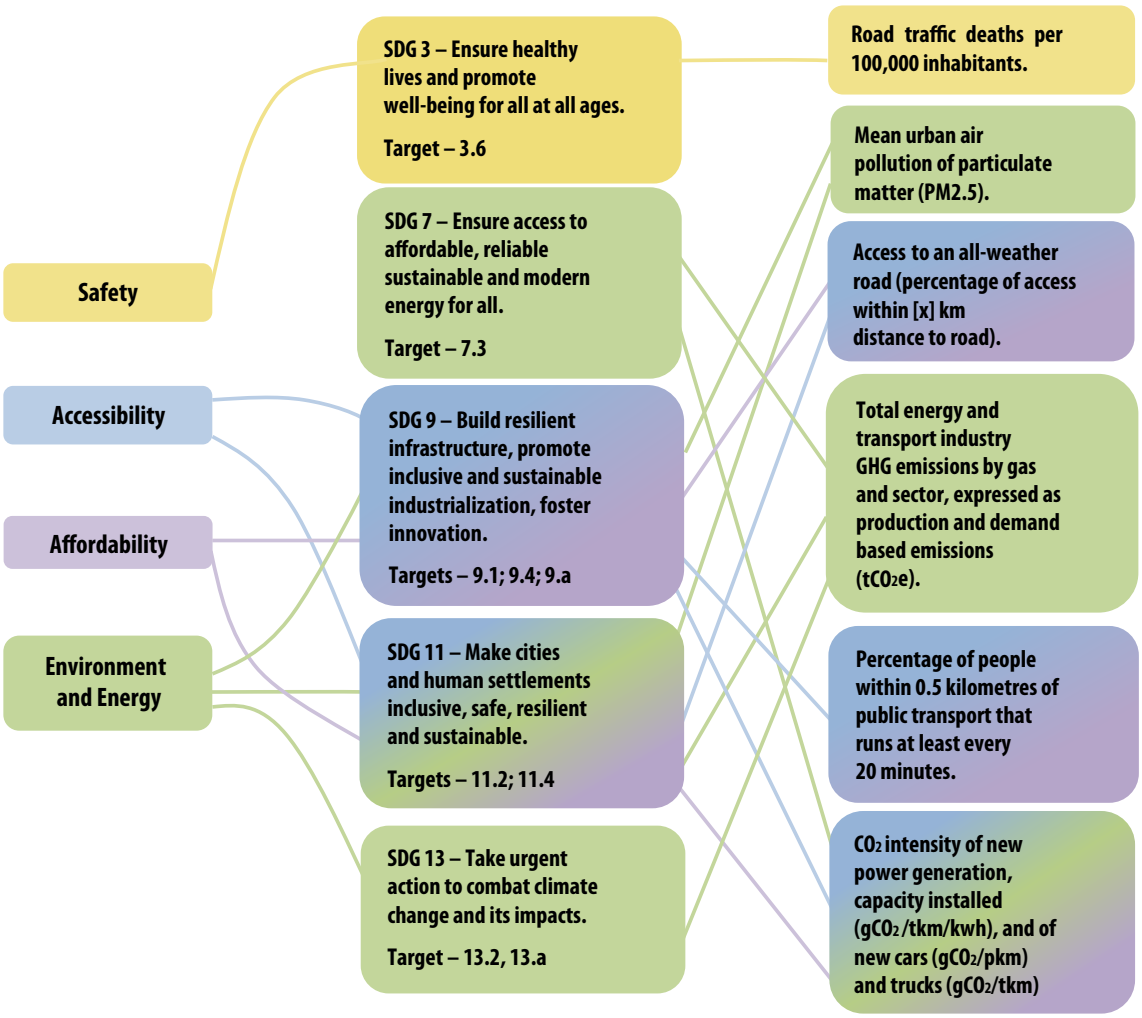
between population and GDP, the goods transported by road or rail and CO_2 emissions. Correlations are non-conclusive between population size and HDI or RAI indexes, road/rail density or transport fatalities. Correlations appear to be significant between a country's land area and GDP, total trade, goods transported by roads/rail and the CO_2 emissions, but not with the HDI and RAI indexes, the road/rail density and transport fatalities.

10.2 Sustainable Inland Transport in the post-2015 Development Agenda

The Rio+20 outcome paper, 'The Future We Want'[190], established a mandate for an Open Working Group to develop a set of Sustainable Development Goals (SDG) for consideration and appropriate action by the United Nations General Assembly at its sixty-eighth session. It also provided the basis for the conceptualization of SDGs that would be coherent with and integrated into the United Nations development agenda beyond 2015.

Figure 10.1 Sustainable Inland Transport and post-2015 Sustainable Development Goals



Source: Sustainable Development Solutions Network report (SDSN, 2015)

[190] Available at http://www.uncsd2012.org/content/documents/727The%20Future%20We%20Want%2019%20June%201230pm.pdf

The right column of Figure 10.1 lists some proposed transport indicators for monitoring and tracking progress to achieve SDGs.

Although the recently concluded process of the Open Working Group did not propose sustainable (inland) transport as a goal in itself, the dimensions of sustainable inland transport and the related challenges as described in this study are embedded as cross cutting issues throughout the 17 proposed SDGs and targets. Figure 10.1 is a brief illustration. [191]

10.3 Policy Implications

Working towards sustainable transport systems requires consideration of all aspects of sustainable development. With policies targeting only one aspect, there is a risk that other dimensions may be neglected or even negatively affected. Environmental concerns, for example, must be addressed; however, by focusing only on these concerns, certain policies may hinder or neglect social and economic sustainability aspects. It is, therefore, imperative to consider challenges to sustainable transport under all its different dimensions. The nature of sustainable development goals calls for a comprehensive and sustainable approach to public policies in transport area. Transport and mobility policies should be comprehensive and in line with a sustainable and equitable economic and social development model. They should not differentiate between passenger and freight transport or the geographical context and they must address the mobility needs of all individuals and businesses, regardless of the particular transport mode (Tomassian et al., 2011).

'Transport accessibility' is a challenge. In rural areas, investment for expanding/upgrading the transport network is scarce and expanding rural transport networks may have significant environmental footprints. In urban areas, the lack of space constrains expansion and structural changes in the transport network. Traffic congestion is an increasing problem, particularly for rapidly industrializing non-OECD countries. It appears that issues related to transport accessibility for individuals are of paramount importance for the sustainability of transport and require a multi-level approach. As a first step, relevant, up-to-date information should be collated in a user- and analysis-friendly format at the international level, involving a maximum of countries. The UNECE statistical platform, which provides information about national transport infrastructure and allows countries to compare development, identify problems, raise awareness and share ideas and practices, could be used/expanded and linked with other relevant transport information platforms to meet this challenge.

Generally, in order to improve transport accessibility and, thus, achieve sustainable transport, innovative/creative policies and solutions are required. It appears that it could be beneficial if the focus of such policies would be shifted from plans/projects responding to the existing trends (re-active approach), to plans/projects attempting to modify those trends so they can be addressed in a more innovative, efficient and cost effective manner (pro-active approach).

'International transport accessibility' is a key for the attractiveness of an economy. It promotes more efficient and cost-effective movements of goods and people, increases competitiveness and attracts human and economic resources leading to the achievement of a 'critical mass' of business activities and knowledge. Nevertheless, accessibility to international markets presents its own challenges. First, improvements in connectivity through 'strategic

[191] Figure 10.1 is an indicator of the dimensions of sustainable inland transport in the proposed SDG framework. It should not be understood as exclusive or exhaustive. More details on SDG targets are available at https://sustainabledevelopment.un.org/sdgsproposal

long-distance links' should be considered and planned; these will require international infrastructure agreements as well as the planning and implementation of international infrastructure projects. Collation/analysis of spatial data (in Spatial Data Infrastructures (SDIs)) is required, as well as strengthening of national capacities, the identification of network bottlenecks and missing links, together with assessments of the criticality, sensitivity and resilience of indispensable components of the transport system (e.g. bridges and tunnels), and the sharing of experiences and 'best' practices. Secondly, administrative bottlenecks, such as at border crossings, that may cause significant socioeconomic losses and affect the efficiency of logistics systems should be removed. Certain improvements are necessary, which could be facilitated by international agreements and cooperation as well as the adoption of widely-accepted/trusted uniform standards and the introduction of efficient information management systems. Thirdly, there are particular challenges involving land-locked countries, where border crossing issues may be significant.

A key challenge for society is to ensure that individual mobility does not depend on individual income. Nevertheless, the analysis and the planning/implementation of effective policies/solutions to increase the affordability of transport services are not straightforward exercises. It requires concentrated efforts, cooperation and sharing of experiences and 'best' practices at many spatio-temporal scales.

Road safety presents many challenges. First, the reduction of road fatalities and/or injuries can be challenging, particularly in regions of rapid motorization growth. In order to achieve such reductions, special attention should be placed on a better understanding of the controlling factors of road accidents and the design of plans/programmes that could provide effective solutions. Secondly, particular emphasis should be given to the increasing problem of motorcycle safety. Thirdly, the introduction of electric vehicles ('silent' vehicles) and increasing bicycle use, could pose additional safety risks to elderly people and people with vision and/or hearing problems. Fourthly, children face increased accident risks; early education on road safety rules, blind spots and safe cycling and walking habits is essential for reducing such risks. Finally, many accidents occur in particular road sections ('black spots'), due to road design/maintenance problems; therefore, removal of 'black spots' should be given a high priority.

Mitigation of the 'environmental impacts of transport' constitutes a major challenge. Major steps should be taken to reduce the carbon footprint of transport and, particularly, of road transport. These steps, however, might be significantly different in different regions. Without a successful green technology transition, GHG emissions may increase substantially in the next decades. An obvious way to decrease the transport carbon footprint is to increase the price of energy through taxation, thereby encouraging road users to adopt more energy-efficient driving behaviour and/or to consider other transport modes. However, high fuel taxation can have important implications on mobility, if not complemented by measures promoting viable alternative transport options such as adequate public transport. There are also non-financial instruments that can promote environmentally sustainable transport. These include, among others: dynamic speed limits; rules for governments and public authorities that serve as good examples for road users; eco-labelling of vehicles according to their emission levels; schemes to promote vehicle fuel efficiency through improvements in driver behaviour; and national initiatives to promote eco-friendly transport.

Relatively little attention has been given, until now, to the assessment of climate change impacts on transport infrastructure and operations, nor to potential adaptation measures. However, recent studies have shown that climate change-induced weather conditions may have very significant implications for transport, and, thus, for the sustainability of the global

and regional economy and livelihood. Therefore, sustainable transport strategies should certainly consider the significant impacts that climate change and variability may have on transport infrastructure/services, and plan for effective adaptation measures.

There are several factors that determine national and regional adaptation options, including among others, risk assessments and short, mid- and long-term financial implications. To identify priorities for climate change adaptation, facilities must be first classified in terms of their criticality within the transport network and according to the difficulties and costs involved in making them climate resilient. At the same time, adaptation options will rely on financing, the availability of which from public, 'hybrid' or private entities may prove to be an important determinant of the adaptation policy approaches.

Finally it should be noted that transport system performance/sustainability is often evaluated on the basis of quantitative indicators (e.g. infrastructure density and travel speeds), whereas traditional transport statistics frequently overlook important transport components, such as the short and non-commuting trips and the non-motorized links of motorized trips. Such conceptions may result in policies/systems promoting road transport over other forms of transport accessibility, with little consideration for alternative transport modes, improved mobility management, intermodality, and the provision of better and swifter information to the transport users and more efficient land use. As such, a paradigm shift in transportation planning/ management could move the focus from mobility-oriented analysis, i.e. the evaluation of the transport system performance on the basis of the quantity of transportation, to accessibility-oriented analysis that places people at the centre of the transportation system and considers a broader range of alternatives.


GEORGIA
ITALY
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UNECE
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11. Our Commitment to Sustainable Transport

The 'Transport for Sustainable Development' study was prepared as a joint effort of the United Nations regional commissions, with the participation of numerous international organizations and institutions dedicated to achieving enhanced sustainability in transport. The following is a very brief overview of the activities of the United Nations regional commissions in the field of transport. More detailed information about the commissions, regional statistics and reports on the transport sector and other areas of work can be found on their websites.

11.1 United Nations Economic Commission for Africa

UNECA [192] has been at the forefront of transport development in Africa since its establishment in 1958. Its interventions have cut across the economic, social and environmental pillars of sustainable development. These interventions have addressed the different dimensions of sustainable transport, including accessibility, affordability, safety and security, and protection of the environment. With 54 member States, and with a dual role as a regional arm of the United Nations and as a key component of the African institutional landscape, UNECA is well positioned to make unique contributions in addressing the continent's development challenges.

In 2005, UNECA cooperated with the African Union Commission, African Development Bank, World Bank and the Sub-Saharan African Transport Policy Programme [193] to develop transport targets and indicators for the Millennium Development Goals. The targets were related to improving access to inputs and markets and generating employment opportunities; improving rural access and urban mobility; providing affordable access for all households; reducing road crash fatalities; promoting environmental sustainability in all transport operations and development programmes; reducing transport costs for landlocked countries, and completing missing links of regional corridors, etc.

Over the years, UNECA has supported African transport development in the context of the continent's regional integration and economic transformation agenda. UNECA worked closely with the African Union Commission to prepare the Intergovernmental Agreement on the Trans-African Highways (TAH) network, which was endorsed by African Heads of State in 2014. The Agreement includes guidelines on road standards, road classification and design, road safety, social development and environmental norms for TAH. UNECA also advocates for the standards and norms to be harmonized in projects of a regional dimension, for example, the Programme for Infrastructure Development in Africa.

UNECA plays a leading role in efforts to improve the safety of Africa's roads. It has organized several high-level road safety events on the continent and brought together different stakeholders to brainstorm on road safety challenges and opportunities. UNECA spearheaded the preparation of the African Road Safety Action Plan for 2011-2020 in the context of the UN Global Decade of Action for Road Safety (2011-2020). It also has an important role in monitoring and evaluating the implementation of the Action Plan. Recently, UNECA worked closely with the African Union Commission to prepare the African

[192] www.uneca.org

[193] now the African Transport Policy Programme

Road Safety Charter that was endorsed at the third Ordinary Session [194] of the Conference of African Ministers of Transport.

The involvement of UNECA in the environmental dimension of sustainable transport goes beyond advocacy for mainstreaming environmental considerations in transport infrastructure projects and includes the application of tools to measure CO_2 emissions in African countries. As part of a United Nations Development Account project to enhance international cooperation and planning towards sustainable transport policies, UNECA worked with UNECE on applying the ForFITs model in Ethiopia in 2013. The model allowed an evaluation of transport activity, energy use and CO_2 emissions in a range of possible policy contexts.

UNECA recognizes the growing importance of ensuring sustainable transport in Africa, particularly in the context of the recent sustained economic growth and rapid urbanization on the continent. The Commission has spearheaded efforts to mainstream sustainable transport in the Post-2015 Development Agenda – notably in the Common African Position, as well as in discussions on the Sustainable Development Goals.

Going forward, UNECA will place more attention on the environmental impact of transport as well as the impact of climate change on Africa's infrastructure. The Commission's interventions will continue to be in the areas of knowledge generation and dissemination, advocacy and capacity-building. The African Institute for Economic Development and Planning of UNECA provides training for African officials on a wide range of development issues. The Institute will launch a course on transport development in 2015 with a module on sustainable transport.

11.2 United Nations Economic Commission for Europe

UNECE [195] was established in 1947 to help rebuild post-war Europe, redevelop economies, strengthen economic relations between European countries, and between Europe and the rest of the world. Fifty-six countries of Western, Central and Eastern Europe, Central Asia and North America come together at UNECE to forge the tools of their economic cooperation. Cooperation may be in economics, statistics, environment, transport, trade, sustainable energy, timber or habitat. The Commission offers a regional framework for developing and harmonizing conventions, norms and standards within its many activities. The experts engage in policy dialogue and provide technical assistance to the countries which need guidance on sustainable development, as well as on accession and implementation of international agreements and conventions.

The UNECE Sustainable Transport Division aims to facilitate the development of sustainable inland transport. It pays special attention to the international movement of persons and goods and aims to improve competitiveness, safety, energy efficiency and security in the transport sector as a whole. UNECE Sustainable Transport Division's work and its impact are both regional and global. It services regional and global institutions which address global transport issues in norms and standard setting, and through legal instruments that have a global geographical coverage (for example in road safety, vehicle regulations, or dangerous goods transport), as well as covering inland transport modes. In some regulatory and legal areas, it promotes regional solutions and capacity-building activities.

[194] Held in Malabo, Equatorial Guinea from 7 to 11 April 2014

[195] www.unece.org/info/ece-homepage.html Information about the UNECE Transport Division is available at www.unece.org/trans/welcome.html

UNECE Subprogramme on Transport

1. **Centre of United Nations transport conventions**, specifically for inland transport, vehicle regulations and dangerous goods transport (58 Conventions).
2. The **Inland Transport Committee** (ITC) and **its Working Parties**, as well as the **ECOSOC Committees** serviced by UNECE Sustainable Transport Division are **decision-making bodies** that **impact the daily life of people and businesses**.
3. The nature of the work is **global, regional, national subnational**.
4. **Type of activities: regulatory, analytical, capacity building and policy dialogue**.
5. **Goals and objectives: to promote safe, secure, environmentally friendly, energy-efficient and competitive transport infrastructure and services, as well as transport and border crossing facilitation**.

For more than six decades, ITC has provided a platform for intergovernmental cooperation to develop local and international transport infrastructure and services while improving safety and minimizing environmental impact. The result of this work is reflected in more than 50 international agreements and conventions which provide an international legal framework and technical regulations for the development of road, rail, inland water and intermodal transport, as well as dangerous goods transport and vehicle construction. UNECE is a centre for negotiating multilateral transport standards and agreements, e.g. the regulations for dangerous goods transport and vehicle harmonization are global. The Sustainable Transport Division provides technical assistance and exchange of best practices; promotes multi-country investment planning; is a substantive partner for transport and border crossing facilitation initiatives; and collects and analyses transport statistics.

UNECE addresses sustainability of transport through the legal instruments, through its analytical work and technical assistance activities, as well as in the traditional work of the Working Parties. The following table summarizes how sustainability and its key areas, access, affordability, safety, security and environmental protection are incorporated into UNECE programmes of work. Experience and lessons from the past activities underline that the measurement of sustainability requires a systematic approach, i.e. considering local, regional, national and international transport.

Table 11.1 Main activities of UNECE in transport and sustainable development

	Legal instruments and standards	Analytical work and capacity-building	Governance structure: Working Parties
Access	Infrastructure agreements: AGC, AGTC, AGR, AGN Border Crossing Facilitation: TIR Convention, Harmonization of Border Crossing Procedures Convention UN Centre for Trade Facilitation and Electronic Business (UN/CEFACT) Trade standards	Support to investment planning at regional level: – Euro-Asian Transport Linkages Project – Trans-European Railways project – Trans-European Road project Support to land-locked transition countries, ports and hinterland connection	ITC/ Transport Trends and Economics (WP.5) ITC/ Border Crossing Facilitation (WP.30) ITC/ Intermodal Transport and Logistics (WP.24) CEFACT Trade Committee
Affordability		Socioeconomic analysis of transport investment Common criteria on identification of bottlenecks, missing links and quality of service Capacity-building in PPPs in infrastructure development	ITC/ Transport Trends and Economics (WP.5) Committee on Economic Competition and Innovation (CECI)
Safe transport	Conventions on road traffic and road signs and signals (Vienna Conventions) European Agreement concerning the International Carriage of Dangerous Goods by Road (ADN, ADR, RID*) European Code for Inland Waterways (CEVNI), Technical requirements for the construction of inland navigation vessels, Signs and Signals on Inland Waterways (SIGNI) Vehicle regulations	Road safety target setting Recommendations on tunnel safety	ITC/ Road Safety (WP.1) ITC/ Transport of Dangerous Goods (WP.15) ITC/ Rail Transport (SC.2) ITC/ Inland Waterway Transport (SC.3 and SC.3/WP.3) ITC/ World Forum for Harmonization of Vehicle Regulations (WP.29) ITC/ Intermodal Transport and Logistics (WP.24)
Transport Security	To be developed	Conferences, seminars and workshops addressing transport security issues	Multidisciplinary group of experts on Transport Security
Environmentally friendly transport	Vehicle regulations Technical requirements for the construction of inland navigation vessels International Carriage of Dangerous Goods by Road (ADR), Inland Waterways (ADN) and Rail (RID)	ForFITS: Facilitates climate change mitigation in transport by developing scenarios for CO_2 reduction and addressing the energy-environment linkages The PEP conferences and workshops addressing environmental and health aspects of transport Reduction of pollution by inland vessels	ITC/ World Forum for Harmonization of Vehicle Regulations (WP. 29) The PEP – The Pan-European Programme on Transport, Health and Environment ITC/ Inland Waterway Transport (SC.3 and WP.3)

11.3 United Nations Economic Commission for Latin America and the Caribbean

UNECLAC [196] was founded in 1948 with the purpose of contributing to the economic development of Latin America at first and the Caribbean later on. It coordinates actions directed towards this end, and reinforces economic ties between member States and beyond. Promotion of the region's social development was to become one of its primary objectives. The Commission's headquarters are in Santiago; it maintains subregional headquarters in Mexico City and in Port-of-Spain, country offices in Buenos Aires, Brasilia, Montevideo and Bogotá, as well as a liaison office in Washington, D.C.

Building upon more than sixty years of transport related work in the region, the approach of UNECLAC in this area is based on its comprehensive vision of transport and its role in the region's economic development and progress to greater equality and social inclusion. Addressing the transport issues from the perspective of "infrastructure services" allows the Commission to effectively include both infrastructure and regulatory issues and to account for the close linkages between the transport and other components of economic infrastructure, such as energy and information and telecommunications services. UNECLAC also endorses the modern concepts of logistics and mobility, which encompass both transport infrastructure and the quality of the services that it provides for the transport of goods and people and which are line with the concept and the goals of sustainable development.

Another fundamental aspect of UNECLAC is its commitment to promote the regional integration of physical infrastructure by providing technical assistance and policy advice to the main regional integration initiatives in Latin America and the Caribbean.

In accordance with this vision, the work of UNELCAC in transport includes issues ranging from assessing the state of economic infrastructure to analyzing the current logistics and mobility services and their regulatory framework. In the area of economic infrastructure, UNECLAC reviews and assesses the trends in the public and private infrastructure spending and supports the regional efforts to move towards a multi-modal regional transport network and associated logistics and mobility services. In the area of logistics and mobility, UNECLAC works on the issues of maritime transport, port governance system, hinterland, as well as energy efficiency of the transport services. UNELCAC analytical work on transport regulations focuses on issues of transport financing, access to domestic and regional markets and the quality of national and regional policies on transport, infrastructure and logistics.

UNECLAC has a strong record of analytical work and a high rate of penetration in the region due to active capacity-building and technical assistance activities. Seeking to improve the quality of public policies and academic research in the region, UNECLAC also provides statistical data on infrastructure financing, maritime transport and transport services for intraregional trade. The current priority in transport consists of helping countries advance toward integrated logistics and mobility public policies that are sustainable and of providing technical assistance to elaboration of a regional strategy on logistics and mobility. Another important area of the Commission's ongoing work consists in assessing the linkages between the infrastructure and logistics services and the exploitation of the region's natural resources. In addition to promoting the use of part of the revenues from natural resources mobilized through taxation for ensuring and stimulating infrastructure investment, UNECLAC seeks to promote access to and shared use of the infrastructure, initially developed for the exclusive use by the mineral industry.

[196] www.cepal.org/en

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11.4 United Nations Economic and Social Commission for Asia and the Pacific

UNESCAP [197] was established in 1947 as the main United Nations economic and social development centre in Asia and the Pacific. Its mandate is to foster cooperation between its 53 member States and 9 associate States in Central Asia, North-Northeast Asia, Southeast Asia, South and Southwest Asia, and the Pacific. The overall objective of UNESCAP is to promote inclusive and sustainable economic and social development in the Asia-Pacific region by intergovernmental processes, norm setting, regional research and analysis, capacity-building and development of partnerships.

UNESCAP Transport Division's areas of work cover policy, infrastructure, facilitation and logistics with a vision to building regional integrated intermodal transport and logistics systems.

UNESCAP promotes and recommends various policy options that can enhance the sustainability and inclusiveness of transportation systems. These policies include: (i) enhancing efficiency of transport operations; (ii) promoting regional standards and guidelines for infrastructure, alternative fuels, vehicle fuel economy and road safety; (iii) inclusive and integrated transport planning encompassing regional, national, intercity, urban and rural transport; and (iv) strengthening institutional capacities of national, local and city agencies and institutional coordination. While development patterns across the region vary, countries that have been able to improve transport capacities and efficiency have been the most successful in promoting sustainable development.

By supporting the development of a regional intermodal transport network, incorporating the Asian Highway network, the Trans-Asian Railway network and the network of Dry Ports, UNESCAP works with its member States to strengthen connectivity, optimize the use of existing infrastructure and increase the level of integration between the different transport modes. In order to finance these transport infrastructure and systems, UNESCAP offers advice on financing options and advocates public-private partnerships including network coordination, diagnostic workshops and online training materials and courses.

While infrastructure development is a prerequisite for achieving regional connectivity, tackling non-physical barriers to cross-border and transit transport is also essential. To this end, UNESCAP promotes the unhindered and safe movement of vehicles, goods and people across borders and through countries of the region by the establishment of regional facilitation frameworks and standards, by the provision of facilitation tools, by assistance in formulating and implementing subregional and bilateral agreements, and by the harmonization of documentation and procedures. UNESCAP also assists countries in developing transport logistics policies and in enhancing the professionalism of logistics service providers.

Working closely with the organizations involved in sustainable transport solutions, UNESCAP facilitates the sharing of knowledge on sustainable transport solutions, including modal shift to rail, increased use of inland and coastal waterways, safer transport systems and promotion of public transport, non-motorized vehicles and the creation of pedestrian spaces in urban environments.

[197] www.unescap.org

11.5 United Nations Economic and Social Commission for Western Asia

UNESCWA [198] was established on 9 August 1973 pursuant to the Economic and Social Council's resolution 1818 (LV). The Commission was set up to raise the level of economic activity in member countries and strengthen cooperation among them. It was also intended to meet the need of Western Asia for the services of a regional economic commission to promote the development efforts in the region. In recognition of the social component of its work, the Commission was entrusted with new responsibilities in the social field by virtue of Economic and Social Council resolution 69/ 1985 of July 1985. Its name then became the Economic and Social Commission for Western Asia. UNESCWA comprises 17 Arab countries in Western Asia and North Africa.

UNESCWA meetings provide an international platform that acts as a forum for governments, transport professionals and researchers to meet and share experiences. The statistical database of UNESCWA also provides information about national infrastructure and allows countries to compare and evaluate the development. Moreover, information material is provided on how to identify problems, share measures and best practices, and raise awareness.

In 2000, UNESCWA prepared the first analytical field study on the cross-border transport of goods in the UNESCWA region. The study included an explanation of procedures adopted for the transport of goods through international outlets in five member countries: Egypt, Jordan, Lebanon, the Syrian Arab Republic and the United Arab Emirates. It also outlined obstacles and solutions and made several recommendations mainly on the establishment of national committees to coordinate the facilitation of transport and trade in the countries of the UNESCWA region. As a result, UNESCWA developed a manual for the establishment of National Transport and Trade Facilitation Committees (NTTFCs). The Committees play a crucial role in supporting effective institutional arrangements between all public and private sector participants in activities related to trade facilitation. Ten member countries established NTTFCs between 2003-2012: Egypt, Iraq, Jordan, Lebanon, Oman, Palestine, Saudi Arabia, the Sudan, the Syrian Arab Republic and Yemen.

Also, UNESCWA initiated work on a Single Window (SW) for Trade Facilitation in 2010. An assessment was carried out on the status of SW development in UNESCWA countries. A quantitative and qualitative ranking of the countries in the region showed variations across the countries on the factors identified for the evaluation. A number of countries in the region have made significant progress in developing SW for trade facilitation: including Lebanon, Morocco, Saudi Arabia, Tunisia and the United Arab Emirates. However, other countries need to invest more in improving their trade facilitation by developing the SW system.[199]

[198] www.escwa.un.org

[199] Trade Facilitation Initiatives in the UNESCWA region, E/ESCWA/EDGD/2013/Technical Paper 3.

11.6 International Road Transport Union

IRU [200] is the world's road transport organization. It upholds the interests of bus, coach, taxi and truck operators to ensure economic growth and prosperity via the sustainable mobility of people and goods by road worldwide and via its commitment to sustainable development.

Since the Earth Summit held in Rio de Janeiro in 1992 where 182 countries adopted Agenda 21, the road transport industry proactively committed to drive towards achieving sustainable development by unanimously adopting the IRU Charter for Sustainable Development in 1996. Striving for sustainable development has since become a constitutional obligation (Article 2 of the IRU Constitution).

For the road transport industry, achieving sustainable development translates into the challenge of satisfying market demands at the lowest possible economic, social and environmental cost, notably by achieving better and cleaner rather than more road transport, in developing and industrialised countries alike.

The IRU established the IRU Academy to foster professional excellence at all levels, and developed the IRU 3 "i" Strategy which is endorsed by the United Nations Environment Programme as the most cost-effective way to achieve sustainable development:

- **Innovation** to develop ever more effective **"**at-source**"** technical measures and operating practices to reduce environmental impact;
- **Incentives** to encourage faster introduction by transport operators of best available technology and practices;

Infrastructure without free-flowing traffic, the above measures are useless. Adequate investment in new infrastructure to remove bottlenecks and missing links, plus fullest use of existing infrastructure are essential. As a result, the road transport industry has invested massively in the latest technologies and training, reducing its toxic and non-toxic emissions by up to 98 per cent over the last 20 years. However, globalization has generated booming tourism and trade flows and, in turn, transport, leading to a dramatic increase in fuel consumption and CO_2 emissions. The commercial road transport sector has therefore taken up the challenge of reducing the 3 per cent of total CO_2 emissions it is responsible for, by proactively committing in 2009 to reduce its CO_2 emissions by 30 per cent by 2030.

The IRU is also a member of UN Global Compact, the world's largest corporate responsibility initiative with over 8,000 business and non-business participants in 135 countries. IRU priorities and related activities of trade and road transport facilitation, as well as sustainable development, are truly in line with the Global Compact's "Ten Principles" on human rights, labour, environment and anti-corruption measures. In order to further support the implementation of the Sustainable Development Goals, the IRU initiated, together with competent international partners and organizations under the United Nations umbrella, a Global Partnership for Sustainable Transport (GPST).

The overall objective of the GPST is to provide an international public-private platform and a framework for multilateral dialogue on policy options and possible measures to enhance sustainable transport systems, particularly in developing countries. Like other global partnerships, GPST will also encourage its members, as well as all relevant transport development stakeholders, to announce and implement commitments on sustainable transport development.

GPST will focus on development needs and opportunities in the transport sector and its contribution to sustainable development in developing countries, notably in least

[200] www.iru.org

developed countries, countries with economies in transition, land-locked developing countries and small island developing states. Furthermore, GPST will function as a high-level platform under the United Nations auspices for promoting sustainable development of all modes of transport in the interests of global socioeconomic development and of facilitating international trade and regional integration.

11.7 International Union of Railways

UIC [201] was founded in 1922 by governments to "create a permanent conference of railway administrations to harmonize and improve the conditions governing the establishment and operation of railways with regard to international traffic".

UIC currently has 240 members on five continents, including integrated railways, infrastructure managers, rail and intermodal operators, and service companies. The chief task of UIC is to:

- promote rail transport at the world level;
- promote interoperability between rail systems;
- develop and facilitate all forms of international cooperation between its members;
- support its members in their efforts to develop new markets and new areas of business;
- propose ways to improve the technical and environmental performance of railways and improve their competitiveness.

Since 2009, four technical departments form the core structure of UIC: Passenger, Freight, Rail System (infrastructure and associated aspects) and Fundamental Values. The latter department brings together railway protection and social and environmental issues — security is thus aligned with safety, environment and sustainability, training and research.

Alongside the actions by UIC member railways, UIC itself has addressed the subject of security by developing activities in various shapes and forms since the late 1990s and by particularly focusing on the threat of terrorism since the 11 September 2001 attacks in the United States of America.

UIC aims to share experience and best practice and to define ways and means of action so that members can learn from and successfully apply lessons learned elsewhere when developing their own strategies, in partnership with their national authorities and, potentially, in accordance with a general international framework.

UIC – the Fundamental Values Department

The three technical departments of UIC — Passenger, Freight and Rail System — correspond to the conventional business units in the rail sector. The 'Fundamental Values' department cross cuts the traditional lines by bringing together security and the economic and societal benefits in the rail sector.

Security and safety are alongside sustainable development, international training, expertise development and research. As discussed in section 6.3, the definition of security in the rail sector is a very broad one that covers extremely disparate realities and constraints. The Fundamental Values Department upholds the rail sectors' policy to be at the service of a multitude of businesses, alongside and complementary to the vital role of the public authorities, not as a substitute for them. The security priorities of rail and those of the authorities may thus differ, but must remain consistent and a source of synergy to move forward.

[201] www.uic.org

CONTENTS
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Annexes

CONTENTS
SEARCH

ANNEX I

Table A1a UN TRANSPORT AGREEMENTS SERVICED BY UNECE

	Infrastructure networks						Road traffic and road safety											Vehicles			Other Legal Instruments Related to Road Transport									
	Construction Traffic Arteries, 1950	E Road Network (AGR), 1975	E Rail Network (AGC), 1985	E Comb. Tr. Network (AGTC), 1991	Protocol Inl. Nav. to AGTC, 1997	E Inl. Water Network (AGN), 1996	Road Traffic, 1949	Road Traffic, 1968	Protocol on Road Signs & Signals, 1949	Road Signs & Signals, 1968	Suppl. 1968 Convention Road Traffic, 1971	Suppl.1968 Conv. Road Signs & Signals, 1971	Weights and Dimensions, 1950	Suppl. 1949 Conv. and Protocol, 1950	Road Markings, 1957	Protocol Road Markings, 1973	Issue and Validity of Driving Permits (APC)	Vehicles Regulations, 1958	Techn. Inspect. Vehicles, 1997	Global Vehicles Regulations , 1998	Work of Crews Int. Road Transport (AETR), 1970	Taxation Priv. Road Vehic. , 1956	Taxation Road Passenger Vehic. , 1956	Taxation Road Goods. Vehic. , 1956	Contract Road Goods Transport (CMR) ,1956	Protocol to CMR, 1978	Add'l Protocol to CMR, (e-CMR) 2008	Contract Pass. & Lugg. Rd. Transp. (CVR) , 1973	Protocol to CVR, 1978	Econ. Regulat. Road Transp. , 1954
COUNTRY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Afghanistan																														
Albania		X	X	X			X	X		X	X	X	X		X	X		X	X		X	X	X		X	X				
Algeria							X																							
Andorra																					X									
Antigua and Barbuda																														
Argentina							X																							
Armenia		X						X													X				X	X				
Australia							X											X		X		X								
Austria	X	S	X	X	S	X	X	X	X	X	X	X		X		X		X	S		X	X	X	X	X	X				
Azerbaijan		X						X		X		X				X		X		X	X				X					
Bahamas								X																						
Bahrain								X		X																				
Bangladesh							X																							
Barbados							X																							
Belarus		X	X	X		X		X		X	X	X				X		X	X	X	X				X	X				
Belgium	X	X	X	X			X	X	X	X	X	X	X	X	X	X		X	S		X	S			X	X	S			S

	Inland navigation							Border crossing facilitation																Dangerous goods & special cargoes				
	Collision Inl. Nav. , 1960	Registr. Inl. Nav. Vessels, 1965	Measurement Inl. Nav. Vessels, 1966	Liability Vessel Owners (CLN), 1973	Protocol to CLN, 1978	Contract Inl. Nav. Pass. & Lugg. (CVN) , 1976	Protocol to CVN, 1978	Touring Facilities, 1954	Protocol Touring Facilities, 1954	Temp. Import. Priv. Road Vehicles, 1954	TIR Convention, 1959	TIR Convention, 1975	Temp. Import.Aircraft & Boats, 1956	Temp. Import. Commerc. Vehicles, 1956	Cross. Front. Pass. Bagg. Rail, 1952	Cross. Front. Goods Rail, 1952	Spare Parts Europ Wagons, 1958	Customs Container Convention, 1956	Customs Container Convention, 1972	Customs Treatment Pallets, 1960	Harmoniz. Frontier Controls Goods, 1982	Customs Pool Containers, 1994	SMGS Transit by Rail, 2006	Dang. Goods by Road (ADR) , 1957	Protocol to ADR, 1993	Liabil. Dang. Goods (CRTD) , 1989	Dang. Goods by Inland Waterways (ADN), 2000	Perishable Foodstuffs (ATP), 1970
COUNTRY	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	-	53	54	55	56	57
Afghanistan											X	X		X														
Albania								X	X	X	X	X			X	X				X	X			X	X			X
Algeria								X	X	X		X	X	X				X	X									
Andorra																								X	X			X
Antigua and Barbuda																		X										
Argentina								X	X	S																		
Armenia												X				X			X		X							
Australia								X	X	X								X	X	X								
Austria	X	X				S		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X
Azerbaijan												X		X					X		X			X				X
Bahamas																												
Bahrain																												
Bangladesh																												
Barbados								X	X	X																		
Belarus	X	X	X									X							X		X			X				X
Belgium	S	S	X					X	X	X	X	X	X	X	X	X	X	X		X	X			X	X		X	X

COUNTRY	Construction Traffic Arteries, 1950	E Road Network (AGR), 1975	E Rail Network (AGC), 1985	E Comb. Tr. Network (AGTC), 1991	Protocol Inl. Nav. to AGTC, 1997	E Inl. Water Network (AGN), 1996	Road Traffic, 1949	Road Traffic, 1968	Protocol on Road Signs & Signals, 1949	Road Signs & Signals, 1968	Suppl. 1968 Convention Road Traffic, 1971	Suppl.1968 Conv. Road Signs & Signals, 1971	Weights and Dimensions, 1950	Suppl. 1949 Conv. and Protocol, 1950	Road Markings, 1957	Protocol Road Markings, 1973	Issue and Validity of Driving Permits (APC)	Vehicles Regulations, 1958	Techn. Inspect. Vehicles, 1997	Global Vehicles Regulations , 1998
	Infrastructure networks						Road traffic and road safety											Vehicles		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Benin							X													
Bosnia and Herzegovina	X	X	X			X		X		X	X	X			X	X	X	X		
Botswana							X													
Brazil								X		S										
Bulgaria	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	
Burkina Faso							X		X											
Burundi																				
Cambodia							X		X											
Cameroon																				
Canada							X													X
Central African Republic							X	X		X										
Chile							X	S		X										
China							X1/	S1/		S1/										X
Congo							X													
Costa Rica								S		S										
Côte d'Ivoire							X	X		X										
Croatia		X	X	X		X		X		X	X						X	X		
Cuba							X	X	X	X										
Cyprus							X								X				S	X

COUNTRY	Work of Crews Int. Road Transport (AETR), 1970	Taxation Priv. Road Vehic. , 1956	Taxation Road Passenger Vehic. , 1956	Taxation Road Goods. Vehic. , 1956	Contract Road Goods Transport (CMR) ,1956	Protocol to CMR, 1978	Add'l Protocol to CMR, (e-CMR) 2008	Contract Pass. & Lugg. Rd. Transp. (CVR) , 1973	Protocol to CVR, 1978	Econ. Regulat. Road Transp. , 1954	Collision Inl. Nav. , 1960	Registr. Inl. Nav. Vessels, 1965	Measurement Inl. Nav. Vessels, 1966	Liability Vessel Owners (CLN), 1973	Protocol to CLN, 1978	Contract Inl. Nav. Pass. & Lugg. (CVN) , 1976	Protocol to CVN, 1978
	Other Legal Instruments Related to Road Transport										Inland navigation						
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Benin																	
Bosnia and Herzegovina	X	X	X	X	X			X									
Botswana																	
Brazil																	
Bulgaria	X				X		X						X				
Burkina Faso																	
Burundi																	
Cambodia		X															
Cameroon																	
Canada																	
Central African Republic																	
Chile																	
China																	
Congo																	
Costa Rica																	
Côte d'Ivoire																	
Croatia	X				X			X				X					
Cuba			X	X													
Cyprus	X				X	X											

COUNTRY	Touring Facilities, 1954	Protocol Touring Facilities, 1954	Temp. Import. Priv. Road Vehicles, 1954	TIR Convention, 1959	TIR Convention, 1975	Temp. Import.Aircraft & Boats, 1956	Temp. Import. Commerc. Vehicles, 1956	Cross. Front. Pass. Bagg. Rail, 1952	Cross. Front. Goods Rail, 1952	Spare Parts Europ Wagons, 1958	Customs Container Convention, 1956	Customs Container Convention, 1972	Customs Treatment Pallets, 1960	Harmoniz. Frontier Controls Goods, 1982	Customs Pool Containers, 1994	SMGS Transit by Rail, 2006	Dang. Goods by Road (ADR) , 1957	Protocol to ADR, 1993	Liabil. Dang. Goods (CRTD) , 1989	Dang. Goods by Inland Waterways (ADN), 2000	Perishable Foodstuffs (ATP), 1970
	Border crossing facilitation																Dangerous goods & special cargoes				
	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	-	53	54	55	56	57
Benin																					
Bosnia and Herzegovina	X		X		X		X				X		X	X			X				X
Botswana																					
Brazil																					
Bulgaria	X	X	X	X	X		X				X	X	X	X			X	X		X	X
Burkina Faso																					
Burundi												X									
Cambodia	X	S	S				X				X										
Cameroon											X										
Canada	X		X	X	X						X	X									
Central African Republic	X	X	X																		
Chile	X	X	X		X																
China												X									
Congo																					
Costa Rica	X	X	X																		
Côte d'Ivoire																					
Croatia	X		X		X	X	X				X		X	X			X			X	X
Cuba	X	X	X				X				X	X	X	X	X						
Cyprus	X	X	X	X	X		X							X			X	X			

Legend: X = Ratification, accession, definite signature; S = Signature

CONTENTS

SEARCH

COUNTRY	Infrastructure networks						Road traffic and road safety											Vehicles		
	1 Construction Traffic Arteries, 1950	2 E Road Network (AGR), 1975	3 E Rail Network (AGC), 1985	4 E Comb. Tr. Network (AGTC), 1991	5 Protocol Inl. Nav. to AGTC, 1997	6 E Inl. Water Network (AGN), 1996	7 Road Traffic, 1949	8 Road Traffic, 1968	9 Protocol on Road Signs & Signals, 1949	10 Road Signs & Signals, 1968	11 Suppl. 1968 Convention Road Traffic, 1971	12 Suppl.1968 Conv. Road Signs & Signals, 1971	13 Weights and Dimensions, 1950	14 Suppl. 1949 Conv. and Protocol, 1950	15 Road Markings, 1957	16 Protocol Road Markings, 1973	17 Issue and Validity of Driving Permits (APC)	18 Vehicles Regulations, 1958	19 Techn. Inspect. Vehicles, 1997	20 Global Vehicles Regulations , 1998
Czech Republic	X	X	X	X	X	X	X	X	X	X	X	X			X	X		X	S	
Democratic Rep. of the Congo							X	X		X										
Denmark	X	X		X	X		X	X	X	X	X	X				X		X	S	
Dominican Republic							X		X											
Ecuador							X	S	X	S										
Egypt							X		X											
El Salvador																				
Estonia								X		X	X	X						X	X	
European Union																		X		X
Fiji							X													
Finland	X	X		S		S	X	X	X	X	X	X				X		X	X	X
France	X	X	X	X	S	S	X	X	X	X	X	X		X	X			X	S	X
Georgia		X		X			X	X		X		X				X			S	
Germany	X	X	X	X	S	S		X		X	X	X			X	X		X	S	X
Ghana							X	S		S					X					
Greece	X	X	X	X	S	S	X	X	X	X	X	X	X	X		X		X	S	
Guatemala							X													
Guyana								X		X										
Haiti							X		X											
Holy See							X	S	X	S				X						

COUNTRY	Other Legal Instruments Related to Road Transport										Inland navigation						
	21 Work of Crews Int. Road Transport (AETR), 1970	22 Taxation Priv. Road Vehic. , 1956	23 Taxation Road Passenger Vehic. , 1956	24 Taxation Road Goods. Vehic. , 1956	25 Contract Road Goods Transport (CMR) ,1956	26 Protocol to CMR, 1978	27 Add'l Protocol to CMR, (e-CMR) 2008	28 Contract Pass. & Lugg. Rd. Transp. (CVR) , 1973	29 Protocol to CVR, 1978	30 Econ. Regulat. Road Transp. , 1954	31 Collision Inl. Nav. , 1960	32 Registr. Inl. Nav. Vessels, 1965	33 Measurement Inl. Nav. Vessels, 1966	34 Liability Vessel Owners (CLN), 1973	35 Protocol to CLN, 1978	36 Contract Inl. Nav. Pass. & Lugg. (CVN) , 1976	37 Protocol to CVN, 1978
Czech Republic	X	X	X	X	X	X	X	X					X				
Democratic Rep. of the Congo																	
Denmark	X	X	X	X	X	X				S							
Dominican Republic																	
Ecuador																	
Egypt																	
El Salvador																	
Estonia	X				X	X											
European Union																	
Fiji																	
Finland	X	X	X	X	X	X	S										
France	X	X			X	X				X	X	X	X				
Georgia	X				X	X											
Germany	X	X			X	X		S	S		X	S	X	S	S		
Ghana		X	X	X													
Greece	X				X	X				X							
Guatemala																	
Guyana																	
Haiti																	
Holy See																	

COUNTRY	Border crossing facilitation																Dangerous goods & special cargoes				
	38 Touring Facilities, 1954	39 Protocol Touring Facilities, 1954	40 Temp. Import. Priv. Road Vehicles, 1954	41 TIR Convention, 1959	42 TIR Convention, 1975	43 Temp. Import.Aircraft & Boats, 1956	44 Temp. Import. Commerc. Vehicles, 1956	45 Cross. Front. Pass. Bagg. Rail, 1952	46 Cross. Front. Goods Rail, 1952	47 Spare Parts Europ Wagons, 1958	48 Customs Container Convention, 1956	49 Customs Container Convention, 1972	50 Customs Treatment Pallets, 1960	51 Harmoniz. Frontier Controls Goods, 1982	52 Customs Pool Containers, 1994	- SMGS Transit by Rail, 2006	53 Dang. Goods by Road (ADR) , 1957	54 Protocol to ADR, 1993	55 Liabil. Dang. Goods (CRTD) , 1989	56 Dang. Goods by Inland Waterways (ADN), 2000	57 Perishable Foodstuffs (ATP), 1970
Czech Republic		X		X	X						X	X	X	X	X		X	X		X	X
Democratic Rep. of the Congo																					
Denmark	X	X	X	X	X	X	X			X	X		X	X	S		X	X			X
Dominican Republic	S		S																		
Ecuador	X	X	X																		
Egypt	X	X	X																		
El Salvador	X	X	X																		
Estonia					X									X			X	X			X
European Union			X		X		X							X	X						
Fiji	X	X	X																		
Finland	X	X	X	X	X	X	X				X	X	X	X			X	X			X
France	X	X	X	X	X	X	X	X	X	X	X		X	X			X	X		X	X
Georgia					X							X		X							X
Germany	X	X	X	X	X	X	X			X	X		X	X			X	X	S	X	X
Ghana	X	X	X																		
Greece	X	X		X	X		X				X	S		X			X	X			X
Guatemala	S		S																		
Guyana																					
Haiti	X	X	X																		
Holy See	S	S	S																		

Legend: X = Ratification, accession, definite signature; S = Signature

COUNTRY	1 Construction Traffic Arteries, 1950	2 E Road Network (AGR), 1975	3 E Rail Network (AGC), 1985	4 E Comb. Tr. Network (AGTC), 1991	5 Protocol Inl. Nav. to AGTC, 1997	6 E Inl. Water Network (AGN), 1996	7 Road Traffic, 1949	8 Road Traffic, 1968	9 Protocol on Road Signs & Signals, 1949	10 Road Signs & Signals, 1968	11 Suppl. 1968 Convention Road Traffic, 1971	12 Suppl.1968 Conv. Road Signs & Signals, 1971	13 Weights and Dimensions, 1950	14 Suppl. 1949 Conv. and Protocol, 1950	15 Road Markings, 1957	16 Protocol Road Markings, 1973	17 Issue and Validity of Driving Permits (APC)	18 Vehicles Regulations, 1958	19 Techn. Inspect. Vehicles, 1997	20 Global Vehicles Regulations , 1998	21 Work of Crews Int. Road Transport (AETR), 1970	22 Taxation Priv. Road Vehic. , 1956	23 Taxation Road Passenger Vehic. , 1956	24 Taxation Road Goods. Vehic. , 1956	25 Contract Road Goods Transport (CMR) ,1956	26 Protocol to CMR, 1978	27 Add'l Protocol to CMR, (e-CMR) 2008	28 Contract Pass. & Lugg. Rd. Transp. (CVR) , 1973	29 Protocol to CVR, 1978	30 Econ. Regulat. Road Transp. , 1954	31 Collision Inl. Nav. , 1960	32 Registr. Inl. Nav. Vessels, 1965	33 Measurement Inl. Nav. Vessels, 1966	34 Liability Vessel Owners (CLN), 1973	35 Protocol to CLN, 1978	36 Contract Inl. Nav. Pass. & Lugg. (CVN) , 1976	37 Protocol to CVN, 1978	38 Touring Facilities, 1954	39 Protocol Touring Facilities, 1954	40 Temp. Import. Priv. Road Vehicles, 1954	41 TIR Convention, 1959	42 TIR Convention, 1975	43 Temp. Import.Aircraft & Boats, 1956	44 Temp. Import. Commerc. Vehicles, 1956	45 Cross. Front. Pass. Bagg. Rail, 1952	46 Cross. Front. Goods Rail, 1952	47 Spare Parts Europ Wagons, 1958	48 Customs Container Convention, 1956	49 Customs Container Convention, 1972	50 Customs Treatment Pallets, 1960	51 Harmoniz. Frontier Controls Goods, 1982	52 Customs Pool Containers, 1994	- SMGS Transit by Rail, 2006	53 Dang. Goods by Road (ADR) , 1957	54 Protocol to ADR, 1993	55 Liabil. Dang. Goods (CRTD) , 1989	56 Dang. Goods by Inland Waterways (ADN), 2000	57 Perishable Foodstuffs (ATP), 1970
	Infrastructure networks						Road traffic and road safety											Vehicles			Other Legal Instruments Related to Road Transport										Inland navigation							Border crossing facilitation																Dangerous goods & special cargoes				
Honduras																																						S	S	S																		
Hungary	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X	X	X				X	X					X		X					X	X	X	X	X	X	X				X	X	X	X			X	X		X	X
Iceland							X																																															X				
India							X		S	X										X																		X	X	X																		
Indonesia								S		S																																X							X									
Iran, Islamic Republic of								X		X															X	X												X	X	X	X	X									X							
Iraq										X																																																
Ireland	X						X												S		X	X	X	X	X	X												X	X	X	X	X		X				X			X			X	X			X
Israel							X	X	S																													X	X	X	X	X						X										
Italy	X	X	X	X	S	X	X	X	X	X	X	X	X	X	S	X		X	S	X	X				X	X				X								X	X	X	X	X	X	X	X	X	X	X		X	X	X		X	X		S	X
Jamaica							X																															X	X	X			X					X										
Japan							X											X		X																		X	X	X	X							X										
Legend: X = Ratification, accession, definite signature; S = Signature																																																										
Jordan							X																		X	X												X	X	X	X	X									X							
Kazakhstan		X		X				X		X	X	X				X		X	X	X	X				X						X											X							X		X			X				X
Kenya								X																																																		
Kuwait								X		X																															X	X																
Kyrgyzstan							X	X	X	X															X	X																X		X					X		X							X
Lao People's Dem. Rep.							X																																												X							
Latvia		X	X	X				X		X	X	X						X			X		X	X	X	X	X	X	X													X									X			X	X			X

	Infrastructure networks						Road traffic and road safety											Vehicles			Other Legal Instruments Related to Road Transport										Inland navigation							Border crossing facilitation																Dangerous goods & special cargoes				
	Construction Traffic Arteries, 1950	E Road Network (AGR), 1975	E Rail Network (AGC), 1985	E Comb. Tr. Network (AGTC), 1991	Protocol Inl. Nav. to AGTC, 1997	E Inl. Water Network (AGN), 1996	Road Traffic, 1949	Road Traffic, 1968	Protocol on Road Signs & Signals, 1949	Road Signs & Signals, 1968	Suppl. 1968 Convention Road Traffic, 1971	Suppl.1968 Conv. Road Signs & Signals, 1971	Weights and Dimensions, 1950	Suppl. 1949 Conv. and Protocol, 1950	Road Markings, 1957	Protocol Road Markings, 1973	Issue and Validity of Driving Permits (APC)	Vehicles Regulations, 1958	Techn. Inspect. Vehicles, 1997	Global Vehicles Regulations , 1998	Work of Crews Int. Road Transport (AETR), 1970	Taxation Priv. Road Vehic. , 1956	Taxation Road Passenger Vehic. , 1956	Taxation Road Goods. Vehic. , 1956	Contract Road Goods Transport (CMR) ,1956	Protocol to CMR, 1978	Add'l Protocol to CMR, (e-CMR) 2008	Contract Pass. & Lugg. Rd. Transp. (CVR) , 1973	Protocol to CVR, 1978	Econ. Regulat. Road Transp. , 1954	Collision Inl. Nav. , 1960	Registr. Inl. Nav. Vessels, 1965	Measurement Inl. Nav. Vessels, 1966	Liability Vessel Owners (CLN), 1973	Protocol to CLN, 1978	Contract Inl. Nav. Pass. & Lugg. (CVN) , 1976	Protocol to CVN, 1978	Touring Facilities, 1954	Protocol Touring Facilities, 1954	Temp. Import. Priv. Road Vehicles, 1954	TIR Convention, 1959	TIR Convention, 1975	Temp. Import.Aircraft & Boats, 1956	Temp. Import. Commerc. Vehicles, 1956	Cross. Front. Pass. Bagg. Rail, 1952	Cross. Front. Goods Rail, 1952	Spare Parts Europ Wagons, 1958	Customs Container Convention, 1956	Customs Container Convention, 1972	Customs Treatment Pallets, 1960	Harmoniz. Frontier Controls Goods, 1982	Customs Pool Containers, 1994	SMGS Transit by Rail, 2006	Dang. Goods by Road (ADR) , 1957	Protocol to ADR, 1993	Liabil. Dang. Goods (CRTD) , 1989	Dang. Goods by Inland Waterways (ADN), 2000	Perishable Foodstuffs (ATP), 1970
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	-	53	54	55	56	57
COUNTRY																																																											
Lebanon							X		S																X	X												X	X			X																
Lesotho							X																																												X							
Liberia								X		X																												X	X	X		X							X		X	X				X		
Liechtenstein																					X																																	X	X			
Lithuania		X	X	X		X		X		X	X	X						X		X	X				X	X	X											X	X	X		X		X					X		X	X		X	X			X
Luxembourg	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X		S		S		X	X					X	X	X	X	X	X	X	X	X	X	X		X	X			X	X		X	X
Madagascar							X																																																			
Malawi							X																																									X										
Malaysia							X											X		X																		X	X	X																		
Mali							X																															X	X	X																		
Malta							X											X			X	X			X	X												X	X	X	X	X	X									X		X				
Mauritius																																						X	X	X			X					X										
Mexico								S		S																												X	X	X																		
Monaco							X	X	X		X										X																	S	S	S																		X
Mongolia								X		X															X																	X									X							
Morocco							X	X		X							X							X	X													X	X	X	X	X							X		X			X		S		X
Namibia							X																																																			
Nepal																																						X	X	X																		
Netherlands	X	X		X	X	X	X	X	X	X	X	X	X	X	S	X		X	X	X	X	X	X	X	X	X	X			S	X	X	X					X	X	X	X	X	X	X	X	X	X	X		X	X			X	X		X	X

COUNTRY	Construction Traffic Arteries, 1950	E Road Network (AGR), 1975	E Rail Network (AGC), 1985	E Comb. Tr. Network (AGTC), 1991	Protocol Inl. Nav. to AGTC, 1997	E Inl. Water Network (AGN), 1996	Road Traffic, 1949	Road Traffic, 1968	Protocol on Road Signs & Signals, 1949	Road Signs & Signals, 1968	Suppl. 1968 Convention Road Traffic, 1971	Suppl.1968 Conv. Road Signs & Signals, 1971	Weights and Dimensions, 1950	Suppl. 1949 Conv. and Protocol, 1950	Road Markings, 1957	Protocol Road Markings, 1973	Issue and Validity of Driving Permits (APC)	Vehicles Regulations, 1958	Techn. Inspect. Vehicles, 1997	Global Vehicles Regulations , 1998	Work of Crews Int. Road Transport (AETR), 1970	Taxation Priv. Road Vehic. , 1956	Taxation Road Passenger Vehic. , 1956	Taxation Road Goods. Vehic. , 1956	Contract Road Goods Transport (CMR) ,1956	Protocol to CMR, 1978	Add'l Protocol to CMR, (e-CMR) 2008	Contract Pass. & Lugg. Rd. Transp. (CVR) , 1973	Protocol to CVR, 1978	Econ. Regulat. Road Transp. , 1954	Collision Inl. Nav. , 1960	Registr. Inl. Nav. Vessels, 1965	Measurement Inl. Nav. Vessels, 1966	Liability Vessel Owners (CLN), 1973	Protocol to CLN, 1978	Contract Inl. Nav. Pass. & Lugg. (CVN) , 1976	Protocol to CVN, 1978	Touring Facilities, 1954	Protocol Touring Facilities, 1954	Temp. Import. Priv. Road Vehicles, 1954	TIR Convention, 1959	TIR Convention, 1975	Temp. Import.Aircraft & Boats, 1956	Temp. Import. Commerc. Vehicles, 1956	Cross. Front. Pass. Bagg. Rail, 1952	Cross. Front. Goods Rail, 1952	Spare Parts Europ Wagons, 1958	Customs Container Convention, 1956	Customs Container Convention, 1972	Customs Treatment Pallets, 1960	Harmoniz. Frontier Controls Goods, 1982	Customs Pool Containers, 1994	SMGS Transit by Rail, 2006	Dang. Goods by Road (ADR) , 1957	Protocol to ADR, 1993	Liabil. Dang. Goods (CRTD) , 1989	Dang. Goods by Inland Waterways (ADN), 2000	Perishable Foodstuffs (ATP), 1970
	Infrastructure networks						Road traffic and road safety											Vehicles			Other Legal Instruments Related to Road Transport										Inland navigation							Border crossing facilitation																Dangerous goods & special cargoes				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	-	53	54	55	56	57
New Zealand							X											X		X																		X	X	X									X									
Niger							X	X	X																																																	
Nigeria							X			X																												X	X	X																		
Norway	X	X		X			X	X	S	X								X		X	X	X	X	X	X	X	S			X								X	X	X	X	X		X	X	X		X		X	X			X	X			X
Pakistan								X		X																																																
Panama																																						S	S	S																		
Papua New Guinea							X																																																			
Paraguay							X																																																			
Peru							X	X																														X	X	X																		
Philippines							X	X		X																												X	X	X																		
Poland	X	X	X	X			X	X	X	X	X	X		X		X		X			X	X	X	X	X	X					X							X	X	X	X	X		X				X	X	X	X	X		X	X		X	X
Portugal	X	X	S	X	S		X	S	X	X					X			X	S		X				X	X												X	X	X	X	X	X	X	X	X		X		X	X			X	X			X
Qatar								X																																																		
Republic of Korea							X	S		S								X		X																						X							X									
Republic of Moldova		X	X	X		X		X			X								X	X	X	X			X	X		X					X									X									X			X	X		X	X
Republic of Montenegro	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X			X		S	X	X	X					X	X	X		X	X	X				X	X	X	X			X				X
Romania	X	X	X	X	X	X	X	X	X	X	X	X			X			X	X	X	X	X	X		X	X					X		X					X	X	X	X	X		X				X	X	X	X			X	X		X	X
Russian Federation		X	X	X		X	X	X	X	X	X	X				X		X	X	X	X				X						X		X	X		X		X	X	X	X	X							X		X			X	X		X	X
Rwanda							X		X																													X	X	X																		

Legend: X = Ratification, accession, definite signature; S = Signature

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COUNTRY	1 Construction Traffic Arteries, 1950	2 E Road Network (AGR), 1975	3 E Rail Network (AGC), 1985	4 E Comb. Tr. Network (AGTC), 1991	5 Protocol Inl. Nav. to AGTC, 1997	6 E Inl. Water Network (AGN), 1996	7 Road Traffic, 1949	8 Road Traffic, 1968	9 Protocol on Road Signs & Signals, 1949	10 Road Signs & Signals, 1968	11 Suppl. 1968 Convention Road Traffic, 1971	12 Suppl.1968 Conv. Road Signs & Signals, 1971	13 Weights and Dimensions, 1950	14 Suppl. 1949 Conv. and Protocol, 1950	15 Road Markings, 1957	16 Protocol Road Markings, 1973	17 Issue and Validity of Driving Permits (APC)	18 Vehicles Regulations, 1958	19 Techn. Inspect. Vehicles, 1997	20 Global Vehicles Regulations , 1998	21 Work of Crews Int. Road Transport (AETR), 1970	22 Taxation Priv. Road Vehic. , 1956	23 Taxation Road Passenger Vehic. , 1956	24 Taxation Road Goods. Vehic. , 1956	25 Contract Road Goods Transport (CMR) ,1956	26 Protocol to CMR, 1978	27 Add'l Protocol to CMR, (e-CMR) 2008	28 Contract Pass. & Lugg. Rd. Transp. (CVR) , 1973	29 Protocol to CVR, 1978	30 Econ. Regulat. Road Transp. , 1954
	Infrastructure networks						Road traffic and road safety											Vehicles			Other Legal Instruments Related to Road Transport									
San Marino							X	X	X	X											X									
Saudi Arabia																														
Senegal							X	X	X	X																				
Serbia	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X			X		S
Seychelles								X		X																				
Sierra Leone							X																							
Singapore							X																							
Slovakia	X	X	X	X	S	X	X	X	X	X	X	X			X	X		X	S	X	X	X	X	X	X	X	X	X		
Slovenia	X	X	X	X				X		X	X							X		X	X				X	X				
Solomon Islands																														
South Africa							X	X										X		X										
Spain	X						X	S	X	S				X	X			X	S	X	X				X	X	X			
Sri Lanka							X																							
Sudan																														
Sweden	X	X					X	X	X	X	X	X				X		X	S	X	X	X	X	X	X	X	S			S
Switzerland		X		X	X	X	S	X	S	X	X	X			S	X		X	S		X				X	X	X			S
Syrian Arab Republic							X																		X					
Tajikistan								X		X										X	X				X					
Thailand							X	S	X	S								X												
The FYR of Macedonia		X	X					X		X	X	X				X		X			X				X	X				
Togo							X																							

COUNTRY	31 Collision Inl. Nav. , 1960	32 Registr. Inl. Nav. Vessels, 1965	33 Measurement Inl. Nav. Vessels, 1966	34 Liability Vessel Owners (CLN), 1973	35 Protocol to CLN, 1978	36 Contract Inl. Nav. Pass. & Lugg. (CVN) , 1976	37 Protocol to CVN, 1978	38 Touring Facilities, 1954	39 Protocol Touring Facilities, 1954	40 Temp. Import. Priv. Road Vehicles, 1954	41 TIR Convention, 1959	42 TIR Convention, 1975	43 Temp. Import.Aircraft & Boats, 1956	44 Temp. Import. Commerc. Vehicles, 1956	45 Cross. Front. Pass. Bagg. Rail, 1952	46 Cross. Front. Goods Rail, 1952	47 Spare Parts Europ Wagons, 1958	48 Customs Container Convention, 1956	49 Customs Container Convention, 1972	50 Customs Treatment Pallets, 1960	51 Harmoniz. Frontier Controls Goods, 1982	52 Customs Pool Containers, 1994	- SMGS Transit by Rail, 2006	53 Dang. Goods by Road (ADR) , 1957	54 Protocol to ADR, 1993	55 Liabil. Dang. Goods (CRTD) , 1989	56 Dang. Goods by Inland Waterways (ADN), 2000	57 Perishable Foodstuffs (ATP), 1970
	Inland navigation							Border crossing facilitation																Dangerous goods & special cargoes				
San Marino																												
Saudi Arabia										X				X					X									X
Senegal								X	X	X																		
Serbia	X	X	X					X	X	X		X	X	X				X	X	X	X			X			X	X
Seychelles																												
Sierra Leone								X	X	X			X	X				X										
Singapore									X	X				X														
Slovakia			X						X		X	X						X	X	X	X	X		X	X		X	X
Slovenia								X		X		X	X	X				X		X	X	X		X	X			X
Solomon Islands								X	X	X			X					X										
South Africa																					X							
Spain								X	X	X	X	X	X	X		X		X	X	X	X			X	X			X
Sri Lanka								X		X																		
Sudan										X																		
Sweden								X	X	X	X	X	X	X	S	S		X		X	X	X		X	X			X
Switzerland	X	X	X	S				X	X	X	X	X	X	X	X	X	X	X	X	X	X	S		X	X		X	S
Syrian Arab Republic								X	X	X		X																
Tajikistan												X									X			X				X
Thailand																												
The FYR of Macedonia										X		X		X							X			X				X
Togo																												

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	Infrastructure networks						Road traffic and road safety												Vehicles			Other Legal Instruments Related to Road Transport										Inland navigation				Border crossing facilitation										Dangerous goods & special cargoes									
COUNTRY	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	-	53	54	55	56	57
Tonga																																					X	X	X																	
Trinidad and Tobago							X																														X	X	X		X															
Tunisia	X	X	X				X	X	X	X		X								X					X	X										X	X	X		X															X
Turkey	X	X	X	X			X	X	X		X				X					X	X				X	X										X	X	X		X															X
Turkmenistan								X		X											X					X																														X
Uganda	X						X		X																												X	X																	
Ukraine		X	X	X		X				X	X	X			X			X	X	X	X		X		X	X		X									X																	X
United Arab Emirates							X	X		X																																													
United Kingdom	X	S					X	S	X	S	S	S		X	S				S	X	X	X	X	X	X	X			S							X	X	X		X															X
United Rep. of Tanzania																									X												X	X	X															
United States							X													X																		X	X	X														X
Uruguay								X																														S															
Uzbekistan								X		X											X				X	X														X	X													X
Venezuela							X	S		S	S																																										
Viet Nam							X	X		X																																										
Zimbabwe							X	X		X																																										
TOTAL	27	37	27	32	9	18	96	71	39	63	35	32	8	14	18	27	7	48	12	33	51	20	20	24	55	42	8	9	1	4	13	9	16	1	0	1	79	74	80	37	68	26	41	10	12	9	44	38	57	30	14	0	48	33	1	17	48

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Construction Traffic Arteries, 1950
E Road Network (AGR), 1975
E Rail Network (AGC), 1985
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E Inl. Water Network (AGN), 1996
Road Traffic, 1949
Road Traffic, 1968
Protocol on Road Signs & Signals, 1949
Road Signs & Signals, 1968
Suppl. 1968 Convention Road Traffic, 1971
Suppl.1968 Conv. Road Signs & Signals, 1971
Weights and Dimensions, 1950
Suppl. 1949 Conv. and Protocol, 1950
Road Markings, 1957
Protocol Road Markings, 1973
Issue and Validity of Driving Permits (APC)
Vehicles Regulations, 1958
Techn. Inspect. Vehicles, 1997
Global Vehicles Regulations , 1998
Work of Crews Int. Road Transport (AETR), 1970
Taxation Priv. Road Vehic. , 1956
Taxation Road Passenger Vehic. , 1956
Taxation Road Goods. Vehic. , 1956
Contract Road Goods Transport (CMR) ,1956
Protocol to CMR, 1978
Add'l Protocol to CMR, (e-CMR) 2008
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Temp. Import. Commerc. Vehicles, 1956
Cross. Front. Pass. Bagg. Rail, 1952
Cross. Front. Goods Rail, 1952
Spare Parts Europ Wagons, 1958
Customs Container Convention, 1956
Customs Container Convention, 1972
Customs Treatment Pallets, 1960
Harmoniz. Frontier Controls Goods, 1982
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Liabil. Dang. Goods (CRTD) , 1989
Dang. Goods by Inland Waterways (ADN), 2000
Perishable Foodstuffs (ATP), 1970

Table A1b UN TRANSPORT AGREEMENTS SERVICED BY ESCAP

	Intergovernmental Agreement on the Asian Highway Network, 2003	Intergovernmental Agreement on the Trans-Asian Railway Network (with annexes), 2006	Intergovernmental Agreement on Dry Ports, 2013
	Infrastructure networks		
	1	2	3
COUNTRY			
Afghanistan	X		
Armenia	X	S	S
Azerbaijan	X	S	
Bangladesh	X	X	S
Bhutan	X		
Cambodia	X	X	S
China	X	X	S
Democratic People's Republic of Korea	X	X	
Georgia	X	X	
India	X	X	
Indonesia	X	S	S
Iran (Islamic Republic of)	X	X	S
Japan	X		
Kazakhstan	X	S	
Kyrgyzstan	X		
Lao People's Democratic Republic	X	X	S
Malaysia	S		
Mongolia	X	X	S
Myanmar	X		S
Nepal	X	X	S
Pakistan	X	X	
Philippines	X		
Republic of Korea	X	X	X
Russian Federation	X	X	S
Sri Lanka	X	X	S
Tajikistan	X	X	S
Thailand	X	X	X
Turkey	X	S	S
Uzbekistan	X	X	
Viet Nam	X	X	X

Legend: X = Ratification, accession, definite signature; S = Signature

Table A1c UN TRANSPORT AGREEMENTS SERVICED BY UNESCWA

	Agreement on International Roads in the Arab Mashreq, 2001	Agreement on International Railways in the Arab Mashreq, 2003
	Infrastructure networks	
	1	2
COUNTRY		
Bahrain	X	X
Egypt	X	X
Iraq	X	
Jordan	X	X
Kuwait	X	X
Lebanon	X	X
Qatar	X	
Saudi Arabia	X	X
State of Palestine	X	X
Sudan	X	X
Syrian Arab Republic	X	X
United Arab Emirates	X	X
Yemen	X	X

Legend: X = Ratification, accession, definite signature; S = Signature

ANNEX II

Table A2a. Statistics for 210 countries and territories (The World Bank)

		CO_2 Emissions from Transport excl. marine bunkers and international aviation (million metric tonnes), 2001	CO_2 Emissions from Transport excl. marine bunkers and international aviation (million metric tonnes), 2011	Energy Use per capita for transport, incl. indigenous production plus imports and stock changes (TOE), 2001	Energy Use per capita for transport, incl. indigenous production plus imports and stock changes (TOE), 2011	Nominal GDP (Current billion US $), 2001	Nominal GDP (Current billion US $), 2011	Nominal GDP (Current billion US $), 2012	Average GDP Annual Growth Rate (per cent), 2001-2013
Afghanistan	AFG					2.5	17.9	20.5	9.8
Albania	ALB	1.5	2.3	0.5	0.7	4.1	13.0	12.6	4.1
Algeria	DZA	16.9	32.3	0.8	1.1	54.7	199.1	205.8	3.0
American Samoa	ASM								
Andorra	AND					1.3			4.4
Angola	AGO	1.2	6.8	0.5	0.7	8.9	104.1	114.1	10.7
Antigua and Barbuda	ATG					0.8	1.1	1.1	1.1
Argentina	ARG	36.5	46.9	1.6	2.0	268.7	446.0	475.5	6.9
Armenia	ARM	0.6	1.3	0.7	0.9	2.1	10.1	10.0	9.1
Aruba	ABW					1.9	2.6		-2.7
Australia	AUS	73.7	86.0	5.4	5.5	378.6	1386.9	1532.4	2.9
Austria	AUT	20.0	21.6	3.8	3.9	191.7	415.6	394.7	1.5
Azerbaijan	AZE	2.6	5.8	1.4	1.4	5.7	66.0	66.6	13.2
Bahamas. The	BHS					6.5	7.9	8.1	0.7
Bahrain	BHR	1.6	2.9	8.7	7.4	7.9	29.0		5.3
Bangladesh	BGD	3.8	8.4	0.2	0.2	47.0	111.9	116.4	6.2
Barbados	BRB					3.1	4.4	4.2	1.1
Belarus	BLR	6.1	11.0	2.5	3.1	12.4	64.3	63.3	6.0
Belgium	BEL	25.1	26.4	5.7	5.3	232.5	512.9	483.3	1.1
Belize	BLZ					0.9	1.5		2.8
Benin	BEN	1.0	3.3	0.3	0.4	2.5	7.3	7.6	4.0
Bermuda	BMU					3.7	5.6	5.5	-0.5
Bhutan	BTN					0.5	1.8	1.8	8.7
Bolivia	BOL	2.8	5.9	0.3	0.7	8.1	23.9	27.0	4.9
Bosnia and Herzegovina	BIH	2.1	3.4	1.1	1.8	5.7	18.3	17.5	2.5
Botswana	BWA	1.3	2.1	1.0	1.1	5.5	15.3	14.5	4.7
Brazil	BRA	126.7	181.9	1.1	1.4	553.6	2476.7	2252.7	3.5
Brunei Darussalam	BRN	0.8	1.3	6.5	9.4	5.6	16.4	17.0	0.7

		CO_2 Emissions from Transport excl. marine bunkers and international aviation (million metric tonnes), 2001	CO_2 Emissions from Transport excl. marine bunkers and international aviation (million metric tonnes), 2011	Energy Use per capita for transport, incl. indigenous production plus imports and stock changes (TOE), 2001	Energy Use per capita for transport, incl. indigenous production plus imports and stock changes (TOE), 2011	Nominal GDP (Current billion US $), 2001	Nominal GDP (Current billion US $), 2011	Nominal GDP (Current billion US $), 2012	Average GDP Annual Growth Rate (per cent), 2001-2013
Bulgaria	BGR	5.6	7.9	2.4	2.6	13.9	53.5	51.0	2.7
Burkina Faso	BFA					2.8	10.4	10.4	6.3
Burundi	BDI					0.9	2.4	2.5	4.0
Cambodia	KHM	1.5	2.0	0.3	0.4	4.0	12.8	14.0	7.6
Cameroon	CMR	1.8	2.8	0.4	0.3	9.6	25.5	25.3	3.5
Canada	CAN	146.7	166.0	8.0	7.3	715.4	1777.8	1821.4	1.7
Cape Verde	CPV					0.6	1.9	1.8	5.6
Cayman Islands	CYM								
Central African Republic	CAF					0.9	2.2	2.2	1.4
Chad	TCD					1.7	12.2	12.9	6.1
Channel Islands	CHI					6.2			4.1
Chile	CHL	15.9	21.6	1.6	1.9	72.3	251.2	269.9	4.3
China	CHN	259.3	623.3	0.9	2.0	1324.8	7321.9	8227.1	10.2
Colombia	COL	19.3	23.8	0.6	0.7	98.2	336.6	369.6	4.7
Comoros	COM					0.2	0.6	0.6	2.2
Congo. Dem. Rep.	COD	0.6	1.8	0.4	0.4	4.7	15.7	17.2	6.5
Congo. Rep.	COG	0.5	1.6	0.3	0.4	2.8	14.4	13.7	5.0
Costa Rica	CRI	3.1	4.6	0.7	1.0	16.4	41.0	45.1	4.7
Cote d'Ivoire	CIV	1.3	1.5	0.4	0.6	10.5	24.1	24.7	2.8
Croatia	HRV	4.5	5.8	1.8	2.0	23.1	61.8	59.2	0.5
Cuba	CUB	2.2	1.4	1.1	1.0	31.7	68.2		5.9
Curacao	CUW								
Cyprus	CYP	1.8	2.1	2.2	2.1	9.7	24.9	22.8	1.0
Czech Republic	CZE	12.9	16.5	4.1	4.1	64.4	216.0	196.4	2.3
Denmark	DNK	12.0	12.3	3.6	3.2	160.5	333.6	314.9	0.4
Djibouti	DJI					0.6			4.5
Dominica	DMA					0.3	0.5	0.5	2.4
Dominican Republic	DOM	5.7	4.9	0.8	0.7	24.9	55.7	59.0	6.4
Ecuador	ECU	9.5	16.0	0.7	0.8	24.5	76.8	84.0	4.3
Egypt. Arab Rep.	EGY	27.3	40.0	0.7	1.0	97.6	236.0	262.8	4.6
El Salvador	SLV	2.5	3.1	0.7	0.7	13.8	23.1	23.9	1.8

		CO_2 Emissions from Transport excl. marine bunkers and international aviation (million metric tonnes), 2001	CO_2 Emissions from Transport excl. marine bunkers and international aviation (million metric tonnes), 2011	Energy Use per capita for transport, incl. indigenous production plus imports and stock changes (TOE), 2001	Energy Use per capita for transport, incl. indigenous production plus imports and stock changes (TOE), 2011	Nominal GDP (Current billion US $), 2001	Nominal GDP (Current billion US $), 2011	Nominal GDP (Current billion US $), 2012	Average GDP Annual Growth Rate (per cent), 2001-2013
Equatorial Guinea	GNQ					1.7	16.8	17.7	3.8
Eritrea	ERI	0.3	0.2	0.2	0.1	0.8	2.6	3.1	1.8
Estonia	EST	2.0	2.2	3.6	4.2	6.2	22.5	22.4	2.8
Ethiopia	ETH	1.9	2.9	0.4	0.4	8.1	29.9	41.6	10.0
Faeroe Islands	FRO					1.2			
Fiji	FJI					1.7	3.8	3.9	0.9
Finland	FIN	11.9	12.3	6.4	6.4	124.6	262.1	247.5	0.9
France	FRA	133.5	122.1	4.2	3.9	1338.3	2779.7	2612.9	0.8
French Polynesia	PYF								
Gabon	GAB	0.3	0.5	1.3	1.3	4.7	18.8	18.4	3.7
Gambia. The	GMB					0.7	0.9	0.9	3.3
Georgia	GEO	1.1	2.3	0.6	0.8	3.2	14.4	15.7	5.8
Germany	DEU	168.0	148.7	4.2	3.8	1880.9	3624.9	3428.1	1.3
Ghana	GHA	2.8	5.5	0.4	0.4	5.3	39.6	40.7	7.7
Greece	GRC	19.7	19.5	2.6	2.4	129.8	289.6	249.1	-1.6
Greenland	GRL					1.1			1.4
Grenada	GRD					0.5	0.8	0.8	1.5
Guam	GUM								
Guatemala	GTM	4.1	5.5	0.6	0.7	18.7	47.7	50.2	3.6
Guinea	GIN					2.8	5.1	5.6	2.7
Guinea-Bissau	GNB					0.4	1.0	0.8	2.3
Guyana	GUY					0.7	2.6	2.9	2.8
Haiti	HTI	0.8	1.1	0.2	0.3	3.5	7.3	7.8	2.0
Honduras	HND	2.2	3.1	0.5	0.6	7.6	17.6	18.4	3.8
Hungary	HUN	9.2	11.3	2.5	2.5	52.7	137.4	124.6	0.5
Iceland	ISL	0.6	0.8	11.4	18.0	7.9	14.0	13.6	1.8
India	IND	93.9	169.9	0.4	0.6	494.0	1872.8	1841.7	7.3
Indonesia	IDN	69.2	114.8	0.7	0.9	160.4	846.3	878.0	5.9
Iran. Islamic Rep.	IRN	79.5	117.2	2.0	2.8	115.4	514.1		2.8
Iraq	IRQ	28.8	34.2	1.1	1.3	18.9	180.6	210.3	4.6
Ireland	IRL	10.7	10.5	3.7	2.9	105.2	225.8	210.8	1.2

		CO_2 Emissions from Transport excl. marine bunkers and international aviation (million metric tonnes), 2001	CO_2 Emissions from Transport excl. marine bunkers and international aviation (million metric tonnes), 2011	Energy Use per capita for transport, incl. indigenous production plus imports and stock changes (TOE), 2001	Energy Use per capita for transport, incl. indigenous production plus imports and stock changes (TOE), 2011	Nominal GDP (Current billion US $), 2001	Nominal GDP (Current billion US $), 2011	Nominal GDP (Current billion US $), 2012	Average GDP Annual Growth Rate (per cent), 2001-2013
Isle of Man	IMN					1.6			7.0
Israel	ISR	9.4	11.1	3.0	3.0	122.9	258.2		4.2
Italy	ITA	117.7	108.2	3.0	2.8	1123.7	2195.0	2014.7	-0.4
Jamaica	JAM	1.9	2.1	1.5	1.1	9.1	14.4	14.8	-0.4
Japan	JPN	258.4	219.7	4.0	3.6	4159.9	5896.8	5959.7	0.7
Jordan	JOR	3.7	5.3	1.0	1.1	9.0	28.8	31.0	5.3
Kazakhstan	KAZ	8.1	12.5	2.3	4.7	22.2	188.0	203.5	6.6
Kenya	KEN	2.7	4.7	0.4	0.5	13.0	33.6	40.7	4.8
Kiribati	KIR					0.1	0.2	0.2	1.4
Korea. Dem. Rep.	PRK	1.6	1.3	0.9	0.8				
Korea. Rep.	KOR	80.9	85.6	4.0	5.2	504.6	1114.5	1129.6	3.5
Kosovo*	KSV	0.7	1.0	1.1	1.4	2.5	6.6	6.4	4.6
Kuwait	KWT	6.1	11.6	10.1	10.4	34.9	160.9		3.4
Kyrgyz Republic	KGZ	0.9	2.8	0.4	0.6	1.5	6.2	6.5	4.2
Lao PDR	LAO					1.8	8.3	9.4	8.0
Latvia	LVA	2.5	3.1	1.7	2.1	8.3	28.5	28.4	2.7
Lebanon	LBN	3.7	5.0	1.6	1.4	17.6	40.1	42.9	4.4
Lesotho	LSO					0.7	2.5	2.4	4.7
Liberia	LBR					0.5	1.5	1.7	11.2
Libya	LBY	11.4	12.0	3.1	2.2	28.4			3.1
Liechtenstein	LIE					2.5			3.5
Lithuania	LTU	3.3	4.2	2.4	2.4	12.2	42.9	42.3	3.1
Luxembourg	LUX	5.1	6.9	7.9	8.0	20.2	58.0	55.2	1.9
Macedonia. FYR	MKD	1.0	1.4	1.2	1.5	3.4	10.4	9.6	3.1
Madagascar	MDG					4.5	9.9	10.0	2.9
Malawi	MWI					1.7	5.6	4.3	3.7
Malaysia	MYS	33.6	43.0	2.1	2.6	92.8	289.3	305.0	4.8
Maldives	MDV					0.8	2.2	2.2	5.7
Mali	MLI					2.6	10.7	10.3	4.2
Malta	MLT	0.4	0.5	2.0	2.1	3.9	9.2	8.7	2.3
Marshall Islands	MHL					0.1	0.2	0.2	1.5

* This designation is without prejudice to positions on status, and in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

		CO_2 Emissions from Transport excl. marine bunkers and international aviation (million metric tonnes), 2001	CO_2 Emissions from Transport excl. marine bunkers and international aviation (million metric tonnes), 2011	Energy Use per capita for transport, incl. indigenous production plus imports and stock changes (TOE), 2001	Energy Use per capita for transport, incl. indigenous production plus imports and stock changes (TOE), 2011	Nominal GDP (Current billion US $), 2001	Nominal GDP (Current billion US $), 2011	Nominal GDP (Current billion US $), 2012	Average GDP Annual Growth Rate (per cent), 2001-2013
Mauritania	MRT					1.3	4.3	4.2	6.1
Mauritius	MUS					4.5	11.3	10.5	3.8
Mexico	MEX	107.3	152.0	1.4	1.6	733.5	1159.9	1178.1	2.4
Micronesia. Fed. Sts.	FSM					0.2	0.3	0.3	0.4
Moldova	MDA	0.5	1.1	0.8	0.9	1.5	7.0	7.3	4.3
Monaco	MCO					2.7	6.1		7.9
Mongolia	MNG	0.9	1.6	1.0	1.3	1.3	8.8	10.3	9.1
Montenegro	MNE		0.6		1.9	1.2	4.5	4.4	3.7
Morocco	MAR	8.5	14.3	0.4	0.5	37.7	99.2	96.0	4.6
Mozambique	MOZ	0.8	1.9	0.4	0.4	4.1	12.6	14.2	7.2
Myanmar	MMR	2.8	2.3	0.3	0.3				
Namibia	NAM	1.3	1.8	0.6	0.7	3.5	12.6	13.1	4.3
Nepal	NPL	0.7	1.9	0.4	0.4	6.0	19.1	19.0	4.2
Netherlands	NLD	32.6	33.4	4.7	4.6	400.7	832.0	770.6	0.9
New Caledonia	NCL								
New Zealand	NZL	12.0	13.5	4.4	4.1	53.3	162.6	167.3	1.6
Nicaragua	NIC	1.5	1.7	0.5	0.5	5.3	9.6	10.5	3.8
Niger	NER					1.9	6.4	6.8	5.3
Nigeria	NGA	26.3	23.6	0.8	0.7	44.1	245.7	262.6	6.5
Northern Mariana Islands	MNP								
Norway	NOR	12.1	13.6	5.9	5.7	170.9	491.1	499.7	1.3
Oman	OMN	2.9	8.8	3.8	8.4	19.9	70.0		5.1
Pakistan	PAK	26.7	36.2	0.4	0.5	72.3	213.9	225.1	4.2
Palau	PLW					0.2	0.2	0.2	-0.3
Panama	PAN	2.2	3.6	0.9	1.1	11.8	31.3	36.3	8.8
Papua New Guinea	PNG					3.1	12.4	15.7	6.2
Paraguay	PRY	3.0	4.5	0.7	0.7	7.7	26.0	25.5	4.9
Peru	PER	9.0	16.9	0.4	0.7	53.9	181.0	203.8	6.9
Philippines	PHL	26.4	23.3	0.5	0.4	76.3	224.1	250.2	5.2
Poland	POL	27.0	47.4	2.3	2.6	190.4	515.7	489.8	3.9
Portugal	PRT	17.9	17.1	2.4	2.2	120.3	237.7	212.3	-0.3

		CO_2 Emissions from Transport excl. marine bunkers and international aviation (million metric tonnes), 2001	CO_2 Emissions from Transport excl. marine bunkers and international aviation (million metric tonnes), 2011	Energy Use per capita for transport, incl. indigenous production plus imports and stock changes (TOE), 2001	Energy Use per capita for transport, incl. indigenous production plus imports and stock changes (TOE), 2011	Nominal GDP (Current billion US $), 2001	Nominal GDP (Current billion US $), 2011	Nominal GDP (Current billion US $), 2012	Average GDP Annual Growth Rate (per cent), 2001-2013
Puerto Rico	PRI					69.2	98.8	101.5	-1.0
Qatar	QAT	2.6	14.5	20.4	17.4	17.5	171.5		12.8
Romania	ROU	11.5	14.1	1.7	1.7	40.2	189.8	192.7	3.0
Russian Federation	RUS	194.0	247.5	4.3	5.1	306.6	1899.1	2014.8	3.8
Rwanda	RWA					1.7	6.4	7.1	7.8
Samoa	WSM					0.2	0.6	0.7	1.3
San Marino	SMR					0.8			2.9
Sao Tome and Principe	STP					0.1	0.2	0.3	4.4
Saudi Arabia	SAU	62.1	109.2	5.1	6.7	183.0	669.5	711.0	6.0
Senegal	SEN	1.2	2.1	0.3	0.3	4.9	14.4	14.0	3.7
Serbia	SRB	3.7	5.7	2.0	2.2	11.4	43.3	37.5	2.0
Seychelles	SYC					0.6	1.1	1.1	5.1
Sierra Leone	SLE					1.1	2.9	3.8	8.2
Singapore	SGP	6.0	8.1	5.1	6.5	91.1	245.0	274.7	5.7
Slovak Republic	SVK	5.3	7.1	3.5	3.2	30.3	95.9	91.1	4.0
Slovenia	SVN	3.7	5.6	3.4	3.5	20.5	50.3	45.3	1.2
Solomon Islands	SLB					0.4	0.9	1.0	5.8
Somalia	SOM								
South Africa	ZAF	36.1	51.2	2.5	2.8	118.5	401.8	384.3	3.3
South Sudan	SSD						19.1	10.2	-2.6
Spain	ESP	94.0	91.3	3.1	2.7	608.9	1453.2	1323.0	0.6
Sri Lanka	LKA	5.2	7.2	0.4	0.5	15.7	59.2	59.4	6.7
St. Kitts & Nevis	KNA					0.5	0.7	0.8	2.6
St. Lucia	LCA					0.7	1.3	1.2	1.8
St. Vincent & the Grenadines	VCT					0.4	0.7	0.7	1.7
Sudan	SDN	3.5	7.6	0.4	0.4	13.2	64.0	58.8	2.2
Suriname	SUR					0.8	4.4	5.0	4.3
Swaziland	SWZ					1.3	4.0	3.7	1.8
Sweden	SWE	21.2	22.4	5.7	5.2	227.4	536.3	523.8	1.9
Switzerland	CHE	16.1	16.9	3.7	3.2	262.6	657.4	631.2	2.0
Syrian Arab Republic	SYR	8.0	11.9	0.9	0.9	21.1		73.7	5.1

		CO_2 Emissions from Transport excl. marine bunkers and international aviation (million metric tonnes), 2001	CO_2 Emissions from Transport excl. marine bunkers and international aviation (million metric tonnes), 2011	Energy Use per capita for transport, incl. indigenous production plus imports and stock changes (TOE), 2001	Energy Use per capita for transport, incl. indigenous production plus imports and stock changes (TOE), 2011	Nominal GDP (Current billion US $), 2001	Nominal GDP (Current billion US $), 2011	Nominal GDP (Current billion US $), 2012	Average GDP Annual Growth Rate (per cent), 2001-2013
Syrian Arab Republic	SYR	8.0	11.9	0.9	0.9	21.1		73.7	5.1
Tajikistan	TJK	0.1	0.3	0.3	0.3	1.1	6.5	7.0	6.9
Tanzania	TZA	1.7	3.2	0.4	0.4	10.4	23.9	28.2	6.9
Thailand	THA	44.9	58.3	1.2	1.8	115.5	345.7	366.0	3.4
Timor-Leste	TLS					0.4	1.1	1.3	8.1
Togo	TGO	0.3	1.0	0.4	0.4	1.3	3.7	3.8	3.6
Tonga	TON					0.2	0.4	0.5	0.9
Trinidad and Tobago	TTO	1.6	2.8	9.2	15.7	8.8	23.6	23.3	2.8
Tunisia	TUN	4.1	5.7	0.8	0.9	22.1	46.4	45.7	3.4
Turkey	TUR	33.3	45.7	1.1	1.5	196.0	774.8	789.3	4.4
Turkmenistan	TKM	5.3	7.2	3.3	4.8	3.5	29.2	35.2	11.2
Turks and Caicos Islands	TCA								
Tuvalu	TUV					0.0	0.0	0.0	1.7
Uganda	UGA					5.8	16.8	19.9	7.0
Ukraine	UKR	28.2	32.6	2.8	2.8	38.0	163.4	176.3	1.9
United Arab Emirates	ARE	16.1	30.9	11.9	7.4	103.3	348.6		3.3
United Kingdom	GBR	121.1	116.8	3.8	3.0	1485.1	2478.9	2471.8	0.9
United States	USA	1709.8	1638.1	7.8	7.0	10625.3	15533.8	16244.6	1.5
Uruguay	URY	2.4	3.2	0.8	1.3	20.9	46.4	49.9	1.8
Uzbekistan	UZB	10.2	7.9	2.0	1.6	11.4	45.3	51.1	8.2
Vanuatu	VUT					0.3	0.8	0.8	4.1
Venezuela. RB	VEN	36.4	43.0	2.3	2.4	122.9	316.5	381.3	4.5
Viet Nam	VNM	11.2	32.9	0.4	0.7	35.3	135.5	155.8	6.2
Virgin Islands (U.S.)	VIR								
West Bank and Gaza	PSE					3.3			6.3
Yemen. Rep.	YEM	4.8	5.8	0.3	0.3	9.9	31.7	35.6	2.3
Zambia	ZMB	0.8	0.7	0.6	0.6	3.7	19.2	20.7	6.4
Zimbabwe	ZWE	1.7	1.3	0.8	0.7	6.8	8.9	9.8	0.2

Table A2b. Statistics for 210 countries and territories (The World Bank, UNECE, OECD)

		GINI Index (0-perfect equality, 100 - perfect inequality), 2010 or latest	Logistics performance index (1=low to 5=high), 2014	Paved Roads (per cent of total), 2011 or latest	Change in Population Older than 65 years old (per cent), 2003-2013	Road Density (km of road per 100 sq. km of land area), 2011 or latest	Rail Density (km of lines operated per 1,000 sq. km), 2012 or latest	Total trade- sum of merchandise and services exports and imports, (per cent of GDP), 2012	Investment in Inland Transport Infrastructure (per cent of GDP), 2011 or latest	Private Investment in Inland Transport Infrastructure (billion US $), 2000-2012
Afghanistan	AFG	27.82 ('08)	2.1	36.4 ('10)	16.0	4 ('10)		25.9		
Albania	ALB	34.51 ('08)	2.4('10)	39.0 ('02)	37.3	63 ('02)		86.1	2.3	0.3
Algeria	DZA	35.30 ('95)	2.6	77.1 ('10)	9.2	5 ('10)		65.4		0.3
American Samoa	ASM									
Andorra	AND									
Angola	AGO	42.66 ('09)	2.5	10.4 ('01)	-2.4	4 ('01)		105.0		0.1
Antigua and Barbuda	ATG			33.0 ('02)	0.1			112.2		
Argentina	ARG	44.49	3.0	32.2	8.3	9		38.6		1.9
Armenia	ARM	31.30	2.7	93.6 ('09)	-7.4	26		78.8		0.8
Aruba	ABW				39.5					
Australia	AUS	35.20 ('98)	3.8	43.3	12.6	11		41.7	1.8	
Austria	AUT	29.15 ('00)	3.6	100.0	16.8	137	99 ('07)	112.3	0.8	
Azerbaijan	AZE	33.71 ('08)	2.4	55.6	-9.8	22	24 ('10)	81.3	3.4	
Bahamas, The	BHS		2.9	57.4 ('01)	30.6	19 ('01)		107.4		
Bahrain	BHR		3.1	83.7	-4.6	546				
Bangladesh	BGD	32.12	2.6	9.5 ('03)	14.0	15 ('09)		58.2		
Barbados	BRB			100.0 ('04)	-2.9	372 ('01)				
Belarus	BLR	26.48 ('11)	2.6	86.5	-3.5	42	5 ('11)	162.1		0.0
Belgium	BEL	32.97 ('00)	4.0	78.2	4.4	504	211 ('09)	221.4	0.8 ('09)	
Belize	BLZ			17.0 ('01)	-4.7	13 ('01)				0.0
Benin	BEN	38.62 ('04)	2.6	9.5 (04)	2.3	17 ('01)		47.6		0.5
Bermuda	BMU							43.6		
Bhutan	BTN	38.73 ('12)	2.3	34.2	20.9	22		104.0		
Bolivia	BOL	56.29 ('08)	2.5	11.6	13.5	7		81.7		0.0
Bosnia and Herzegovina	BIH	36.21 ('07)	2.7	92.1 ('10)	27.9	45		102.9		

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Botswana	BWA	61,00 ('94)	2.5	32.6 ('05)	17.2	4 ('05)		103.4		
Brazil	BRA	54.69 ('09)	2.9	13.5	27.8	19		26.5		59.2
Brunei Darussalam	BRN			82.3	41.9	54		100.0		
Bulgaria	BGR	28.19 ('07)	3.2	98.6	12.8	18	51	139.4	1.1	0.5
Burkina Faso	BFA	39.79 ('09)	2.6	20.6	-7.0	6		52.7		
Burundi	BDI	33.27 ('06)	2.6	10.4 ('04)	-14.3	44 ('04)		49.1		
Cambodia	KHM	36.03 ('09)	2.7	6.3 ('04)	29.2	22 ('09)		165.7		0.2
Cameroon	CMR	38.91 ('07)	2.3	10.1 ('10)	-3.4	6 ('08)		61.2		
Canada	CAN	32.56 ('00)	3.9	39.9 ('04)	18.1	10 ('10)	7 ('09)	61.6	1.3	
Cape Verde	CPV	50.52 ('02)		69.0 ('01)	-5.2	33 ('01)		93.5		
Cayman Islands	CYM			97.9		184				
Central African Republic	CAF	56.30 ('08)	2.4	6.8 ('10)	-3.3	3 ('10)		24.8		
Chad	TCD	39.78 ('03)	2.5	0.8 ('00)	-11.8	3 ('06)		59.0		
Channel Islands	CHI				13.6			0.0		
Chile	CHL	52.06 ('09)	3.3	23.8	29.7	10		69.2		7.9
China	CHN	42.06 ('09)	3.5	63.7	20.6	43		52.8		33.7
Colombia	COL	55.91	2.6		25.3	19		36.5		6.0
Comoros	COM	64.30 ('04)	2.4	76.5 ('01)	-6.2	39 ('01)		54.5		0.0
Congo, Dem. Rep.	COD	44.43 ('06)	1.9	1.8 ('04)	1.6	7 ('04)		69.4		
Congo, Rep.	COG	47.32 ('05)	2.1	7.1 ('06)	-4.5	5 ('06)		118.4		0.7
Costa Rica	CRI	50.73 ('09)	2.7	26.0	23.4	83		84.8		0.9
Cote d'Ivoire	CIV	41.50 ('08)	2.8	7.9 ('07)	8.6	25 ('07)		89.7		0.2
Croatia	HRV	33.65 ('08)	3.1	91.1	10.2	52	73 ('11)	85.4	1.2	
Cuba	CUB		2.2	49.0 ('01)	26.9	55 ('01)				
Curacao	CUW				22.7					
Cyprus	CYP		3.0	65.8	17.1	141		86.6		
Czech Republic	CZE		3.5	100.0 ('04)	19.8	166	198	173.7	1.1	

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Denmark	DNK		3.8	100.0	20.1	172		102.4	0.6 ('10)	
Djibouti	DJI	39.96 ('02)	2.1	45.0 ('01)	23.6	14 ('01)				0.6
Dominica	DMA			81.9 ('10)		121 ('10)		93.9		
Dominican Republic	DOM	47.20	2.9	49.4 ('01)	15.0	26 ('01)		62.5		1.8
Ecuador	ECU	49.26	2.7	14.8 ('07)	20.3	17 ('07)		64.1		1.5
Egypt, Arab Rep.	EGY	30.77 ('08)	3.0	92.2 ('10)	6.3	14 ('10)		53.1		2.2
El Salvador	SLV	48.33 ('09)	3.0	53.1	20.1	35		78.6		
Equatorial Guinea	GNQ		2.4		-18.6	10 ('01)		121.5		
Eritrea	ERI		2.1	21.8 ('01)	18.9	3 ('01)		45.9		
Estonia	EST	36.00 ('04)	3.3	18.2	10.9	129	48	197.4	1.6	
Ethiopia	ETH	33.60 ('11)	2.6	13.7 ('07)	11.0	4 ('07)		50.0		
Faeroe Islands	FRO									
Fiji	FJI	42.83 ('09)	2.5	49.2 ('01)	42.2	19 ('01)		87.3		
Finland	FIN	26.88 ('00)	3.6	65.8	22.6	23	26 ('11)	81.6	0.7	
France	FRA	32.70 ('95)	3.8	100.0	9.5	192	93 ('09)	61.9	0.9	
French Polynesia	PYF				54.7					
Gabon	GAB	41.45 ('05)	2.2	12.0 ('07)	-10.2	3 ('07)		85.2		0.2
Gambia, The	GMB	47.28 ('03)	2.2	19.3 ('04)	-7.8	33 ('04)		77.6		
Georgia	GEO	42.10	2.5	94.1 ('07)	3.7	27	34 ('10)	90.0	4.5	0.6
Germany	DEU	28.31 ('00)	4.1	100.0 ('03)	18.4	180	116	92.4	0.6	
Ghana	GHA	42.76 ('06)	2.6	12.6 ('09)	7.6	46 ('09)		92.1		0.0
Greece	GRC	34.27 ('00)	3.2	92.0 ('00)	9.4	89	23 ('08)	58.6	1.0 ('07)	
Greenland	GRL									
Grenada	GRD			61.0 ('01)	-7.8	306 ('01)		79.5		
Guam	GUM				34.8					
Guatemala	GTM	55.89 ('06)	2.8	44.8	8.1	15		62.8		
Guinea	GIN	39.35 ('07)	2.5	9.8 ('03)	-6.1	18		73.3		0.2

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Guinea-Bissau	GNB	35.52 ('02)	2.4	27.9 ('02)	-3.3	12 ('02)		42.3		
Guyana	GUY	44.50 ('98)	2.5	7.4 ('01)	-16.1	4 ('01)		141.0		
Haiti	HTI	59.21 ('01)	2.3	24.3 ('01)	10.8	15 ('01)		64.3		
Honduras	HND	56.95 ('09)	2.6	20.4 ('01)	9.3	12 ('01)		126.3		0.1
Hungary	HUN	31.18 ('07)	3.5	37.9	11.3	216	99 ('10)	189.0	1.2 ('10)	
Iceland	ISL		3.4	40.7	9.6	13		114.7	0.4	
India	IND	33.90	3.1	53.8	15.4	143		57.4	0.2	79.6
Indonesia	IDN	38.14 ('11)	3.1	57.0	8.5	26		49.7		3.9
Iran, Islamic Rep.	IRN	38.28 ('05)		74.3	13.4	13				
Iraq	IRQ	30.86 ('07)	2.3	84.3 ('01)	-8.3	10 ('10)		79.7		0.5
Ireland	IRL	34.28 ('00)	3.9	100.0 ('10)	8.6	137 ('10)	27 ('10)	189.2	0.9 ('07)	
Isle of Man	IMN									
Israel	ISR	39.20 ('01)	3.3	100.0	7.2	84	41 ('06)			
Italy	ITA	36.03 ('00)	3.7	100.0 ('03)	10.3	162 ('05)	80 ('11)	59.4	0.5 ('10)	
Jamaica	JAM	45.51 ('04)	2.8	73.3 ('05)	4.1	201		87.8		0.9
Japan	JPN		3.9	78.2 ('03)	33.7	90		33.6	1.1 ('10)	
Jordan	JOR	35.43	2.9	100.0	12.6	8		124.4		1.4
Kazakhstan	KAZ	29.04 ('09)	2.7	88.7	-9.6	4	5 ('07)	76.6		0.3
Kenya	KEN	47.68 ('05)	2.8	7.0	-2.7	28		78.2		0.4
Kiribati	KIR				17.7	92 ('01)		62.6		
Korea, Dem. Rep.	PRK			2.8 ('06)	39.1	21 ('06)				
Korea, Rep.	KOR	31.6 ('98)	3.7	80.4	43.3	106		113.9	0 ('08)	
Kosovo*	KSV			26.0 ('10)		64 ('10)		19.0		0.1
Kuwait	KWT		3.0	85.0 ('04)	-32.2	39				
Kyrgyz Republic	KGZ	33.38 ('11)	2.2	91.1 ('01)	-26.4	17 ('07)	2 ('08)	154.9		
Lao PDR	LAO	36.74 ('08)	2.4	13.7 ('09)	2.4	17		64.6		0.0
Latvia	LVA	34.81 ('09)	3.4	20.9 ('09)	13.9	108	33	134.9	1.4	

* This designation is without prejudice to positions on status, and in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

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Lebanon	LBN		2.7		18.8	67 ('05)		144.6		0.2
Lesotho	LSO	52.50 ('03)	2.4	53.0 ('05)	-9.0	20 ('01)		172.6		
Liberia	LBR	38.16 ('07)	2.6	6.2 ('01)	-0.1	10 ('01)		86.3		0.1
Libya	LBY		2.5	57.2 ('01)	16.1	5 ('01)				
Liechtenstein	LIE								0.9 ('05)	
Lithuania	LTU	37.57 ('08)	3.2	30.1	6.5	127	33 ('11)	172.8	1.5	
Luxembourg	LUX	30.76 ('00)	3.9	100.0 ('04)	-0.9	202 ('04)	106 ('09)	289.5	0.9	
Macedonia, FYR	MKD	43.56	2.5	58.3	14.2	54	36 ('11)	133.4	0.5	0.3
Madagascar	MDG	44.11	2.4	16.3	-4.4	6		45.6		0.1
Malawi	MWI	43.91	2.8	45.0 ('03)	5.0	13 ('03)		93.6		
Malaysia	MYS	46.21 ('09)	3.6	80.9	29.0	47		166.0		5.9
Maldives	MDV	37.37 ('04)	2.7	100.0 ('05)	15.2	29 ('05)		201.2		0.5
Mali	MLI	33.02	2.5	24.6 ('09)	-13.2	2 ('09)		49.5		0.1
Malta	MLT		3.1	87.5 ('08)	32.4	968 ('08)		208.4	0.1 ('05)	
Marshall Islands	MHL							93.6		
Mauritania	MRT	40.46 ('08)	2.2	34.6	0.4	1		126.2		
Mauritius	MUS		2.5	98.0 ('09)	36.0	102 ('10)		130.6		
Mexico	MEX	47.16	3.1	37.8	24.6	19		67.8	0.5	17.6
Micronesia, Fed. Sts.	FSM	61.10 ('00)		17.5 ('01)	3.7	34 ('01)		74.9		
Moldova	MDA	33.03	2.7	86.2	5.4	38	34 ('10)	129.8	0.1	0.1
Monaco	MCO			100.0 ('10)		3850('10)				
Mongolia	MNG	36.52 ('08)	2.4	3.5 ('02)	2.9	1 ('09)		137.8		
Montenegro	MNE	28.58	2.9	70.4	4.7	57		104.3	0.5	
Morocco	MAR	40.88 (07)		70.6	1.8	13		92.2		0.4
Mozambique	MOZ	45.66 ('08)	2.2	20.8 ('09)	3.3	4 ('09)		111.7		0.3
Myanmar	MMR		2.2	45.7	7.8	6				
Namibia	NAM	63.90 ('04)	2.7	14.5 ('10)	7.3	6		84.7		

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Nepal	NPL	32.82	2.6	53.9 ('08)	24.6	14 ('08)		48.0		
Netherlands	NLD		4.0	90.0 ('00)	23.4	331	68 ('05)	187.4	0.6	
New Caledonia	NCL				56.2	30 ('06)				
New Zealand	NZL	36.20 ('97)	3.6	66.2	17.6	35		13.8	0.7	
Nicaragua	NIC	40.47 ('05)	2.7	13.3	17.8	18		98.2		0.1
Niger	NER	34.55 ('08)	2.4	20.6 ('08)	3.8	2 ('10)		67.0		
Nigeria	NGA	48.83	2.8	15.0 ('04)	-0.4	21 ('04)		72.9		3.4
Northern Mariana Islands	MNP									
Norway	NOR	25.79 ('00)	4.0	80.7 ('10)	6.6	29	13	66.6	0.9	
Oman	OMN		3.0	49.3	14.6	19				
Pakistan	PAK	30.02 ('08)	2.8	72.6	8.3	33		36.3		2.2
Palau	PLW							64.4		
Panama	PAN	51.92	3.2	41.8	23.6	20		143.8		0.1
Papua New Guinea	PNG		2.4	3.5 ('01)	13.8	4 ('01)		76.7		
Paraguay	PRY	52.42	2.8	15.6	18.4	8		80.0		
Peru	PER	48.14	2.8	13.3	23.8	10		50.5		5.7
Philippines	PHL	42.98 ('09)	3.0	9.9 ('03)	16.7	67 ('03)		60.2		2.3
Poland	POL	32.73 ('11)	3.5	68.0	11.4	132	120	91.7	2.5	
Portugal	PRT	32.73 ('97)	3.6	86.0 ('04)	11.8	24	28	79.2	1.1 ('10)	
Puerto Rico	PRI			95.0 ('04)	17.5	303 ('10)				
Qatar	QAT	41.10 ('07)	3.5	90.0 ('00)	-34.1	79				
Romania	ROU	27.42 ('11)	3.3	56.5 ('09)	5.6	47	84	86.2	2.9	0.1
Russian Federation	RUS	40.11 ('09)	2.7	67.4 ('99)	-2.4	6	5 ('08)	51.4	1.4	9.3
Rwanda	RWA	50.82 ('11)	2.8	19.0 ('04)	-13.1	53 ('04)		48.1		
Samoa	WSM			14.2 ('01)	9.3	82 ('01)		108.4		
San Marino	SMR					584				

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Sao Tome and Principe	STP	50.82 ('01)	2.7	68.1 ('01)	-16.2	33 ('01)		73.5		
Saudi Arabia	SAU		3.1	21.5 ('05)	-12.3	11 ('05)		11.9		
Senegal	SEN	40.30 ('11)	2.6	35.5 ('10)	-6.1	8		63.2		0.5
Serbia	SRB	29.62	3.0	63.5	4.7	50	43 ('10)	101.7	1.2	
Seychelles	SYC	65.77 ('07)		96.5	-0.3	110		129.8		
Sierra Leone	SLE	35.35 ('11)		8.0 ('02)	10.0			81.7		0.1
Singapore	SGP		4.0	100.0	28.8	481		373.5		
Slovak Republic	SVK	26.00 ('09)	3.3	100.0	12.2	88	74	188.8	1.1	
Slovenia	SVN	31.15 ('04)	3.4	100.0	15.0	193	107 ('11)	164.7	0.6	
Solomon Islands	SLB		2.6	2.4 ('01)	15.8	5 ('01)		130.6		
Somalia	SOM		1.8	11.8 ('01)	-3.3	3 ('01)				
South Africa	ZAF	63.14 ('09)	3.4	17.3 ('01)	40.3	30 ('01)		63.2		4.1
South Sudan	SSD	45.53 ('09)			10.9					
Spain	ESP	34.66 ('00)	3.7	99.0 ('03)	5.4	132	38 ('11)	63.4	1.3	
Sri Lanka	LKA	36.40	2.7	14.9 ('10)	26.4	174 ('10)		62.0		0.5
St. Kitts & Nevis	KNA							75.0		
St. Lucia	LCA				21.0			123.2		
St. Vincent & the Grenadines	VCT			70.0 ('03)	-2.1	213 ('03)		87.8		
Sudan	SDN	35.29 ('09)	2.2	36.3 ('01)	7.6	1 ('01)		26.2		0.0
Suriname	SUR	52.90 ('99)		26.3 ('03)	11.8	3 ('03)		104.3		
Swaziland	SWZ	51.49		30.0 ('02)	13.4	21 ('02)		102.8		
Sweden	SWE	25.00 ('00)	4.0	23.2	12.4	129	34 ('10)	85.9	0.8	
Switzerland	CHE	33.68 ('00)	3.8	100.0	13.7	173		86.5	1.5 ('10)	
Syrian Arab Republic	SYR	35.78 ('04)	2.1	64.9 ('10)	20.6	38 ('10)		16.0		0.1
Tajikistan	TJK	30.83 ('09)	2.5		-13.9	19 ('01)		98.0		
Tanzania	TZA	37.58 ('07)	2.3	14.9 ('09)	8.3	9		76.5		0.2
Thailand	THA	39.37	3.4	98.5 ('00)	33.7	35 ('06)		158.6		0.9

		GINI Index (0-perfect equality, 100 - perfect inequality), 2010 or latest	Logistics performance index (1=low to 5=high), 2014	Paved Roads (per cent of total), 2011 or latest	Change in Population Older than 65 years old (per cent), 2003-2013	Road Density (km of road per 100 sq. km of land area), 2011 or latest	Rail Density (km of lines operated per 1,000 sq. km), 2012 or latest	Total trade- sum of merchandise and services exports and imports, (per cent of GDP), 2012	Investment in Inland Transport Infrastructure (per cent of GDP), 2011 or latest	Private Investment in Inland Transport Infrastructure (billion US $), 2000-2012
Timor-Leste	TLS		1.6('12)		26.5			111.6		
Togo	TGO	39.29 ('11)	2.3	21.0 ('07)	-1.6	21 ('07)		73.4		0.6
Tonga	TON			27.0 ('01)	-1.3	91 ('01)		47.9		
Trinidad and Tobago	TTO			51.1 ('01)	30.6	162 ('01)		93.8		
Tunisia	TUN	36.06	2.6	76.3	10.5	12		109.0		0.8
Turkey	TUR	40.03	3.5	89.4 ('10)	16.0	47	15 ('10)	57.5	1.2	10.7
Turkmenistan	TKM	40.80 ('98)	2.3	81.2 ('01)	-9.8	5 ('01)		76.3		
Turks and Caicos Islands	TCA									
Tuvalu	TUV							68.6		
Uganda	UGA	44.30 ('09)	2.8('10)	23.0 ('03)	-5.7	29 ('03)		63.8		0.4
Ukraine	UKR	25.62	3.0	97.9	0.2	28		107.5		0.1
United Arab Emirates	ARE		3.5	100.0 ('00)	-59.0	5 ('04)				
United Kingdom	GBR	36.00 ('99)	4.0	100.0	10.2	172	129 ('10)	66.3	0.7	
United States	USA	40.81 ('00)	3.9	100.0 ('09)	13.6	67	27 ('10)	31.5	0.6 ('03)	
Uruguay	URY	45.32	2.7	10.0 ('04)	5.5	44 ('04)		52.9		0.3
Uzbekistan	UZB	36.72 ('03)	2.4	87.3 ('01)	-7.0	18 ('01)		43.2		0.0
Vanuatu	VUT			23.9 ('01)	21.3	9 ('01)		104.0		
Venezuela, RB	VEN	44.77 ('06)	2.8	33.6 ('01)	28.7	11 ('01)		46.5		0.0
Viet Nam	VNM	35.57 ('08)	3.2	47.6 ('07)	0.5	48 ('07)		175.4		1.1
Virgin Islands (U.S.)	VIR				66.3					
West Bank and Gaza	PSE	35.50 ('09)		100.0	21.9	78				
Yemen, Rep.	YEM	37.69 ('06)	2.2	8.7 ('05)	6.3	14 ('05)		57.5		0.2
Zambia	ZMB	57.49	2.5	22.0 ('01)	-3.7	12 ('01)		88.3		0.0
Zimbabwe	ZWE	50.10 ('95)	2.3	19.0 ('02)	9.1	25 ('02)		75.8		0.1

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Table A2c. Statistics for 210 countries and territories (The World Bank, UNECE, UNDP)

			Goods Transported by Rail (million tons - km), 2012 or latest	Unemployment (per cent of total labor force), 2012 or latest	HDI Index (0-low human development, 1-very high human development), 2012	RAI Index (per cent of), 2004	Passenger Cars per 1,000 inhabitants, 2001	Passenger Cars per 1,000 inhabitants, 2011	Fatalities per 100,000 passenger cars, 2001	Fatalities per 100,000 passenger cars, 2011
Afghanistan	AFG	7033		8.5 ('05)	0.374	22				
Albania	ALB	4600 ('10)	46	14.2 10)	0.749	31	44	102 ('10)	222	98
Algeria	DZA	1822	1248	10 ('11)	0.713	59				
American Samoa	ASM									`
Andorra	AND				0.846					
Angola	AGO	4709 ('01)			0.508	42				
Antigua and Barbuda	ATG				0.76					
Argentina	ARG		12111	7.2	0.811	77				
Armenia	ARM	287	346	18.4 ('11)	0.729	80				
Aruba	ABW			5.7 ('07)						
Australia	AUS	194906	59649	5.2	0.938					
Austria	AUT	16997	21683	4.3	0.895	95	520	531 ('10)	23	12
Azerbaijan	AZE	12356	8212	5.2	0.734	67	42	90 ('10)	163	113
Bahamas, The	BHS			14.0	0.794	82				
Bahrain	BHR			1.1 ('10)	0.796	99				
Bangladesh	BGD		710	5.0 ('09)	0.515	37				
Barbados	BRB			11.6	0.825	100				
Belarus	BLR	19436	48351	6.1 ('09)	0.793	64				
Belgium	BEL	43658	5439	7.5	0.897	100	461	493	31	16
Belize	BLZ			8.2 ('08)	0.702	78				
Benin	BEN		36 ('08)	0.7 ('02)	0.436	32				
Bermuda	BMU									
Bhutan	BTN			2.1	0.538	47				
Bolivia	BOL		1060 ('08)	3.4 ('09)	0.675	48				
Bosnia and Herzegovina	BIH	2363	1325	28.1	0.735	81				
Botswana	BWA		674	17.6 ('06)	0.634	79				
Brazil	BRA		267700	6.7 ('11)	0.73	53				
Brunei Darussalam	BRN				0.855	81				
Bulgaria	BGR	17943	2850	12.3	0.782	98	263	367	48	24

			Goods Transported by Rail (million tons - km), 2012 or latest	Unemployment (per cent of total labor force), 2012 or latest	HDI Index (0-low human development, 1-very high human development), 2012	RAI Index (per cent of), 2004	Passenger Cars per 1,000 inhabitants, 2001	Passenger Cars per 1,000 inhabitants, 2011	Fatalities per 100,000 passenger cars, 2001	Fatalities per 100,000 passenger cars, 2011
Burkina Faso	BFA		1	3.3 ('07)	0.343	25				
Burundi	BDI				0.355	19				
Cambodia	KHM		92 ('05)	0.2	0.543	81				
Cameroon	CMR		1057	3.8 ('10)	0.495	20				
Canada	CAN	136393	352535	7.2	0.911		458	497 ('09)	19	13
Cape Verde	CPV				0.586	82				
Cayman Islands	CYM			4.0 ('08)						
Central African Republic	CAF				0.352					
Chad	TCD				0.34	5				
Channel Islands	CHI									
Chile	CHL		4032	6.4	0.819	76				
China	CHN	5137474	2518310	4.0 ('07)	0.699	97				
Colombia	COL	65688 ('09)	12 ('09)	10.6	0.719	78				
Comoros	COM				0.429	73				
Congo, Dem. Rep.	COD		170		0.304	26				
Congo, Rep.	COG		257		0.534	48				
Costa Rica	CRI			7.8	0.773	82				
Cote d'Ivoire	CIV		675 ('07)		0.432	56				
Croatia	HRV	8926	2332	15.8	0.805	84	267	355	55	28
Cuba	CUB	2461	1351 ('08)	3.2 ('11)	0.78	81				
Curacao	CUW									
Cyprus	CYP	923		11.8	0.848	89	399	552	35	15
Czech Republic	CZE	54830	11423	7.0	0.873	97	345	437	38	17
Denmark	DNK	12025	2030 ('04)	7.5	0.901	99	350	384 ('09)	23	14
Djibouti	DJI		97 ('05)	59.5 ('02)	0.445	81				
Dominica	DMA				0.745	88				
Dominican Republic	DOM			14.7 ('11)	0.702	62				
Ecuador	ECU	1193 ('07)		4.1	0.724	73				
Egypt, Arab Rep.	EGY		1592	12.7	0.662	77				
El Salvador	SLV			6.1	0.68	64				

			Goods Transported by Rail (million tons - km), 2012 or latest	Unemployment (per cent of total labor force), 2012 or latest	HDI Index (0-low human development, 1-very high human development), 2012	RAI Index (per cent of), 2004	Passenger Cars per 1,000 inhabitants, 2001	Passenger Cars per 1,000 inhabitants, 2011	Fatalities per 100,000 passenger cars, 2001	Fatalities per 100,000 passenger cars, 2011
Equatorial Guinea	GNQ				0.554	53				
Eritrea	ERI				0.351	29				
Estonia	EST	7365	4807	10.1	0.846	86	298	428	49	18
Ethiopia	ETH	2456 ('01)		17.0 ('06)	0.396	32				
Faeroe Islands	FRO			3.2 ('05)						
Fiji	FJI			8.7 ('09)	0.702	76				
Finland	FIN	23770	9275	7.6	0.892	82	417	553	20	10
France	FRA	293000	31616	9.9	0.893	99	469	483	28	13
French Polynesia	PYF			11.7 ('07)						
Gabon	GAB		2417		0.683	45				
Gambia, The	GMB				0.439	77				
Georgia	GEO	628	6055 ('10)	15.0	0.745	82	56	11	225	1069
Germany	DEU	468900	105894	5.4	0.92	89	539	525	16	9
Ghana	GHA		181 ('08)	4.2 ('10)	0.558	61				
Greece	GRC	538	24.2	0.86	90					
Greenland	GRL		8.4 ('06)							
Grenada	GRD			0.77	98					
Guam	GUM		12.2							
Guatemala	GTM		2.9	0.581	55					
Guinea	GIN			0.355	22					
Guinea-Bissau	GNB			0.364	52					
Guyana	GUY			0.636	46					
Haiti	HTI			0.456	28					
Honduras	HND		4.4 ('11)	0.632	40					
Hungary	HUN	1179	10.9	0.831	98	244	298	50	21	
Iceland	ISL		6.0	0.906	81	561	646	15	6	
India	IND	625723	3.6	0.554	61					
Indonesia	IDN	7166	6.6 ('11)	0.629	94					
Iran, Islamic Rep.	IRN	22604	10.5 ('08)	0.742	66					
Iraq	IRQ		249	15.3 ('08)	0.59	58				
Ireland	IRL	9941	91	14.7	0.916	93	363	426	29	11 ('10)
Isle of Man	IMN			2.4 ('06)						

			Goods Transported by Rail (million tons - km), 2012 or latest	Unemployment (per cent of total labor force), 2012 or latest	HDI Index (0-low human development, 1-very high human development), 2012	RAI Index (per cent of), 2004	Passenger Cars per 1,000 inhabitants, 2001	Passenger Cars per 1,000 inhabitants, 2011	Fatalities per 100,000 passenger cars, 2001	Fatalities per 100,000 passenger cars, 2011
Israel	ISR		1099	6.9	0.9	88	231	275 ('10)	36	16
Italy	ITA	118565	11249	10.7	0.881	98	583	611	21	10
Jamaica	JAM			13.7	0.73	93				
Japan	JPN	254078 ('10)	20255	4.3	0.912	99				
Jordan	JOR		344	12.2	0.7	79				
Kazakhstan	KAZ	121074	235846	5.3	0.754	77	71	193 ('10)	210	69
Kenya	KEN		1399 ('06)		0.519	44				
Kiribati	KIR				0.629					
Korea, Dem. Rep.	PRK					44				
Korea, Rep.	KOR	12545 ('04)	9996	3.2	0.909	89				
Kosovo*	KSV			30.9						
Kuwait	KWT			3.6 ('11)	0.79	82				
Kyrgyz Republic	KGZ	1302,8	923	8.2 ('08)	0.622	76	39	58 ('08)	370	373 ('08)
Lao PDR	LAO	320		1.4 ('05)	0.543	64				
Latvia	LVA	12131	16930	14.9	0.814	90	251	297	88	29
Lebanon	LBN			6.2 ('09)	0.745	87				
Lesotho	LSO			25.3 ('08)	0.461	67				
Liberia	LBR			3.7 ('10)	0.388	66				
Libya	LBY				0.769	78				
Liechtenstein	LIE	300 ('10)			0.883					
Lithuania	LTU	21512	14172	13.2	0.818	97	327	566	62	17
Luxembourg	LUX	8837	189	5.1	0.875		636	664	25	10
Macedonia, FYR	MKD	5381	497 ('10)	31.0	0.74	78	152	152	35	55
Madagascar	MDG		12 ('02)	2.6 ('05)	0.483	25				
Malawi	MWI		33 ('08)	7.8 ('04)	0.418	38				
Malaysia	MYS		3071	3.0	0.769	82				
Maldives	MDV			14.4 ('06)	0.688					
Mali	MLI		189 ('02)	8.8 ('04)	0.344	14				
Malta	MLT	250		6.4	0.847	100	497	594	8	7
Marshall Islands	MHL									
Mauritania	MRT		7536	31.2 ('08)	0.467	31				
Mauritius	MUS			8.7	0.737	70				
Mexico	MEX	226900	69185	4.9	0.775	61				

* This designation is without prejudice to positions on status, and in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

			Goods Transported by Rail (million tons - km), 2012 or latest	Unemployment (per cent of total labor force), 2012 or latest	HDI Index (0-low human development, 1-very high human development), 2012	RAI Index (per cent of), 2004	Passenger Cars per 1,000 inhabitants, 2001	Passenger Cars per 1,000 inhabitants, 2011	Fatalities per 100,000 passenger cars, 2001	Fatalities per 100,000 passenger cars, 2011
Micronesia, Fed. Sts.	FSM				0.645	82				
Moldova	MDA	3538,1	945	5.6	0.66	66	71	126	164	97
Monaco	MCO									
Mongolia	MNG	1834 ('10)	11418	4.8 ('11)	0.675	36				
Montenegro	MNE	102,465		19.6	0.791					
Morocco	MAR	800 ('09)	5976	9.0	0.591	36				
Mozambique	MOZ		1193		0.327	27				
Myanmar	MMR	4	885 ('06)		0.498	23				
Namibia	NAM	591 ('02)		16.7	0.608	57				
Nepal	NPL			2.7 ('08)	0.463	17				
Netherlands	NLD	75747	4331 ('04)	5.3	0.921	100	418	471	15	8
New Caledonia	NCL									
New Zealand	NZL	18110		6.9	0.919	83				
Nicaragua	NIC			8.0 (10)	0.599	28				
Niger	NER				0.304	37				
Nigeria	NGA		77 ('07)		0.471	47				
N. Mariana Islands	MNP			6.5 ('05)						
Norway	NOR	16965	2092 ('05)	3.2	0.955	83	415	480	15	7
Oman	OMN				0.731	81				
Pakistan	PAK	177954	1757	5.0 ('08)	0.515	61				
Palau	PLW			4.2 ('05)	0.791					
Panama	PAN			4.0	0.78	77				
Papua New Guinea	PNG				0.466	68				
Paraguay	PRY	11785 ('10)		4.9	0.669	54				
Peru	PER		900	3.6	0.741	43				
Philippines	PHL		1 ('04)	7.0	0.654	80				
Poland	POL	218888	32904	10.1	0.821	95	275	470	53	23
Portugal	PRT	37472	2064	15.6	0.816	88	538	444	30	19
Puerto Rico	PRI			14.5		98				
Qatar	QAT			0.5	0.834	81				
Romania	ROU	26347	11200	7.0	0.786	89	144	203	76	47

			Goods Transported by Rail (million tons - km), 2012 or latest	Unemployment (per cent of total labor force), 2012 or latest	HDI Index (0-low human development, 1-very high human development), 2012	RAI Index (per cent of), 2004	Passenger Cars per 1,000 inhabitants, 2001	Passenger Cars per 1,000 inhabitants, 2011	Fatalities per 100,000 passenger cars, 2001	Fatalities per 100,000 passenger cars, 2011
Russian Federation	RUS	247936	2222388	5.5	0.788	81	178('05)	255	133('05)	64
Rwanda	RWA				0.434	52				
Samoa	WSM			5.7 ('11)	0.702	71				
San Marino	SMR			2.6 ('07)						
Sao Tome and Principe	STP			16.7 ('06)	0.525	83				
Saudi Arabia	SAU		1852	5.6	0.782	75				
Senegal	SEN		384 ('07)	10.0 ('06)	0.47	29				
Serbia	SRB	446	2955	23.9	0.769	74	199('05)	231	57 ('05)	43
Seychelles	SYC			5.5 ('05)	0.806					
Sierra Leone	SLE			3.4 ('04)	0.359	65				
Singapore	SGP			2.8	0.895					
Slovak Republic	SVK	29045	7262	13.9	0.84		240	324	47	19
Slovenia	SVN	15931	3227	8.8	0.892	95	444	520	31	13
Solomon Islands	SLB				0.53	77				
Somalia	SOM					40				
South Africa	ZAF		113342	25.0	0.629	21				
South Sudan	SSD									
Spain	ESP	264806	7507	25.0	0.885	95	446	483	30	9
Sri Lanka	LKA		135 ('08)	4.0	0.715	92				
St. Kitts & Nevis	KNA				0.745	89				
St. Lucia	LCA			20.6 ('10)	0.725	89				
St. Vincent & the Grenadines	VCT			18.8 ('08)	0.733	97				
Sudan	SDN		770	14.8 ('08)	0.414	5				
Suriname	SUR			9.5 ('04)	0.684	79				
Swaziland	SWZ		862		0.536					
Sweden	SWE	33400	11500 ('08)	8.0	0.916	86	452	466	15	7
Switzerland	CHE	17510	8110	4.2	0.913		498	529	15	8
Syrian Arab Republic	SYR		2206	8.4 ('10)	0.648	49				
Tajikistan	TJK		555	11.5 ('09)	0.622	74				
Tanzania	TZA	7 ('08)	728 ('06)	3.5 ('11)	0.476	38				
Thailand	THA		2455	0.7	0.69	33				

			Goods Transported by Rail (million tons - km), 2012 or latest	Unemployment (per cent of total labor force), 2012 or latest	HDI Index (0-low human development, 1-very high human development), 2012	RAI Index (per cent of), 2004	Passenger Cars per 1,000 inhabitants, 2001	Passenger Cars per 1,000 inhabitants, 2011	Fatalities per 100,000 passenger cars, 2001	Fatalities per 100,000 passenger cars, 2011
Thailand	THA		2455	0.7	0.69	33				
Timor-Leste	TLS			3.9 ('10)	0.576	90				
Togo	TGO				0.459	22				
Tanzania	TZA	7 ('08)	728 ('06)	3.5 ('11)	0.476	38				
Thailand	THA		2455	0.7	0.69	33				
Timor-Leste	TLS			3.9 ('10)	0.576	90				
Togo	TGO				0.459	22				
Tonga	TON			1.1 ('06)	0.71	86				
Trinidad and Tobago	TTO			4.6 ('08)	0.76	91				
Tunisia	TUN	16611 ('02)	2024	18.3 ('11)	0.712	39				
Turkey	TUR	203072	10691	9.2	0.722	69	70	103('10)	97	54('10)
Turkmenistan	TKM		11992		0.698	66				
Turks and Caicos	TCA			5.4 ('07)						
Tuvalu	TUV			6.5 ('05)						
Uganda	UGA		218 ('04)	4.2 ('09)	0.456	27				
Ukraine	UKR	38596	237722	7.5	0.74	56	118('05)	151	131('05)	70
United Arab Emirates	ARE			4.2 ('09)	0.818	76				
United Kingdom	GBR	152990	19230 ('10)	7.9	0.875	96	436	454	14	7
United States	USA		2524585	8.1	0.937	86	778	403	19	26
Uruguay	URY			6.5	0.792	84				
Uzbekistan	UZB	24500 ('10)	22482		0.654	57				
Vanuatu	VUT			4.6 ('09)	0.626	77				
Venezuela, RB	VEN		81 ('07)	8.1	0.748	78				
Viet Nam	VNM	36179 ('10)	3959	1.8	0.617	84				
Virgin Islands (U.S.)	VIR									
West Bank and Gaza	PSE			23.0	0.67					
Yemen, Rep.	YEM			17.8 ('10)	0.458	21				
Zambia	ZMB			15.9 ('05)	0.448	64				
Zimbabwe	ZWE		1580 ('08)	4.2 ('04)	0.397	65				

Table A2d Correlation between population and land area with different transport factors (SPSS correlation) (, correlation significant at 0.01 level; *, correlation significant at 0.05 level). The data analysed have been for the years 2001 and 2011 (where available).**

Factor 1	Factor 2	Correlation *(Pearson's r)*	Correlation *(Significance level)*
Population (individuals) 2011	Land Area (km2) 2011	.457**	Significant at the 0.01 level
	CO_2 emissions from transport, excluding marine bunkers and international aviation (million metric tonnes) 2001	.297**	Significant at the 0.01 level
	CO_2 Emissions from transport, excluding marine bunkers and international aviation (million metric tonnes) 2011	.462**	Significant at the 0.01 level
	Energy use per capita for transport (TOE-Tonnes of Oil Equivalent) 2001	-0.08638	Not significant
	Energy use per capita for transport (TOE-Tonnes of Oil Equivalent) 2011	-0.07126	Not significant
	Nominal GDP (current billion US $) 2001	.274**	Significant at the 0.01 level
	Nominal GDP (current billion US $) 2011	.498**	Significant at the 0.01 level
	Paved Roads (per cent of total) 2011 or latest	0.033203	Not significant
	Road Density (road km per 100 km2of land area) 2011 or latest	-.032	Not significant
	Rail Density (line km/1,000 km2) 2012 or latest (UNECE)	-0.07497	Not significant
	Total trade (merchandise and services, exports and imports) (per cent of GDP) 2011	-0.09227	Not significant
	Goods transported on roads (million tons-km) 2011	.990**	Significant at the 0.01 level
	Goods transported by rail (million tons-km) 2011	.635**	Significant at the 0.01 level
	Unemployment (per cent of labor force) 2011	-0.14766	Not significant
	Human Development Index–HDI (0 (low) to 1 (high) scale) 2012 (UNDP)	-0.02119	Not significant
	RAI Index (per cent) 2004	0.042645	Not significant
	Passenger cars per 1,000 inhabitants 2001 (UNECE)	.412**	Significant at the 0.01 level
	Passenger cars per 1,000 inhabitants 2011 (UNECE)	-0.03049	Not significant
	Fatalities per 100,000 passenger cars 2001 (UNECE)	-0.15214	Not significant
	Fatalities per 100,000 passenger cars 2011 (UNECE)	-0.06246	Not significant
Land Area (km2) 2011	CO_2 Emissions from transport, excl. marine bunkers and international aviation (million metric tones) 2001	.491**	Significant at the 0.01 level
	CO_2 Emissions from transport, excl. marine bunkers and international aviation (million metric tonnes) 2011	.579**	Significant at the 0.01 level
	Energy Use per capita for transport TOE-Tonnes of Oil Equivalent) 2001	.094	Not significant
	Energy Use per capita for transport (TOE-Tonnes of Oil Equivalent) 2011	.097	Not significant
	Nominal GDP (Current billion US $), 2001	.391**	Significant at the 0.01 level

Factor 1	Factor 2	Correlation *(Pearson's r)*	Correlation *(Significance level)*
	Nominal GDP (current billion US $) 2011	.549**	Significant at the 0.01 level
	Paved Roads (per cent of total) 2011 or latest	-.030	Not significant
	Road Density (road km per 100 km2of land area) 2011 or latest	-.088	Not significant
	Rail Density (line km per 1,000 km2) 2012 or latest (UNECE)	-.292	Not significant
	Total trade (merchandise and services, exports and imports) (per cent of GDP) 2011	-.148*	Significant at the 0.05 level
	Goods transported on roads (million tons-km) 2011	.437**	Significant at the 0.01 level
	Goods Transported by Rail (million tons-km) 2011	.777**	Significant at the 0.01 level
	Unemployment (per cent of labor force) 2011	-.106	Not significant
	Human Development Index–HDI (0 (low) to 1 (high) scale) 2012 (UNDP)	.091	Not significant
	RAI Index (per cent) 2004	-.025	Not significant
	Passenger cars per 1,000 inhabitants 2001 (UNECE)	.291	Not significant
	Passenger cars per 1,000 inhabitants 2011 (UNECE)	-.159	Not significant
	Fatalities per 100,000 passenger cars 2001 (UNECE)	-.071	Not significant
	Fatalities per 100,000 passenger cars 2011 (UNECE)	-.023	Not significant

Transport for Sustainable Development
The case of inland transport

The study «Transport for Sustainable Development: The case of Inland Transport» – with UNECE as the lead author – is the result of cooperation between the five Regional Commissions of the United Nations and key global stakeholders, in particular, the International Road Transport Union and the International Union of Railways.

The study examines issues, progress and challenges in global efforts to achieve a transition to sustainable mobility of freight and people using inland modes of transport, i.e. road, railways, inland waterways and intermodal transport. While transport is a precondition for social and economic interactions, unfortunately, it has also negative impacts, such as road crashes, air and noise pollution, and greenhouse gas emissions. With a wealth of good and best practices, the study showcases results in mitigating the negative impacts, and also identifies the main challenges and opportunities to accelerate the transition to sustainability. It promotes an in-depth and real-world understanding of the five defining dimensions of sustainable transport – accessibility, affordability, safety, security and environmental performance. The study brings forth theoretical insights and best practices from all regions of the world and thus maps similarities and differences among countries of different income groups and geographical regions in their efforts towards sustainable transport. A common element is that transport is central in the shift to sustainable societies but a high level of political will is needed to decouple its growth from impacts such as air pollution, traffic accidents or climate change. Statistics show that only UNECE countries have managed to decrease the per capita CO_2 emissions from transport in the decade 2001-2011. But, as these countries are responsible for roughly 50 per cent of the total emissions, further progress is needed. Only UNECE Governments have achieved absolute decoupling between the increasing levels of motorization and road fatalities (i.e. the latter decreases while the former increases). In two other regions (UNECLAC and UNESCWA) during the same period, Governments achieved relative decoupling (the latter increases at a slower pace than the former); in the other two regions (UNECA and UNESCAP) decoupling has, however, yet to be achieved.

The authors of this study are committed to promoting sustainable mobility and transport which are central to sustainable economic and social development. We plan to regularly update this study, as well as to facilitate broad exchanges of best practices. Any views, suggestions or examples you wish to share can be submitted to: sustainable_inland_transport@unece.org

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