UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

TRANSPORT FOR SUSTAINABLE DEVELOPMENT IN THE ECE REGION

UNITED NATIONS

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United Nations Economic Commission for Europe

The United Nations Economic Commission for Europe (UNECE) is one of the five United Nations regional commissions administered by the Economic and Social Council (ECOSOC). It was established in 1947 with the mandate to help rebuild post-war Europe, develop economic activity and strengthen economic relations among European countries, and between Europe and the rest of the world. During the Cold War, UNECE served as a unique forum for economic dialogue and cooperation between East and West. Despite the complexity of this period, significant achievements were made, with consensus reached on numerous harmonization and standardization agreements.

In the post Cold War era, UNECE acquired not only many new Member States, but also new functions. Since the early 1990s the organization has focused on analyses of the transition process, using its harmonization experience to facilitate the integration of Central and Eastern European countries into the global markets.

UNECE is the forum where the countries of Western, Central and Eastern Europe, Central Asia and North America, 56 countries in all, come together to forge the tools of their economic cooperation. That cooperation concerns economics, statistics, environment, transport, trade, sustainable energy, timber and habitat. The Commission offers a regional framework for the elaboration and harmonization of conventions, norms and standards. The Commission's experts provide technical assistance to the countries of South-East Europe and the Commonwealth of Independent States. This assistance takes the form of advisory services, training seminars and workshops where countries can share their experiences and best practices.

UNECE TRANSPORT

The UNECE Transport Division facilitates the international movement of persons and goods by inland transport modes. It aims to improve competitiveness, safety, energy efficiency and security in the transport sector. At the same time it focuses on reducing the adverse effects of transport activities on the environment and contributing effectively to sustainable development. It is the

- Centre for multilateral transport standards and agreements in Europe and beyond, e.g. regulations for dangerous goods transport and road vehicle construction at the global level
- Gateway for technical assistance and exchange of best practices
- Promoter of multi-country investment planning
- Substantive partner for transport and trade facilitation initiatives
- Historic centre for transport statistics.

For more than six decades, the **UNECE Inland Transport Committee (ITC)** has provided a platform for intergovernmental cooperation to facilitate and develop international transport while improving its safety and environmental performance. The main results of this persevering and critical work are reflected in more than 50 international agreements and conventions which provide an international legal framework and technical regulations for the development of international road, rail, inland water and intermodal transport, as well as dangerous goods transport and vehicle construction. Considering the perspectives of the transport services providers and their regulators, UNECE offers a balanced approach to and treatment of facilitation and security issues alike.

Executive summary

Transport for sustainable development

Transport affects social, economic and environmental sustainability. Transport links markets and individuals, making regions more competitive and promoting individuals' social and economic development. The transport system provides the individual with access to basic social services, such as health, food, education, employment and recreational activities. This requires the transport system to be safe to ensure that human health is not at risk. Environmental sustainability is affected negatively by transport through the consumption of non-renewable energy, the emissions of harmful pollutants and greenhouse gases, through the generation of waste and by a reduction of natural habitat.

Providing access to social services and markets

Increased urbanization has led to congestion issues in many cities throughout the ECE region. In addition to this the ageing ECE population requires special transport considerations. These issues have to be addressed with an urgency of first degree. International accessibility is crucial for economic sustainability. Missing international links combined with growing congestion at borders reduce the fluidity of international freight flows, which is a burning challenge for some ECE countries.

Making funds last longer

Many ECE member states have experienced a collapse of public transport during the last decades. Public transport is important for social, economic and environmental sustainability. The lack of sound multi-year investment programs, backlogs in maintenance investments combined with lack of public funds create a challenging situation in many UNECE countries. A first urgency has been identified for the improvement of individual and social affordability.

A safe and secure transport system

Every day more than 300 people are killed on roads in the ECE region. Many of these fatalities can be avoided if the traffic rules are respected. For example in the United States of America drink-driving kills more than 15,000 people every year. Not only safety measures but also security initiatives are needed as New York in 2001, Madrid in 2004, London in 2005 and most recently Moscow in 2010 showed that that all transport modes are at risk of terrorist attacks. Improving transport safety, particularly road traffic safety is of first degree urgency. The same applies for inland transport security.

Environmental sustainability

The emission of local pollutants has come under control through the work of the UNECE World Forum on Harmonization of Vehicle Regulations (WP. 29) and within the European Union (EU) through the EURO-standards system. Achievements in this field are commendable, but implementation should follow in all countries. Therefore decreasing local pollutants receives a second degree of urgency. On the other hand, the emission of

greenhouse gases from transport continues to rise and further attention to this issue is needed in order to get emissions under control. Actual actions are sporadic and often timid.

UNECE works for sustainable development

Each UNECE country recognises that transport is an important tool to help meet overall sustainability objectives. Attributes of sustainable transport follow from the expanded definition of sustainable development: sustainable transport is safe, high-quality, and accessible to all; ecologically sound; economically viable; and a positive contributor to local, national and international development. Specific goals for sustainable transport may include improved service quality and quality of access to goods and services, safety, improved air quality, noise reduction, improved water quality, protection of natural habitat and open space, historic preservation, reduced carbon emissions, increased social equity, economic development, and a satisfying quality of life, as well as local goals consistent with the overall objective.

UNECE addresses sustainability of transport through the different legal instruments, through its analytical work and technical assistance activities, as well as through its main governing structures, i.e. the traditional work of the Working Parties. The following table summarises how sustainability and its key areas: access, affordability, safety, security and environmental protection are incorporated into the UNECE work programme. Assessing the role of UNECE in promoting sustainable development of transport we can make the following observations:

- UNECE by its mandate and traditional approach is primarily focusing on international transport, while sustainability measures require a system-approach, i.e. considering local, regional, national and international transport;

- UNECE is playing a key role in some areas of sustainability, like international access, road traffic safety, environmentally friendly vehicles and inter-modal transport. At the same time having a marginal or no role in other important areas. In light of the resource constraints, this selectivity will likely to continue also in the future.

Main activities of the UNECE in relation to sustainable development and transport

	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 their hinterland connection	ITC/ Transport Trends and Economics (WP.5) ITC/ Customs and Transport (WP.30) CEFACT WP Trade Committee
Affordability		Socio-economic analysis of transport investments Common criteria on identification of bottlenecks, missing links, 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 Forum (WP.1) ITC/ Working Party on the Transport of Dangerous Goods ITC/ Working Party on Railway Transport (SC.2) ITC/ Inland Waterway Transport (SC.3 and WP.3) ITC/ World Forum for Harmonization of Vehicle Regulations (WP. 29)
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 Int. Carriage of Dangerous Goods by Road (ADR), Inland Waterways (ADN) and Rail (RID*)	ForFITS: Facilitating climate change adaptation in transport through addressing the energy-environment linkage. 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 Transport, Health and Environment Pan-European Program ITC/ Inland Waterway Transport (SC.3 and WP.3)

* in cooperation with OTIF


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Introduction

> *"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. " (World Commission on Environment and Development, 1987).*

Sustainable development has been a normative political objective for individuals, governments and international organizations at least since it was put forward by the World Commission on Environment and Development in their 1987 report "Our common future", also known as the "Brundtland Report". This report made it clear that action is needed to obtain sustainable development. The United Nations Conference on Environment and Development in Rio de Janeiro in 1992 provided an additional boost to action for sustainable development. Today, two decades later, it is time to evaluate the process, identify the gaps and renew political will and commitment to sustainable development.

In these years there are numerous high level political events where sustainable development is on the agenda with an outlook to and potential impact on transportation. Among them are the United Nations Commission on Sustainable Development with transport on its agenda in 2010-2011[1], the International Transport Forum that will discuss transport and society in 2011, the United Nations Conference on Sustainable Development (UNCSD, 'Rio+20') in 2012, as well as the UNECE session in 2011 discussing sustainable development and integration in the ECE region. The current publication serves as a background paper to all of these events.

The overarching goals of the current publication are:

a) strengthen the broad horizon of policy setting for sustainable development, i.e. without losing sight of environmental sustainability, look beyond it and treat economic and social sustainability as equally important aspects in transport policies;
b) present the transport sector as one that brings also positive externalities, and not only negative ones;
c) show-case best and good practices in the UNECE countries and also this way facilitate information sharing and the wider use of available knowledge and experience;
d) outline challenges specific to the UNECE countries;
e) contribute to policy debate on solutions and needed measures, as well as facilitate their faster dissemination and application for sustainable transport development.

This report on *Transport for Sustainable Development in the ECE region* deals with issues and best practices in inland transport, i.e. in road, rail, inland waterway and intermodal

[1] The UNECE supported this process through the background papers CSD18/2010/BP16: *United Nations Economic Commission for Europe Work in the area of chemicals, including Globally Harmonized System (GHS) and transport of dangerous goods* and CSD18/2010/BP15: *United Nations Economic Commission for Europe Work in support of Sustainable development of transport* . This paper builds on especially the latter background paper with a broader and more in depth analysis of issues in the ECE region.

transport. It also outlines key UNECE contributions and reviews progress towards the development of more sustainable inland transport.

Chapter 1 gives a brief review of sustainable development and its implications for transport.

Chapter 2 gives an account of general trends in the ECE region relevant to sustainable transport development.

Chapter 3 explains transport's role for social and economic sustainability by providing access for individuals and markets.

Chapter 4 discusses the issues of affordable transport for the individuals and for the public at large.

Chapter 5 deals with transport safety specifically road traffic safety.

Chapter 6 argues that transport security must be included in a comprehensive approach to sustainability.

Chapter 7 reviews the most prominent element of sustainability, i.e. the environmental issues in terms of local pollution and climate change impacts of transport.

Chapter 8 calls for more support to intermodal transport.

Chapter 9 concludes by assessing the current situation giving general "verdicts" and through outlining the ways forward.

1. What is sustainable development?

Many definitions of sustainable development have been put forward during the last two decades. Most formulations are very similar, there is however one fundamental aspect of the definition that is of great importance. According to the *integrated view*, sustainable development is about ensuring the well-being of the *current and future* generations. In contrast, the *future-oriented view* is only concerned about the well-being of *future* generations. The former approach which is in line with the definition put forward by the Brundtland Commission implicitly includes the issue of inter- and intra-generational distributional justice which must be balanced. The latter approach, the future oriented view, is narrower, since it eliminates the concerns about the current generations and allows sustainable development policy to focus on future generations.

It is important to distinguish between different viewpoints and understandings of sustainable development. In this report the integrated view of the Brundtland Commission, which is also the most commonly used by national governments, is applied. This allows us to address issues of both the current and future generations

Measuring sustainable development – the capital approach

There is no one single measurement of sustainable development that allows us to evaluate the progress and current state of transport and sustainable development. Sustainability is linked to many aspects and it is therefore necessary to establish a set of indicators to determine the current situation and trend. From a theoretical point of view it is optimal to define these indicators based on the so called capital approach.[2] If we target meeting the need of the current and future generations, our goal is to sustain the society's total capital base. We can define this capital base to consist of three types of capital:[3]

1. *Social capital* refers to "the institutions, relationships and norms that shape the quality and quantity of a society's social interactions" (World Bank, 2000). Transport connects people, and provides access to basic social services and is therefore a necessary condition for social sustainability.
2. *Economic capital* refers to financial, tangible and intangible capital. Transport provides access, connects people and business and is therefore essential for economic sustainability.
3. *Environmental capital* refers to natural capital, including natural resource stocks, land and ecosystems. Transport affects the environmental capital negatively through pollution, greenhouse gas emission, energy use, generation of waste and loss of natural habitat. A minimization of these negative impacts is essential for the sustainability of transport systems.

[2] According to: www.unece.org/stats/publications/Measuring_sustainable_development.pdf

[3] Typically five to six types of capital are used: Financial Capital, Produced Capital, Natural Capital, Human Capital and Social Capital (UNECE, 2009). We have aggregated these types of capital to the three pillars of sustainable development social, economic and environmental.

From three pillars to five UNECE working areas

The three pillars of sustainability - economic, social and environmental - are closely linked, and a policy distinction is neither possible nor beneficial. Consequently UNECE works in five inter-related transport areas covering the three pillars of sustainable development. The linkage of the five working areas to the three dimension of sustainability is presented in table 1.1.

Table 1.1
Linking the three pillars of sustainable development to the UNECE transport working areas

		Three pillars of sustainable development		
		Social	***Economic***	***Environmental***
Five UNECE working areas	***Accessibility***	Social inclusion through access to social services.	Competitiveness through access to markets.	Congestion in urban areas and border crossing inefficiencies has negative environmental consequences.
	Affordability	Social inclusion through affordable mobility.	Social affordability of infrastructure and transportation. Ensuring a competitive business environment.	Maintenance backlogs reduce the environmental efficiency of the transport system.
	Safety	Safe transport ensures that mobility is not a health risk.	Cost for the society for a loss of human life and crashes.	Safe transport of dangerous goods.
	Security	A secure transport system ensures that individuals can travel without risk of terrorist attacks or other criminal offences.	Cost for the society of loss of goods, infrastructure and especially human life.	Secure transport of dangerous goods.
	Environmental	Minimise local air pollution and noise from transport which is a risk for human health.	The impact of transport on the environment has economic costs.	Minimize impact of transport on natural capital by reducing negative impact on biodiversity, natural habitat, air pollution, greenhouse gas emission, generation of waste and noise.

Social and economic development depends on *access*. Individual access to health and educational institutions is a means of ensuring social development. Access to employment is essential for the individual's economic development and social inclusion, vice versa economic development requires access to the goods and labour market for firms.

Indicators for measuring sustainable development

Each of the five working areas of UNECE has its own, but nevertheless linked, challenges to sustainable development. To evaluate the current situation and challenges for the UNECE we therefore consider a set of indicators which are presented in table 1.2.

To evaluate the challenges for national accessibility we evaluate the infrastructure density and quality. International transport links play an important role for the economic development of regions, evaluating international freight transport and border crossing efficiency gives an idea how the transport system is performing with respect to international accessibility.

Mobility is an important factor for social inclusion. Access to the most basic social services requires mobility; an affordable transport system is thus a prerequisite to avoid social exclusion. To analyse individual affordability we inspect household expenditures on transport and the development of transport pricing. The transport system should be affordable for the individual and also for the society; we therefore evaluate the public expenditures on transport.

Each fatality or injury leads to substantial social and economic losses for both individual families and for the society. With respect to road safety we look at the development in road fatalities, drink-driving and seat-belt use.

Transportation affects the environment negatively through the consumption of non-renewable energy sources which is evaluated together with the current situation and recent development of CO_2 emissions, local pollutants and noise from transport. How well the transport system works is analyzed by looking at modal split of rail, inland waterways and road transport.

Table 1.2 gives an overview of the working areas of the UNECE Transport Division with respect to sustainable development and indicators of the performance of the transport system on this area.

Table 1.2

Indicator set: Transport for sustainable development

	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 to avoid individual tragedies and loss of human and cultural capital. ***Economic capital:*** Safe transport to avoid cost of traffic crashes.	***Social capital:*** Secure transport to avoid individual tragedies and loss of human and cultural capital. ***Economic capital:*** Secure transport to avoid loss of infrastructure, goods and human lives.	***Natural capital:*** Transport that is sustainable with respect to energy use, emissions and land use and 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 spending on transport ***Indicator 2:*** The price of transport ***Indicator 3:*** Public investment on transport ***Indicator 4:*** Private investment in transport.	***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:*** Energy consumption in transport ***Indicator 2:*** Emission of greenhouse gases and local pollutants ***Indicator 3:*** Local pollutants from transport ***Indicator 4:*** Noise from transport
Sustainability targets	*-Infrastructure density is linked to social development performance.* *- Minimize share of population without access to all-season road or rail.* *-Strategic international links especially for landlocked countries.* *- Efficient border crossings*	*- Affordable transport independent of income* *- 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 threats and attacks* *- Prevent criminal activities*	*- Reduce dependency on non-renewable energy sources in transport.* *- Minimize emissions of greenhouse gas emissions and pollutants* *- Minimize noise impact from transport* *- Minimize waste from transport and improve degree of recycling*

2. General trends in the ECE region: Economic growth and demand for transport

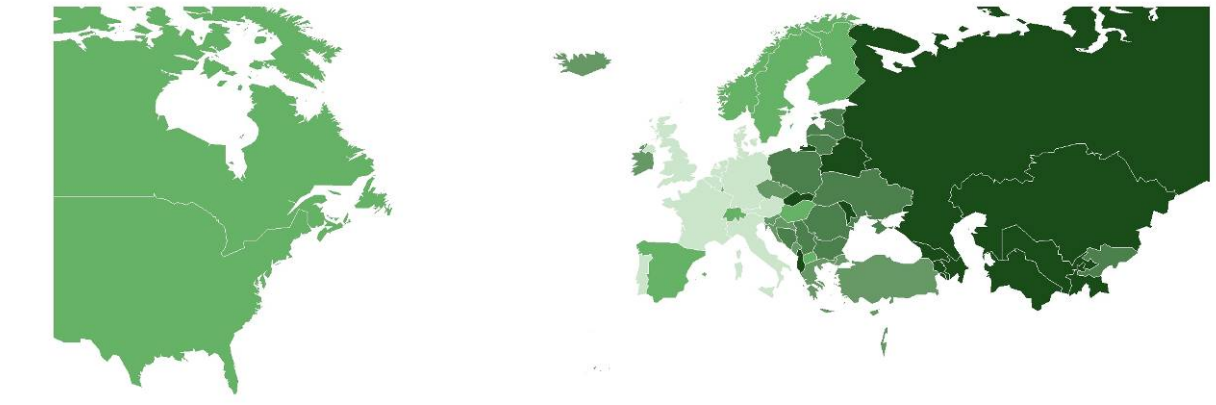
2.1 Economic development in the ECE region

Economic growth

Income increased considerably from 2000 to 2009 in especially East, South-East Europe and Central Asia as shown in figure 2.1. The old European Union member States (EU15), as well as Canada, Iceland, Norway, Switzerland and the U.S.A. have had a low to moderate growth of between 1 and 2 (%) per annum. As a result the poorest countries have narrowed the gap to the Western European countries with respect to income per capita. In 2001, the per capita income in Tajikistan was 38 times lower than in the U.S.A. In 2009 the difference had been reduced to 20!

The global financial crisis had a severe impact on the economy in the ECE region. According to UNECE statistics, 41 of 50 countries for which data is available, had a negative GDP growth from 2008 to 2009. In 2008 only seven countries had a negative growth rate and in 2007 none of the UNECE member countries had negative GDP growth: The worst development was seen in Latvia (-18%), Ukraine (-15.2%) and Lithuania (-14.8%); while the best development occurred in Azerbaijan (9.3%), Uzbekistan (8.1%) and Turkmenistan (6.1%).

Figure 2.1
Average annual GDP growth 2000-2009 in the ECE region



Source: UNECE

Unemployment

More than one-quarter of the UNECE member States for which data was available in 1995 had double-digit unemployment rates, this rate peaked in 1999 when 41% of the countries had an unemployment rate above 10%. Only 7 out of 53 UNECE countries had double digit unemployment rates in 2007, but the financial crisis led to a return to the 1995 level in 2009,

when almost one-third of the ECE member states had more than ten percent unemployment.

The negative global impact has also affected unemployment. In 2009 only nine out of the 47 UNECE countries for which data is available had an unemployment rate below 6%. In 2008 the number was twenty (out of 50). Norway had one of the lowest unemployment rates, 3.1% while the Former Yugoslav Republic of Macedonia had the highest unemployment rate of 32.2%.[4] The second highest rate was seen in Bosnia and Herzegovina with 24.1%. In Estonia, Latvia and Lithuania the unemployment rate more than doubled from 2008-2009.

2.2 Transport trends in the ECE region

Vehicle fleet

The passenger car density varies considerably from country to country in the ECE region. The highest concentration of vehicles is seen in small countries: Malta (566 passenger cars per 1,000 inhabitants in 2009), Iceland (644) and Luxembourg (671) top the list of ECE countries. At the bottom of the list are Turkmenistan (18) and Tajikistan. 24 of the 52 ECE countries for which data is available have between 400 and 600 vehicles per 1,000 inhabitants.

Road and rail density

The road density varies as much as the vehicle density within the ECE region. The lowest density is found in Israel with 2.4 km roads per 1,000 inhabitants; the highest density is found in Sweden with 62 km roads per 1,000 inhabitants. Rail density is sparser than road density. The highest density of railways is in Canada with 1.7km railway lines per 1,000 inhabitants. The density of inland navigation in the ECE region is typically between 0 and 200 meters per 1,000 inhabitants, with a few exceptions. The Netherlands has almost 400 meters of inland navigation per 1,000 inhabitants.[5]

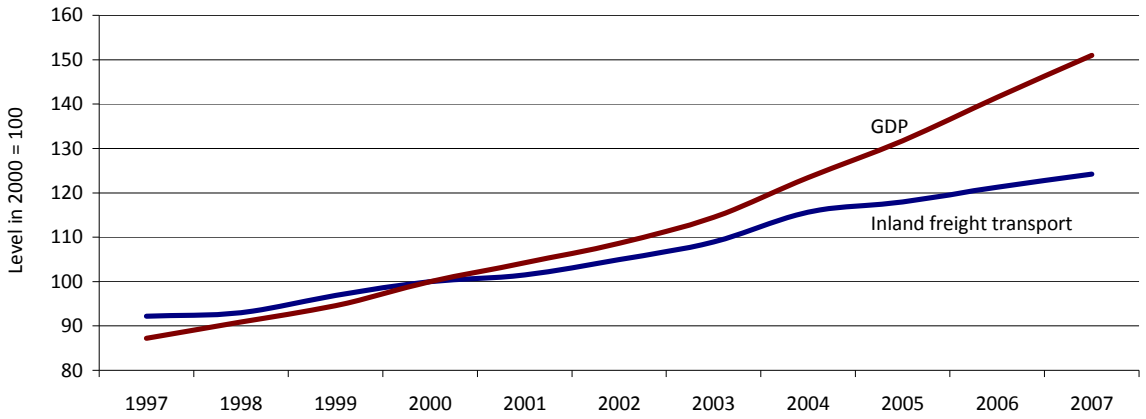
Transport demand

Did you know? Scientific studies have shown that transport infrastructure investments increases private sector productivity.

Inland freight transport in the ECE region increased by 24% from 2000 to 2007. The East and South-Eastern European countries showed increasing demand for freight transport. Figure 2.2 shows, that there are signs of a decoupling between freight transport and economic growth. Increased globalization and smoother border crossings increases the importance of international trade and therefore also transport, leading to continued coupling. However, services are increasingly important for the economic growth and the role of goods and therefore transportation of goods is declining. If this latter mechanism dominates the first, a decoupling of freight transport from economic growth may happen. The recent global financial crisis has however led to extraordinary circumstances, and it is therefore not possible to determine whether the trend shown in figure 2.2 is a result of a long-term decoupling.

[4] According to the UNECE statistical database.
[5] According to Eurostat.

Figure 2.2
Inland freight transport and GDP growth in the ECE region



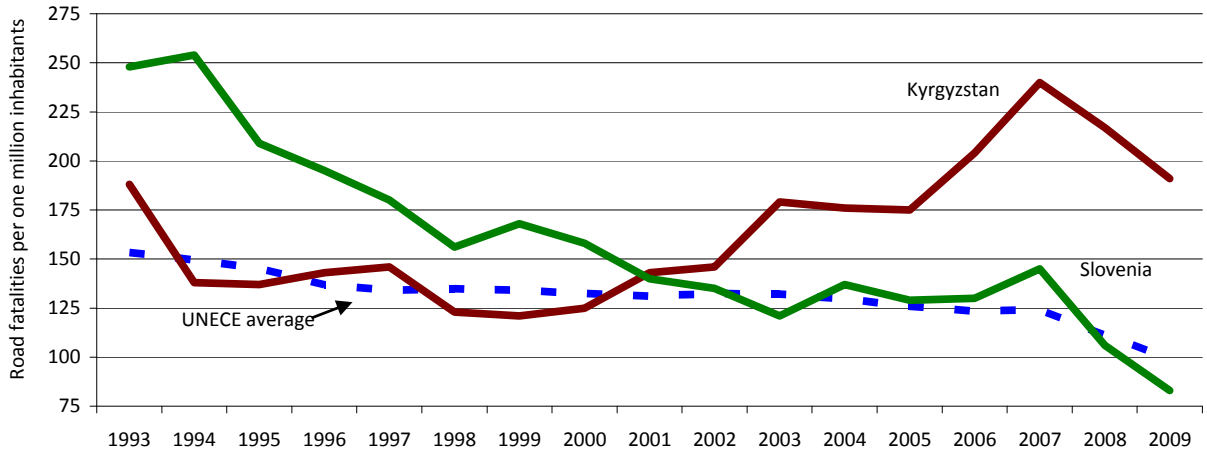
Source: UNECE and OECD/ITF

Road safety

Figure 2.3 shows that in 1993 more than 150 individuals were killed in road accidents per one million inhabitants in the ECE region. Over the last two decades road safety has improved considerably and in 2009 it crossed the mark of 100 fatalities per one million inhabitants.

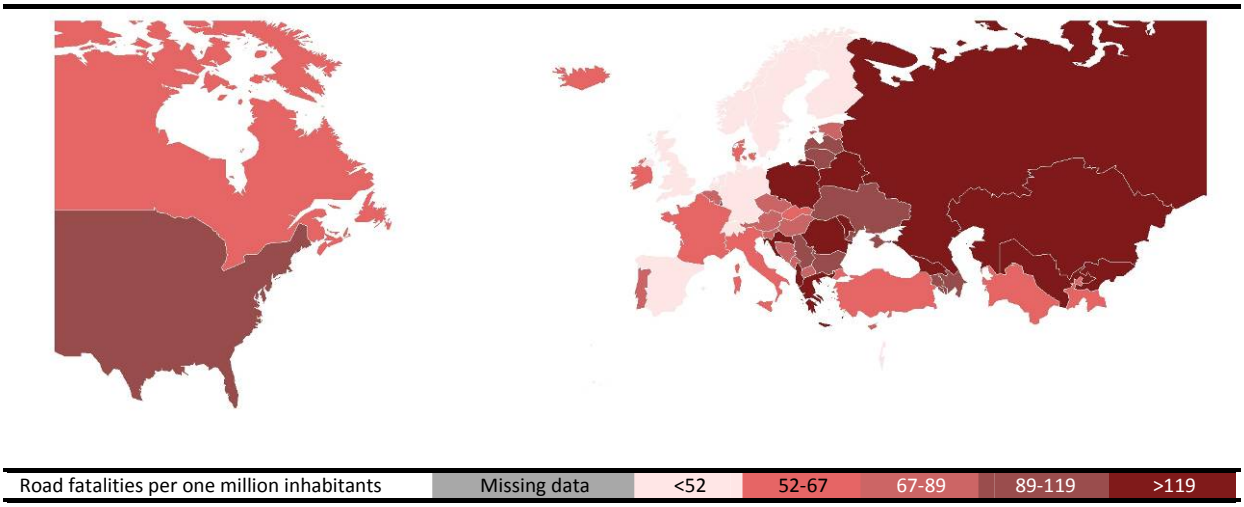
Figure 2.3 also shows that Slovenia managed to reduce the number of road fatalities per one million inhabitants from more than 245 in 1993 to 83 in 2009. Unfortunately this positive development is not seen in all countries. Kyrgyzstan for instance increased the fatality rate from 138 fatalities per one million inhabitants in 1994 to 191 in 2009.

Figure 2.3
Road fatalities 1993-2009



Source: UNECE, OECD/ITF and Eurostat. Note that the UNECE average is estimated.

Figure 2.4
Road fatalities in the ECE region in 2009



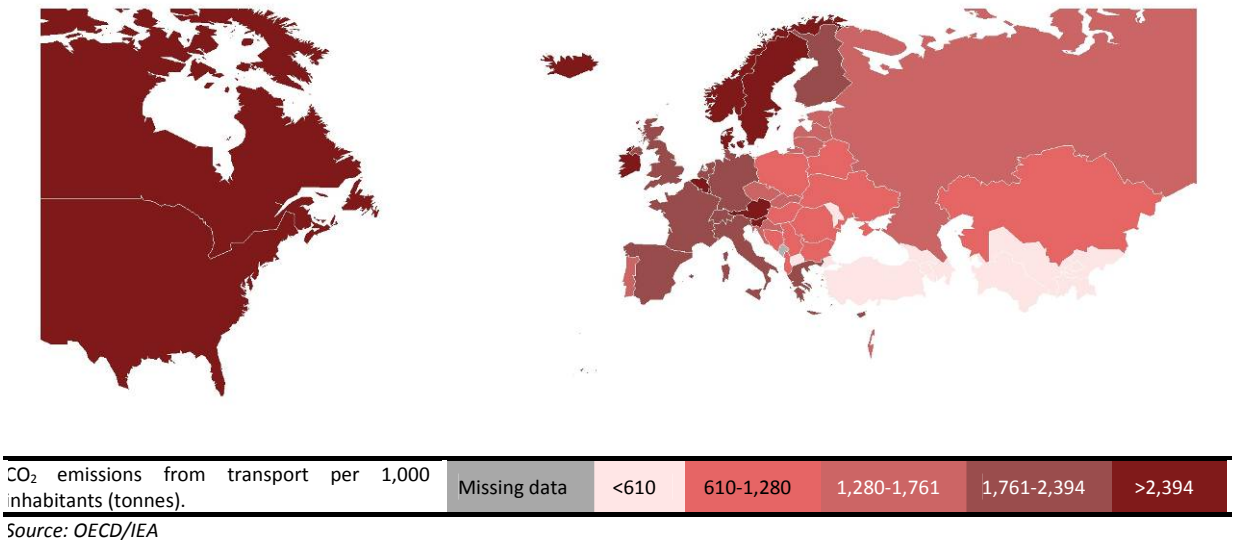
Road fatalities per one million inhabitants	Missing data	<52	52-67	67-89	89-119	>119

Source: UNECE

Figure 2.4 shows that especially the East and South-East European countries have substantial road safety issues. More than half of the UNECE countries (32) had less than 100 road fatalities per one million inhabitants in 2009. The lowest rates are found in Sweden and the United Kingdom (both 38); the highest rate is found in the Russian Federation (195).

Emissions from transport

Figure 2.5
CO_2 emissions from transport per 1,000 inhabitants in the ECE region in 2008



CO_2 emissions from transport per 1,000 inhabitants (tonnes).	Missing data	<610	610-1,280	1,280-1,761	1,761-2,394	>2,394

Source: OECD/IEA

CO_2 emissions from transport measured in tonnes have increased by 23% in the ECE region from 1990-2008. In several member States the CO_2 emissions have more than doubled. This development is not seen in all countries, many regions are able to reduce their CO_2 emissions. For example in Germany the emissions have been reduced by 6% over the same period.

Figure 2.5 shows the CO_2 emissions from transport per 1,000 inhabitants in 2008. It is not surprising that emission levels are highest in more developed countries, as economic development and demand for transport are coupled. Transport demand is highest in these regions leading to a high level of CO_2 emissions from transport.

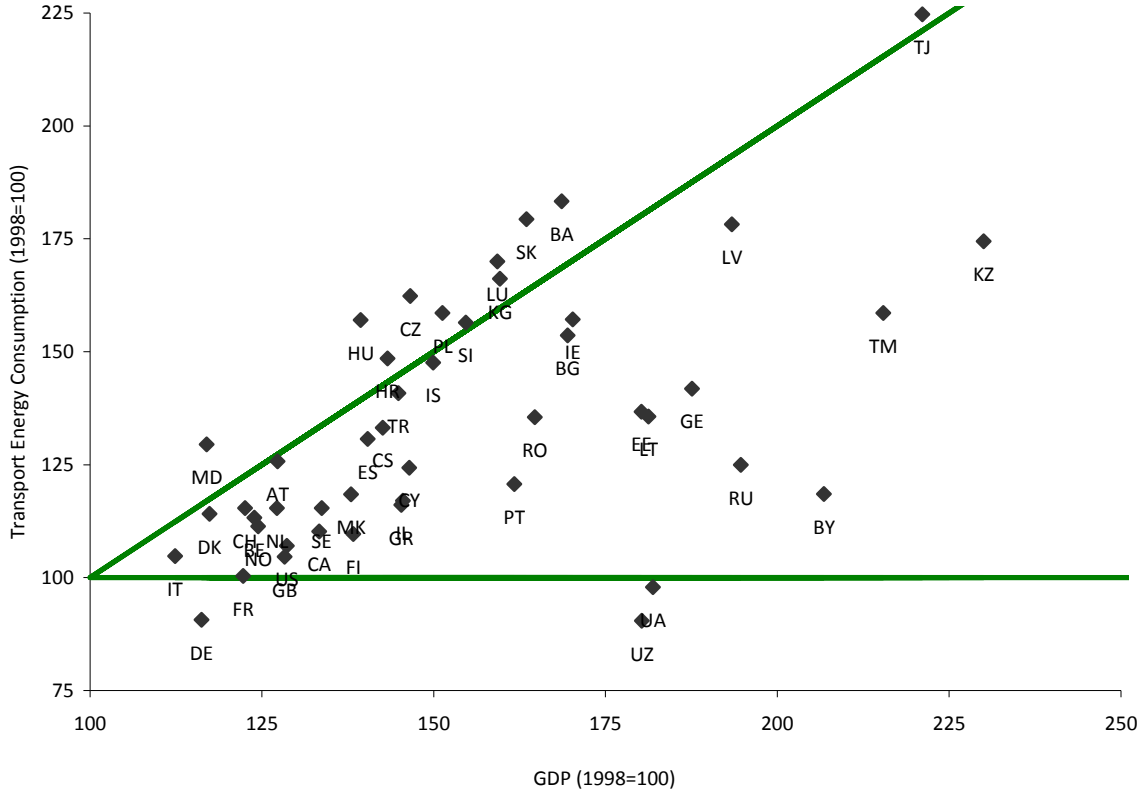
Energy consumption

Development

In the ECE region the transport sector consumes on average one tonne of oil equivalent energy per capita (937 kg). The oil consumption per capita in the transport sector has increased by 12 percent since 1993 when the average consumption was 836 kg of oil equivalent energy per capita. The consumption peaked in 2007. In that year an average ECE inhabitant consumed 965 kg of oil equivalent energy in transport. Luxembourg (4,444) and U.S.A. (1,976) consumed the most energy per capita in 2008 in the transport sector; Tajikistan (15) consumed the least. Figure 2.6 shows GDP growth is closely linked with transport energy consumption. The countries located above the green 45 degree line increased energy consumption more than income. The countries below the horizontal green line managed a decoupling of transport energy consumption from economic growth. Most UNECE member States are located between these two lines, indicating a *relative decoupling*.

Figure 2.6

Change in energy consumption in transport and GDP in 2008 compared to 1998



Source: OECD/IEA and UNECE

Table 2.1
Key statistics for UNECE member States

	GDP per capita USD PPP corrected (2009)	GDP growth (2008-2009)	Unemployment rate (2009)	Inflation (2009)	Passenger cars per 1,000 inhabitants (2009)	Road density, km of road per thousand inhabitants (2008)	Road density, km of road per square km (2008)	Road fatalities per mio inhabitants (2009)	Energy consumption in transport, tonnes of oil equivalent per 1,000 inhabitants (2008)	Energy consumption in transport without domestic aviation, tonnes of oil equivalent per 1,000 inhabitants (2008)	Tonnes of CO2 emissions from transport per 1,000 inhabitants (2008)	Tonnes of CO2 emissions from transport (without aviation) per 1,000 inhabitants (2008)
Albania	8,416f	3.3	13*	2.3	89	5.7	0.6	120	240	240	732	732
Armenia	5,007	-14.2	6.9	3.4	94e	2.5	0.3	100	103	103	270	270
Austria	38,988	-3.9	4.8	0.5	521	13.2	1.3	76	966	948	2,650	2,597
Azerbaijan	9,696	9.3	6	1.3	86	7.0d	0.7d	105	205	198	604	583
Belarus	12,477	0.2	0.9	13	242	10.0c	0.5c	137	262	262	679	679
Belgium	36,463	-2.8	7.9	-0.1	481	14.2	5.0	89	857	856	2,530	2,529
Bosnia and Herzegovina	7,537	-2.9	24.1	-0.4	184	5.8c	0.4c	88	246	244	737	731
Bulgaria	13,900	-4.9	6.8	2.8	330	5.2c	0.4c	119	379	377	1,084	1,078
Canada	38,049	-2.6	8.3	0.3	589	41.8	0.1	63	1,704	1,543	4,863	4,387
Croatia	20,270	-5.8	9.1	2.4	348	6.6	0.5	125	469	454	1,392	1,349
Cyprus	30,862	-1.7	5.3	0.4	529	14.1	1.3	89	788	788	2,284	2,284
Czech Republic	25,639	-4.1	6.7	1	423	12.4	1.7	86	594	588	1,710	1,692
Denmark	37,849	-5.2	6	1.3	470f	13.2	1.7	55	837	830	2,494	2,472
Estonia	19,965	-13.9	13.8	-0.1	407	43.3	1.3	75	573	572	1,693	1,693
Finland	35,387	-8.2	8.2	0	520	14.8	0.2	52	825	797	2,390	2,307
France	33,841	-2.6	9.5	0.1	495	15.2	1.7	66	715	693	2,002	1,936
Georgia	4,755	-3.9	16.9	1.8	116f	4.6c	0.3c	169	147	147	411	411
Germany	36,495	-4.7	7.5	0.3	510	7.9	1.8	51	659	636	1,807	1,740
Greece	29,246	-2.3	9.5	1.2	455	10.3	0.9	129	670	639	1,953	1,863
Hungary	20,366	-6.7	10	4.2	301	19.7	2.1	82	451	451	1,280	1,280
Iceland	36,951	-6.8	7.2	12	644	40.9	0.1	53	964	941	2,867	2,804
Ireland	39,740	-7.6	11.9	-4.5	432f	21.7	1.4	54	1,023	1,013	3,028	3,001
Israel	28,267	0.8	7.6	3.3	265	2.4	0.8	42	481	481	1,413	1,413
Italy	32,545	-5	7.8	0.8	604	8.3c	1.6c	67	680	667	1,956	1,917
Kazakhstan	11,612	1.2	6.6	7.3	173	5.9	0.0	182	331	323	906	884
Kyrgyzstan	2,304	2.3	8.4	6.9*	60	6.5e	0.2	191	96	96	271	271

Source: UNECE, OECD/IEA, Eurostat, The World Bank, IRF, National Statistical Offices,
Note: -=data is not available. Data is for the year given in the column header, except for a: 2000, b: 2004, c:2005, d:2006, e:2007 and f: 2008

Table 2.1

Key statistics for UNECE member states

	GDP per capita USD PPP corrected (2009)	GDP growth (2008-2009)	Unemployment rate (2009)	Inflation (2009)	Passenger cars per 1,000 inhabitants (2009)	Road density, km of road per thousand inhabitants (2008)	Road density, km of road per square km (2008)	Road fatalities per mio inhabitants (2009)	Energy consumption in transport, tonnes of oil equivalent per 1,000 inhabitants (2008)	Energy consumption in transport without domestic aviation, tonnes of oil equivalent per 1,000 inhabitants (2008)	Tonnes of CO2 emissions from transport per 1,000 inhabitants (2008)	Tonnes of CO2 emissions from transport (without aviation) per 1,000 inhabitants (2008)
Latvia	16,238	-18	17.1	3.5	401	30.9	1.1	113	523	523	1,567	1,567
Lithuania	17,136	-14.7	13.7	4.5	508	24.3	1.2	111	520	520	1,486	1,483
Luxembourg	85,165	-3.7	5.1	0.4	671f	11.6	2.2	95	4,444	4,444	13,179	13,179
Malta	25,269	-0.19	7	2.1	566	7.5	9.8	51	433	433	1,287	1,287
Montenegro	2,841	-6.5	6.4	-0.1	287	11.9	0.5	82	-	-	-	-
Netherlands	40,987	-5.7	19.1	3.8	461	8.2	3.3	44	736	733	2,126	2,117
Norway	55,964	-3.9	3.7	1.2	465	19.3	0.3	44	996	923	2,944	2,731
Poland	19,009	-1.4	3.1	2.2	432	10.0	1.2	120	411	411	1,158	1,158
Portugal	25,091	1.7	8.2	3.8	374f	7.3c	0.8	79	598	589	1,761	1,735
Republic of Moldova	12,964	-2.5	9.6	-0.8	113	3.5	0.4	134	97	97	286	286
Romania	14,615	-7.1	6.9	5.6	198	9.2b	0.8b	131	242	236	694	677
Russian Federation	14,915	-7.9	8.4	11.7	233	6.8e	0.1e	195	685	644	1,714	1,591
Serbia	11,477	-3.1	16.1	8.1	224	5.5	0.5	101	300	300	879	879
Slovakia	22,968	-4.8	12	1.6	293	8.1	0.9	64	489	489	1,304	1,304
Slovenia	27,652	-8.1	5.9	0.9	518	19.0	1.9	83	999	999	2,939	2,939
Spain	32,391	-3.7	18	-0.4	478	14.9e	1.3e	46	807	755	2,394	2,239
Sweden	37,154	-5.3	8.3	-0.3	462	61.8	1.3	38	897	875	2,523	2,456
Switzerland	45,353	-1.9	4.1	-0.5	519	9.2	1.7	45	800	792	2,256	2,233
Tajikistan	1,835	3.9	2.1	6.4	29e	4.5a	0.2	64	15	15	41	41
FYR Macedonia	11,181	-0.9	32.2	-0.6	137	7.0	0.5	78	197	197	583	583
Turkey	14,223	-4.8	14	6.3	97.76	4.99	0.46	59.59	224	200	662	589
Turkmenistan	6,325	6.1	-	-	18e	5.3a	0.0a	64	195	195	549	549
Ukraine	6,325	-15.1	8.8	15.9	43	3.7	0.3	116	272	271	701	698
United Kingdom	35,249	-4.9	7.6	-0.6	457	6.8	1.7	38	704	691	2,032	1,995
United States	45,918	-2.6	9.3	-0.4	443	21.2	0.7	110	1,976	1,803	5,557	5,044
Uzbekistan	2,851	8.1	0.2e	-	43e	3.3a	0.2a	135	128	120	329	306

Source: UNECE, OECD/IEA, Eurostat, The World Bank, IRF, National Statistical Offices,

Note: -=data is not available. Data is for the year given in the column header, except for a: 2000, b: 2004, c:2005, d:2006, e:2007 and f: 2008

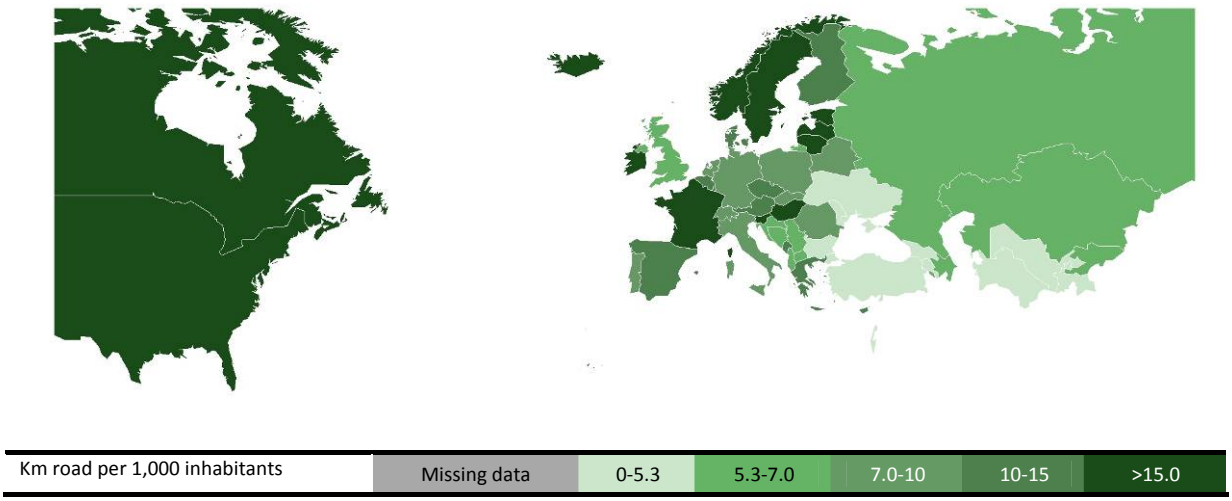
3. Accessibility: Access to social services and international markets

3.1 National accessibility: Providing access for individuals with special needs!

Attending school, visiting the doctor, shopping for groceries, going to work and visiting friends are basic needs that require transport. While many individuals in the ECE region can take it for granted that the local transport infrastructure is able to provide access to these activities a considerable share of the population has no access. By improving the infrastructure - especially in rural areas - the social inclusion and economic development of rural populations can be improved. Local accessibility is a necessary precondition for social and economic sustainability. It provides individuals with access and improves the competitiveness of the region and ensures economic development.

National accessibility ⇨ High Mobility ⇨ Access to education, food, health and employment ⇨ **Social inclusion, individual economic development and reduced inequality!**	
Key challenges	➢ Rural accessibility is low in some areas of the ECE region ➢ Road quality is poor in some areas of the ECE region ➢ Individuals with disabilities require special attention ➢ Congestion is an increasing challenge in urban areas.
UNECE	➢ Provides an intergovernmental platform for sharing of best practices ➢ Provides statistical and analytical information that assists governments in recognizing and handling national accessibility of transport.

Figure 3.1
Road density in the ECE region, 2008 or newest year available.



Source: UNECE

The current situation in national accessibility

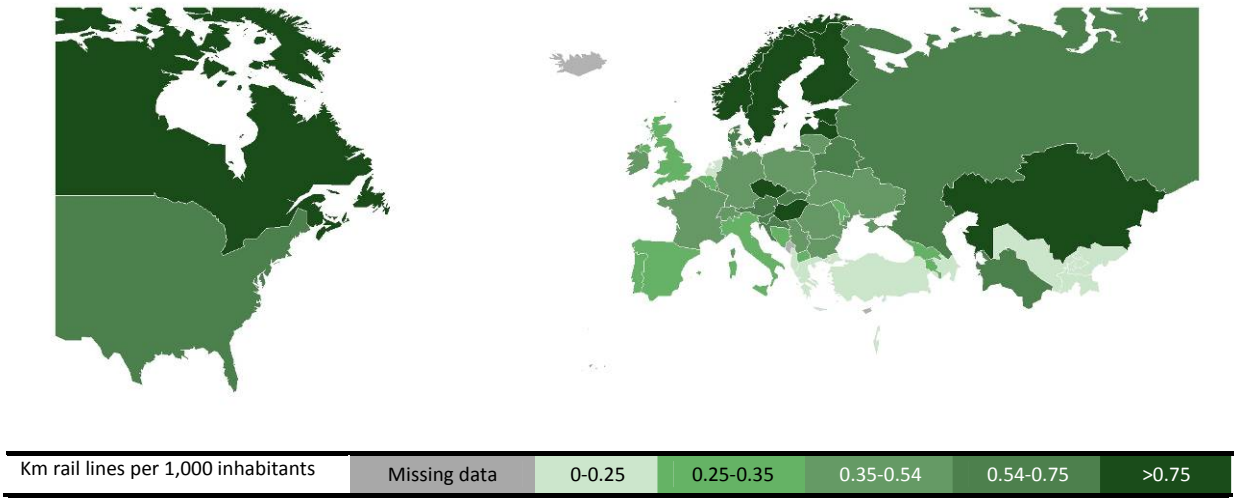
Measuring national accessibility: Infrastructure density

Measuring local accessibility is a very complex task. The degree of local accessibility depends on geographic and demographic characteristics of the area and in many cases measurement requires very detailed data. Here a very simple indicator for local accessibility which shows

the infrastructure density of rail and road density is applied. It is important to recognize the limitations of such an indicator. More roads and rail lines are in general beneficial for accessibility, but it may not be the best solution. Especially in urban areas, space is limited and congestion leads to low accessibility despite the existence of roads. In these cases other measures are necessary. It is difficult to measure all aspects of accessibility at once. A simple indicator has the advantage of being easily understandable and intuitive, and as long as one realizes the limitations it can reveal valuable information.

Figure 3.1 shows a map of the road density in the ECE region, measured by km of roads per 1,000 inhabitants. There are considerable differences within the ECE region. In the ECE areas with the lowest density there is about 2.5 km of roads per 1,000 inhabitants, the most dense road infrastructure is in Sweden with 62 km of roads per 1,000 inhabitants, followed by Estonia (43km) and Canada (42km). These small changes are unlikely to make a difference for sustainable development, while a difference of 2.5 to 46 is considerable and will influence the social and economic development of the region. The rail infrastructure density measured by km of rail lines per 1,000 inhabitants is presented in figure 3.2. The densest infrastructure is found in Canada with 1.7 km of rail lines per 1,000 inhabitants.

Figure 3.2
Rail density in the ECE region, 2008 or newest year available



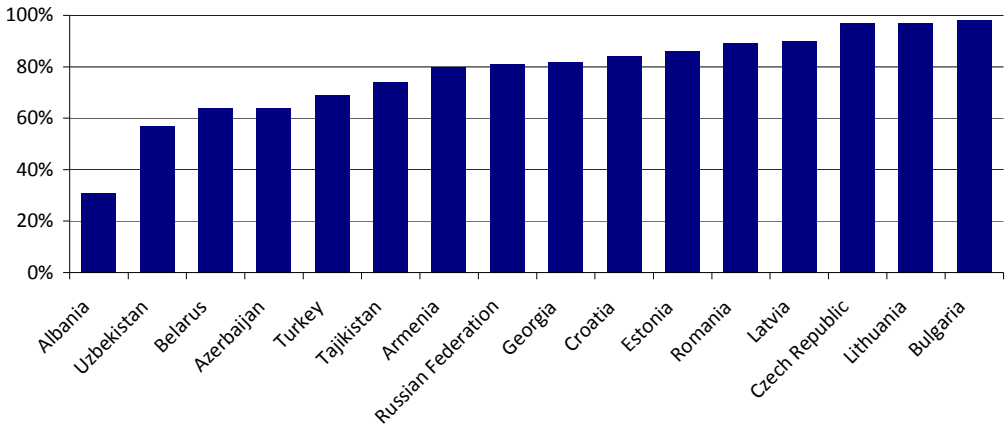
Source: UNECE

Rural accessibility

Especially in rural areas inclusion of the individual in the society and individual development depends on the existence of roads or rails that allow them to fulfil social tasks efficiently and safely. Figure 3.3 shows an example of the rural access indicator created by the World Bank. The rural access indicator shows the estimated percentage of rural people who live within 2 km of an all season road. The World Bank has identified a significant correlation between this rural access indicator and basic social services. It is seen that in a number of UNECE countries, the rural accessibility is below 80%. In Albania, two out of three inhabitants in rural areas have no access to an all season road within about twenty minutes walk (2 Km).

This may have serious consequences for the social and economic inclusion of these individuals in the society.

Figure 3.3
The share of the rural population living within 2 km of an all season road

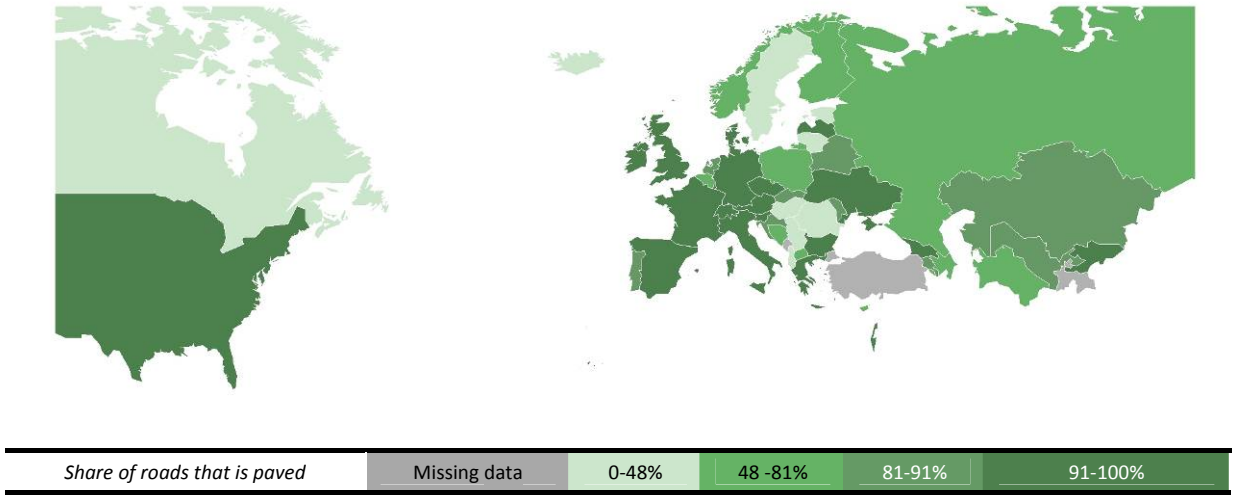


Source: The World Bank. Note: Data is from the period: 2000-2003.

The World Bank has identified a significant correlation between the rural access index indicator and social factors, such as poverty, maternal mortality and gender equity. For instance, Vietnam has managed to improve the rural accessibility, a development in close correlation with the reduction of poverty.

Paved roads

Figure 3.4
Paved roads in the ECE region, 2008 or newest year available



Source: The World Bank and IRF

It is important to realize that the type and quality of roads should follow the needs. Many regions will be made accessible with unpaved roads that can be produced at considerably lower costs than advanced highways. Figure 3.4 shows the share of paved roads in the ECE

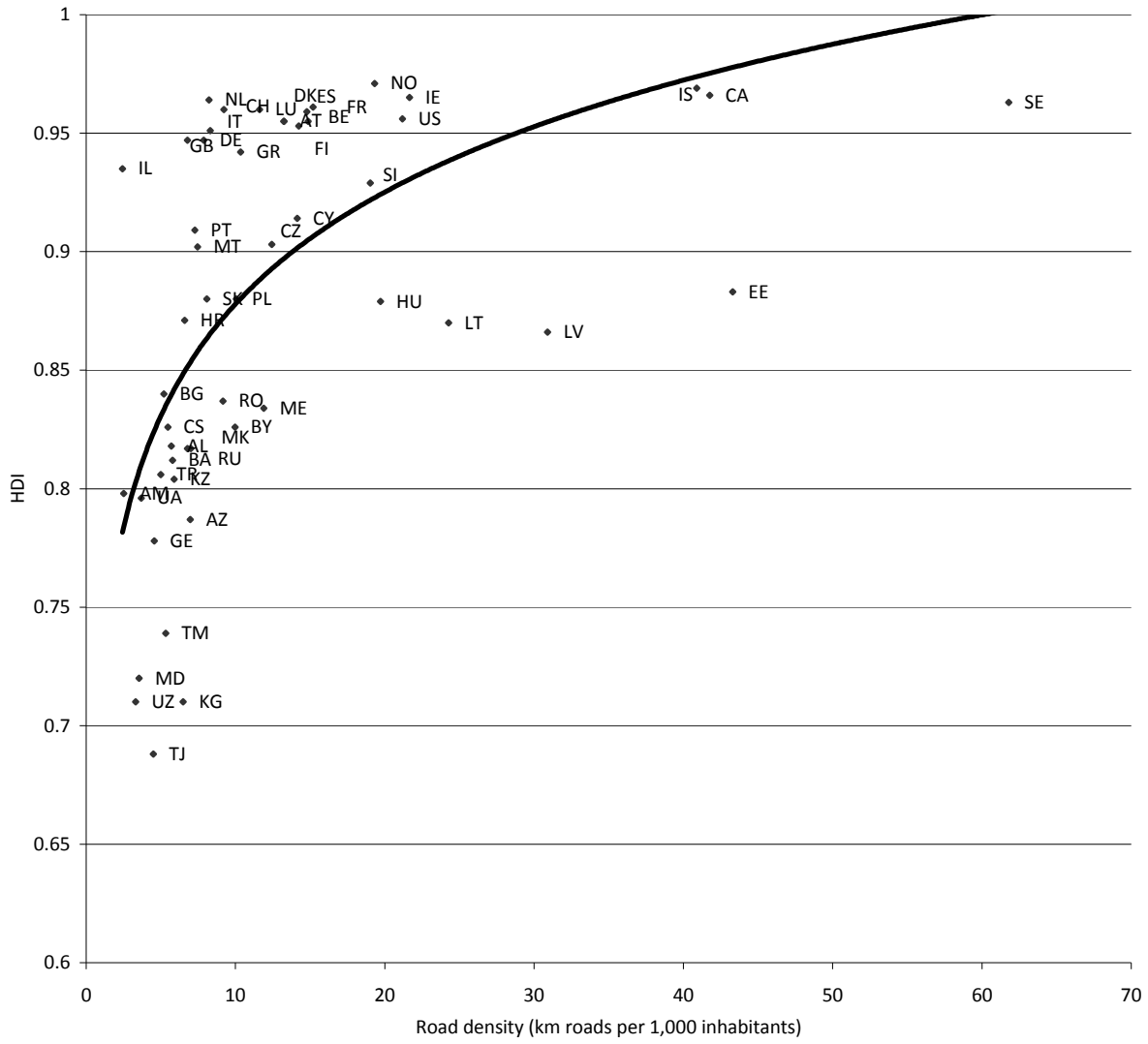
region. It is seen that many less developed countries of the ECE region apply this strategy and have a considerable share of unpaved roads. It is interesting to note that in the countries with the most dense road infrastructure, Sweden and Estonia, the share of paved roads is among the lowest.

National access and social performance

The rural access index is a more precise measurement of local accessibility than road density. But even for road density a close correlation with social factors can be identified. Figure 3.5 shows a clear positive relationship between road infrastructure density and the human development index score for the UNECE countries.

Figure 3.5

Total roads per 1,000 inhabitants and the Human Development Index



Source: UNDP and UNECE. Note: The Human Development Index is a composite indicator combining information on GDP per capita, life expectancy and education. 1=high, 0=low.

Challenges and Best Practices: Access for everyone!

Challenges

Did you know? More than 1.2 billion people live in the ECE region.

Rural accessibility

The indicators have shown that rural accessibility is low in some areas of the ECE region. The Ministry of Transport of the Russian Federation is addressing the issue of low accessibility by considering the 39,000 settlements that only have access to the transport network through unpaved roads. The Russian Transport Ministry has estimated that 10% of the population, corresponding to about 15 million inhabitants, is at risk of losing connection to the transport network in the spring and the autumn.[6] Ensuring access to transport is therefore among the main goals of the Russian Transport Strategy towards 2030.[7]

The World Bank data from 2000-2003 shows that in several UNECE countries a considerable part of the rural population does not have access to an all season road within 2 km of their place of living. Responses to the UNECE questionnaire related to this report indicate considerable improvement in this area. Nonetheless, improving the accessibility especially in the rural parts of the ECE area is important for obtaining economic and social sustainability. Many rural areas are in transition economies, and improving infrastructure is therefore a special challenge because public funds are scarce and the financial return is often relatively low in these projects. Moreover environmental sustainability has to be considered as new infrastructure everything else reduces the amount of natural habitat and often has an undesired impact on biodiversity.

UNECE specific challenge – National Accessibility

Providing access for individuals with special needs

Certain groups in the society have special needs with respect to mobility, because they, due to individual characteristics may have special requirements. Children and young individuals are not able to operate private transportation. This group also needs special attention because access to education is crucial for their development. Elderly and disabled individuals have special needs that require the infrastructure and transportation to take specific initiatives, to secure their mobility. To include these groups in the society it is important that they can access cultural and social activities, as well as health institutions. The WHO has estimated that about 2.9% of the worlds population are severely and about 12.4% moderately disabled. This corresponds to in total almost 100 million individuals![8]

[6] According to the information given by the Russian Federation in the questionnaire on Transport for Sustainable Development, December 2010.

[7] According to goal 3 of Transport Strategy, Russian Federation until 2030. http://rosavtodor.ru/information/Osnovnye_programmy/transportnaya_strategiya_rf_na_period__do_2030_goda.html

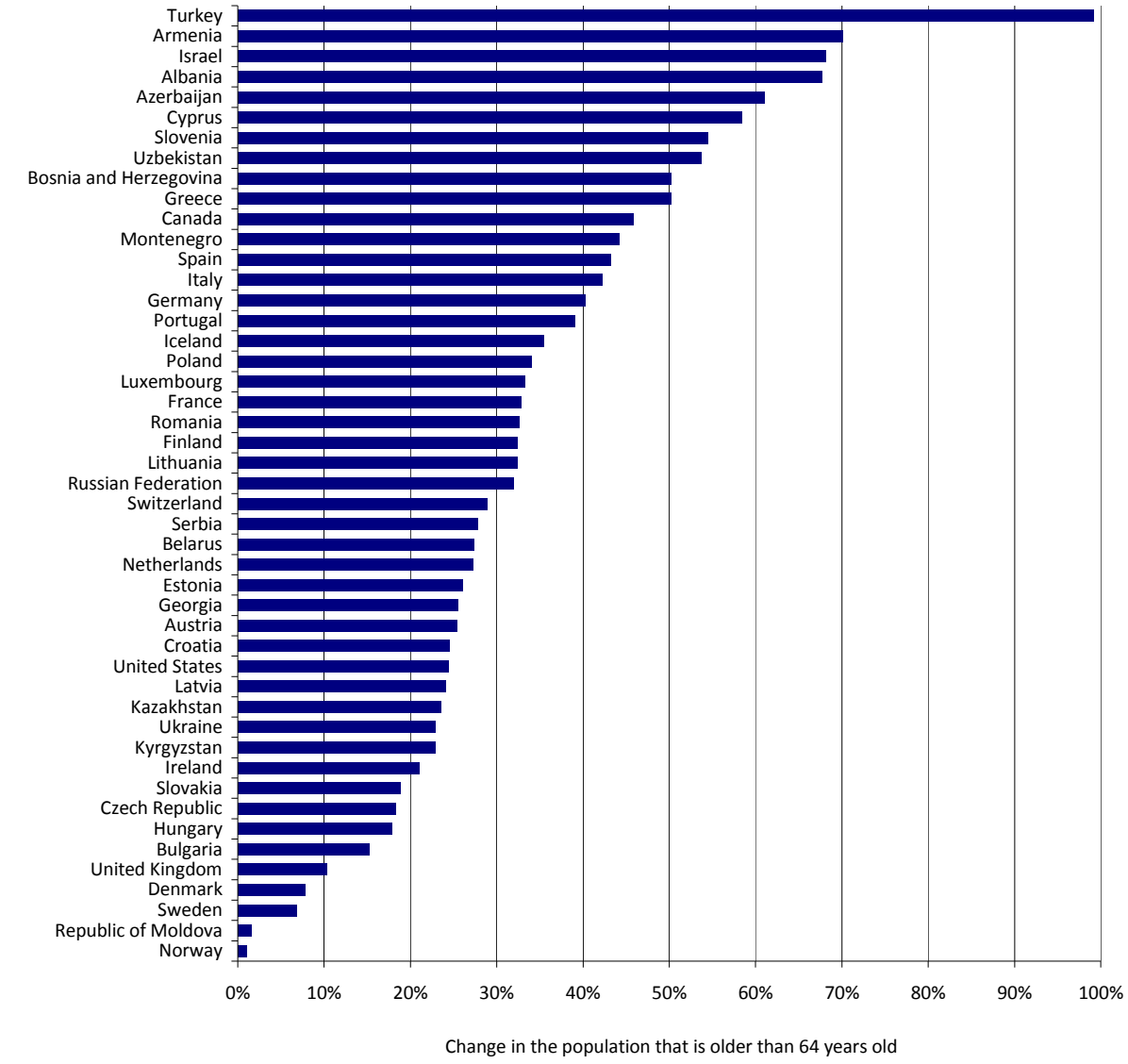
[8] According to: www.who.int/healthinfo/global_burden_disease/GBD_report_2004update_part3.pdf

Congestion in urban areas

Accessibility is not only a concern in rural areas. Increased urbanization and the resulting increasing transport demand leads to congestion and low accessibility, especially around peak hours. Urban areas are challenging because of the lack of space. Infrastructure cannot be increased in quantity, because the space is simply not there. Moreover liveability in cities is negatively affected by traffic density. Air pollution, traffic noise and reduction in recreational areas may be the result of increasing transport. New roads and more traffic will therefore have negative impacts on human health, well-being and the environment in urban areas.

Figure 3.6

Change in the population that is older than 64 years old. 1990 – 2008



Source: UNECE

Providing access to an aging population

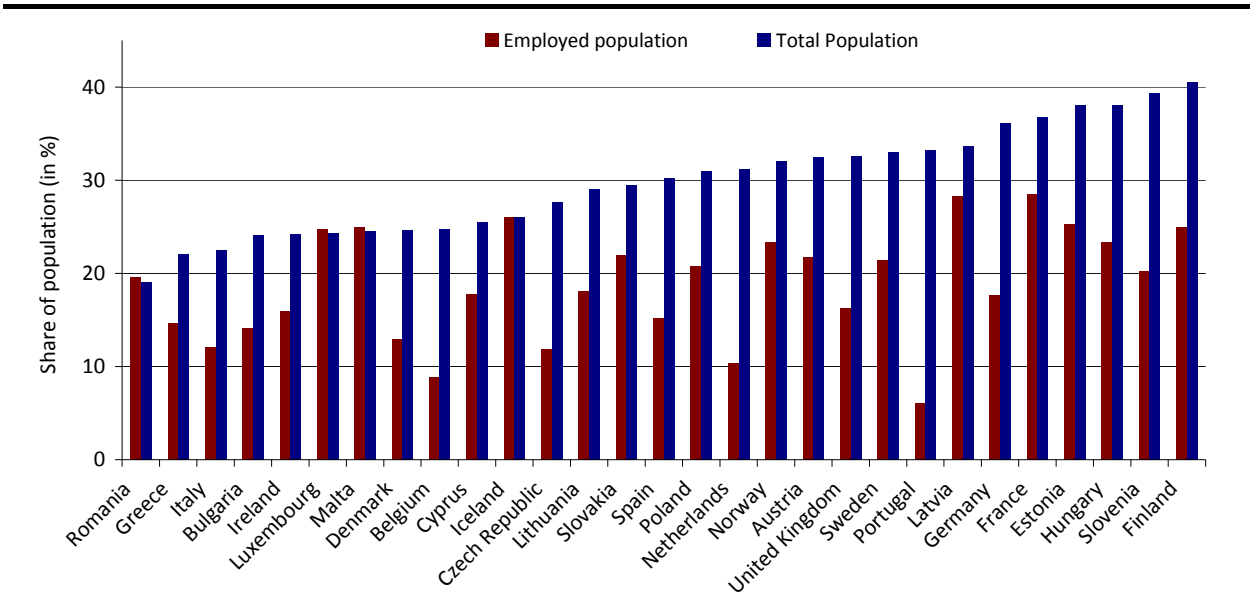
Figure 3.6 shows how the number of individuals that are above 64 years of age has increased in all UNECE countries over the period 1990 to 2008. In eleven UNECE countries, there has been an increase of more than 50%. In Turkey, the number of individuals above the age of 64 almost doubled over the observed period. The share of the population that is more than 64 years old has been increasing in 45 out of the 48 UNECE countries for which data is available. In seven countries the share has increased by more than 50%. Only Norway, Ireland and Sweden experienced a decrease in the share. These major changes in the age distribution of the population must be considered when designing transport systems. Elderly require special assistance and have different needs than the younger population.

Health issues in the ECE region

The ECE region has unfortunately witnessed a number of wars and conflicts during the decades. These have had an impact on the health condition of the population. War veterans and individuals living in conflict zones usually have long-standing health issues that affect their mobility. Figure 3.7 reveals that health problems are not only an issue in recent conflict zones. The figure shows the share of the population with a long-standing health problem in 2008 (blue bars). In all but one of the countries for which data is available every fifth has a long-standing health problem. The red bar indicates the share of the employed population with long-standing health issues. It is interesting to note that in some countries the share among employed is as high as the total population, indicating that health problems not necessary imply exclusion from the labour market. This is a good sign for the social inclusion of individuals with health issues, but it nevertheless worrying that in seven of the countries for which data is available more than one in three has a long-lasting health problem.

Figure 3.7

Share of population with a long-standing illness or health problem in 2008



Source: Eurostat

Best practices

Assessment of accessibility issues[9]

A very thorough analysis of how local accessibility affects social exclusion was carried out in United Kingdom in 2002 and led to a number of striking findings:

- Lack of transport was a barrier to getting a job for 38% of the jobseekers.
- Over a 12-month period 1.4 million individuals did not seek medical help because of transportation problems.
- Among individuals without access to a car, 16% had difficulties accessing the supermarket, compared to 6% in the total population. 18% of the individuals without a car have issues seeing friends and relatives due to transport problems compared to 8% in the total population.
- 45 % said that the most important transport problem is inadequate public transport.

To handle these issues a number of national and local initiatives were initiated, 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.

Designated infrastructure for individuals with special needs[10]

In the German city of Düsseldorf, a waiting room for individuals with hearing impairments was set up on the main train station in 2007. The room is staffed with two social workers and gives individuals a possibility to meet and communicate with likeminded. Moreover the room is equipped with Internet facilities, webcam and a kitchen.

Rural roads in Armenia – A World Bank project[11]

The World Bank is supporting Armenia in improving their rural road accessibility. A 40 million United States dollar loan has been granted to rehabilitate 190 km of roads. Furthermore technical assistance is provided to the Armenian government for improving the efficiency in designing new roads. Low accessibility is a major challenge in rural areas of Armenia, where the inability to bring crops to the market has resulted in a loss of at least 40% of the harvest. The project has also direct impacts in the region. The total job impact (direct and indirect) is estimated to be 19,000 person-months of employment.

Best Practice – National Accessibility

The case of Linz: Ensuring mobility of individuals with special needs

"Ungehindert mobil" is German for barrier-free mobility and is the name of an Austrian project that has worked for barrier free travel for individuals with special needs in the Austrian city of Linz. Projects involve ramps that allow access for wheelchairs to and from public transport, designated spaces for wheelchairs in public transport, ground marking for individuals with reduced vision, DISA an audio guide for individuals with reduced vision that informs about next departures and public transport maps that apply the Braille method. Moreover specially designed taxis and teaching of professional drivers to take special consideration to individuals with special needs is applied.

[9] According to: www.ilo.int/wcmsp5/groups/public/---ed_emp/---emp_policy/---invest/documents/publication/wcms_asist_8210.pdf
[10] According to: www.glsh-warteraum.de/
[11] According to: http://go.worldbank.org/BQBS78RWS0

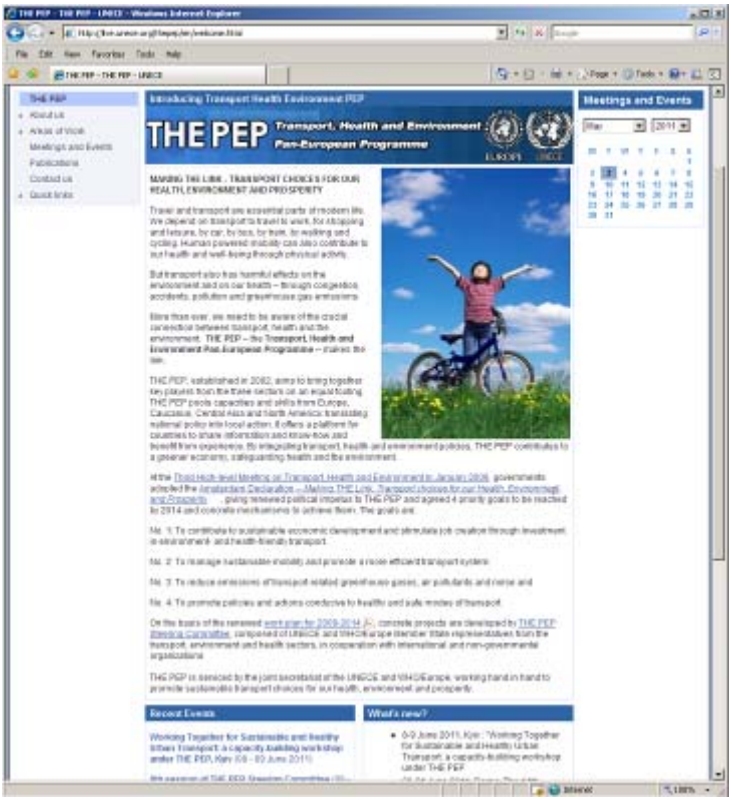
The Role of UNECE in improving national accessibility

Sharing best practices

Improving accessibility is a challenging task. In rural areas investment funds are scarce and the impact on the environmental sustainability may be substantial. Lack of space requires creative solutions in urban areas and the environmental and health impact in cities may be even larger than in rural areas. International sharing of best practices, experiences, ideas and problems is therefore crucial for obtaining national and local accessibility. The UNECE is a unique international platform, which acts as a forum for governments and transport professionals and researchers to get together and share experiences.

THE PEP

The Pan-European Programme on Transport, Health and Environment (THE PEP) was established in 2002 to promote cooperation and integration between regions (Europe, Caucasus, Central Asia and North America) and sectors (Transport, Health and Environment). THE PEP is serviced by the UNECE and WHO Europe.



The needs of individuals with disabilities

UNECE has also taken the initiative to improve the accessibility of disabled people. The Working Party on Rail Transport (SC.2) initiated a workshop on passenger accessibility of heavy rail systems, dealing with the issue whether rail transport discriminates.

Capacity building

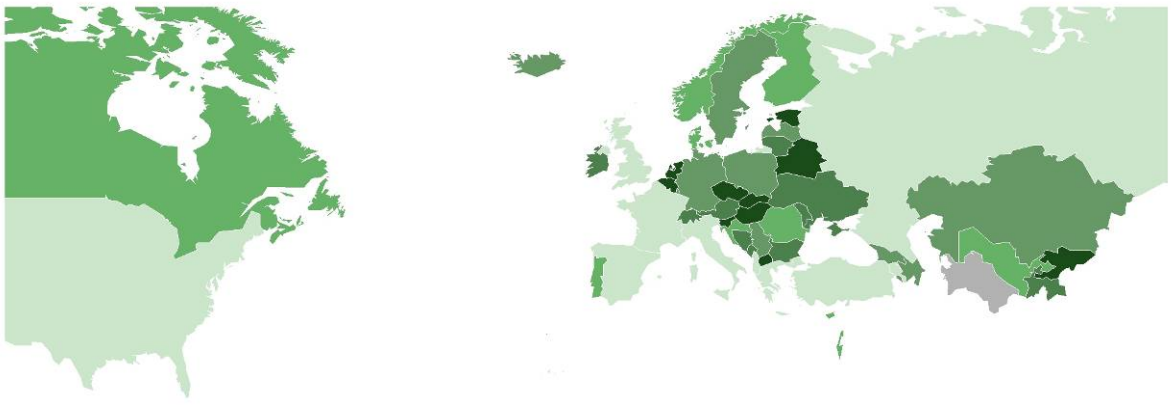
The UNECE statistical database provides information about national infrastructure and allows countries to compare and evaluate the development. Moreover information material is provided to identify problems, share measures and best practices and raise awareness.

3.2 International accessibility: Sustainable access to markets!

International transport links are a prerequisite for engaging in global trade chains. Participation in global logistic supply chains is essential for attracting foreign investments, firms and human capital. Strategic international links are therefore important for the economic development of a region. Foreign trade is especially important for small economies. Landlocked countries are disadvantaged as they rely on hinterland connections and border crossings have a disproportionate impact on trade to and from landlocked countries. Especially emerging economies that are landlocked need special attention, so that their geographical position is constraint for economic development.

International accessibility ⇨ Participate in global trade ⇨ Increased competitiveness ⇨ economic development	
Key challenges	➢ International transport links are a key element for regional competitiveness ➢ The burden of crossing borders is high in some UNECE member States ➢ Landlocked countries are disadvantaged with respect to international trade, as sea transport is a dominant mode for long distance transport
UNECE	➢ Provides trade and transport facilitation with special attention to land-locked countries ➢ Provides assistance in identification of bottlenecks, missing links and quality of service in infrastructure networks

Figure 3.8
Foreign trade as a percentage of GDP in 2009



Source: UNECE

The current situation

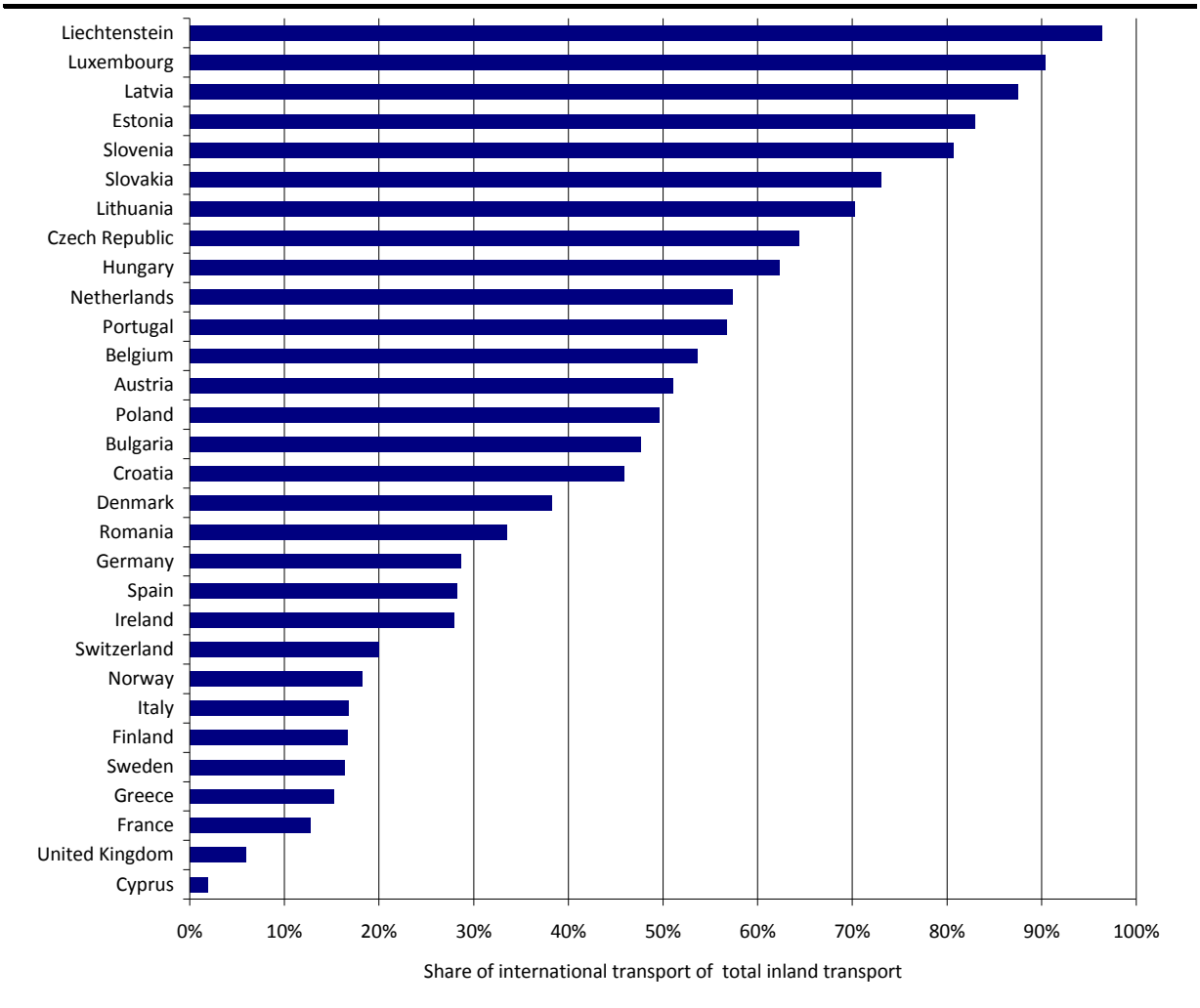
Did you know? Infrastructure networks from the Atlantic to the Pacific are coordinated through UNECE agreements.

International trade

Figure 3.8 shows a map of total foreign trade as a percentage of GDP. In several Eastern European countries total foreign trade (import plus export) is larger than GDP, indicating their dependence of engaging in international trade patterns. It is not surprising that foreign trade is less important in larger countries such as Canada, United States of America and the Russian Federation. In these countries the home-market is large enough to create a sufficient demand for most goods and every industry is typically represented.

Figure 3.9

Share of international transport of total inland transport in 2009



Source: Eurostat

In smaller countries the home-market demand is only limited and domestic firms will therefore seek to supply foreign markets. Inefficient transport links and border crossings can however reduce the attractiveness of exporting goods, as the final price of producing and

delivering a good becomes too high. Furthermore if the transport is time-consuming and unreliable, it becomes difficult to reach the end-market in foreign regions. Efficient and reliable international transport links are therefore a key to make areas more attractive for firms and human capital.

International freight transport

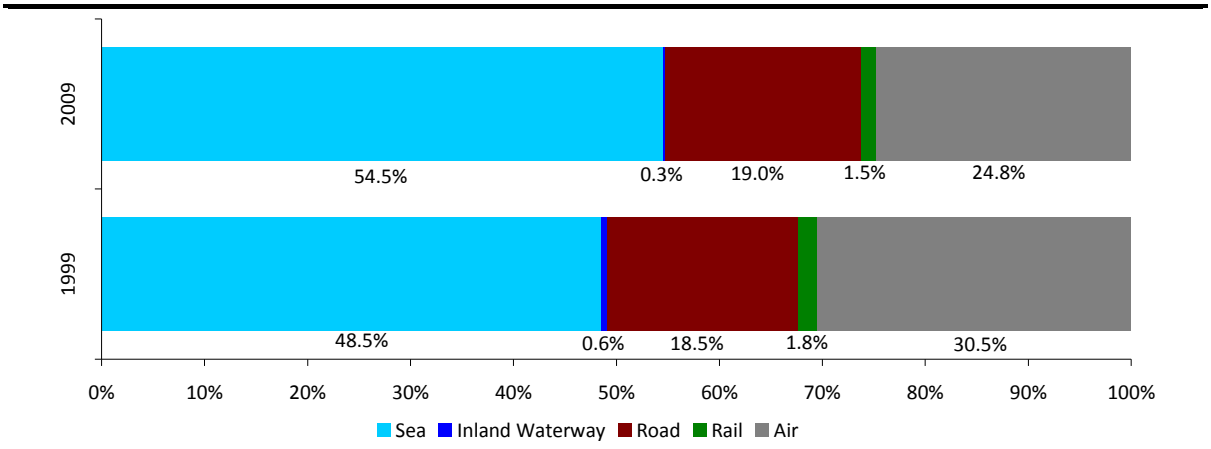
Did you know? The UNECE has issued a publication containing a methodology for identifying bottlenecks in the infrastructure network.

In many ECE countries, international freight transport constitutes more than half of the total freight transport as shown by figure 3.9. Especially Central European countries have high shares of international transport due to their geographic position. The countries with the lowest shares of international transport are for obvious reasons island States.

Transport to and from the European Union

Road transport is more flexible than rail, air and water transport, but the transport volume is considerably lower. Figure 3.10 shows the modal split of imports and exports to and from the EU by transport mode. Measured by volume, sea transport is by far the most important transport mode. In September 2010 freight of a value of 128 billion Euros left and arrived to the EU by sea transport. 57 billion Euros worth of freight arrived and left on air transport and the value of freight received and sent on road transport was 43 billion Euros.

Figure 3.10
Modal split of trade in and out of EU, measured in value.



Source: Eurostat

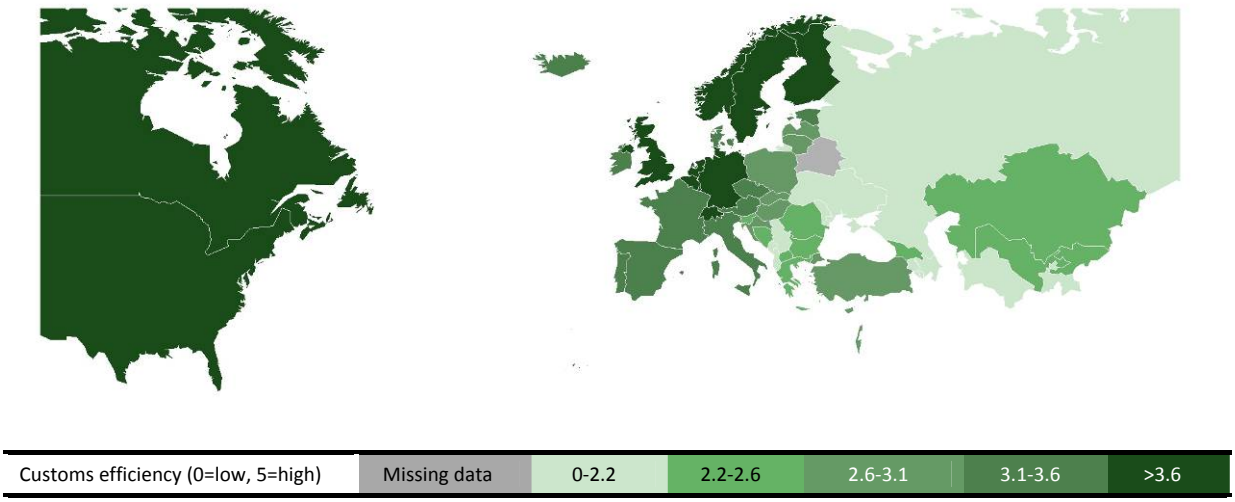
In 1999, sea transport accounted for 49% measured by value of the goods that arrived and left the EU. In 2010, sea transport accounts for 55%. Air transport has decreased their share from 31% in 1999 to 25% in 2009, while the share of inland waterways has been reduced by 50%. Measured by weight, sea transport is even more dominating.

Border crossings

Transport of goods between regions and across borders does not only depend on the existence of international transport links but also on how effectively borders can be crossed. Customs controls can be both time-consuming and costly when freighting goods. In order to ensure timely and efficient international transport border crossings and customs control must be efficient and reliable.

Figure 3.11

Efficiency of customs clearance process



Source: The World Bank's Logistics Performance Index

Figure 3.11 shows the burden of customs control measured by the World Bank. It is seen that most old EU member States are well above the average and show a high degree of efficiency. The customs control efficiency of Eastern as well as South-East Europe, Caucasus and Central Asia countries are mostly below average. This inefficiency may hamper their economic development, as it makes the area less attractive for business, everything else equal.

The high scores of the EU countries with respect to customs efficiency show that international cooperation can work to increase efficiency. International agreements are therefore crucial to allow the less developed countries of Eastern as well as South-Eastern Europe, Caucasus and Central Asia to attain Western European and North American level.

Challenges and best practices

Challenges

Strategic long-distance links

In order to promote cooperation and trade and engage in an international business environment of exchanging ideas and commodities, it is important to provide strategic long-distance links. Integration of transport modes, for instance allowing smooth shifts from

inland waterway traffic to rail and road transport can have a huge impact on a region's attractiveness.

Open borders and increased mobility of the labour force makes it possible for firms to locate where the business environment is attractive. International accessibility is a key for the attractiveness of regions. It has both a direct impact on the region as goods and people can be transported faster and at lower costs to other regions. But the indirect impact might be even greater. Increased competitiveness of a region attracts businesses and people, leading to agglomeration of business activities, knowledge and agglomeration effects.

UNECE specific challenge – International access

Railway Line Warsaw – Bialystok – Grodno – Vilnius

The rail connection from Warsaw to Vilnius, the capitals of Poland and Lithuania are either via Kaunas in Lithuania or via Minsk in Belarus, implying a detour of respectively 90 and 250 kilometres. Furthermore border regulations and geometric parameters imply that only low train speeds are allowed. Therefore the upgrading and reconstructing of the direct corridor: Warsaw – Bialystok – Grodno – Vilnius is highly needed. The electrified double track runs from Warsaw to Bialystok. However, the tracks from Bialystok to the Polish border consist of a single electrified track and a Belarusian single track. Currently the travel time from Warsaw to Vilnius is 10 hours (via Kaunas) and 20 hours (via Minsk) and with the upgrading and reconstructing of the corridor the travel time would be reduced to less than five hours.

The corridor is today a part of the Trans-European Railway (TER) of the UNECE.

Border crossings

Transport links are not only dependent on the establishment of infrastructure but also requires efficient border administration, which reduces costs and time lost at national borders. International agreements and cooperation can improve the efficiency and reliability of border crossings. Uniform standards which are accepted and trusted help identify goods and transportation and making border and customs clearing efficient. Border

waiting time causes high socio-economic loss since both goods and labour are in an unproductive state and cause delays in logistic systems. Increasing border efficiency in Eastern and South-Eastern European, as well as central Asian countries can unlock new resources and enhance the growth of these regions.

Landlocked countries

The ECE region includes several landlocked countries, where border crossing issues have a disproportionate effect. Figure 3.10 shows that sea transport is by far the most important transport mode for international transport measured by value and these countries cannot connect to the sea without crossing borders. Furthermore landlocked countries are dependent on hinterland transport by rail, inland navigation or road in order to engage in international trade patterns. Special attention to these countries is therefore required in order to ensure that they have the same chances of economic development as countries with direct access to the sea.

Best practices

Optimal routing from Austria to Hamburg[12]

Austria is as a landlocked Central European country very dependent on hinterland connections to the ports in North-Western Europe, especially in Hamburg and Rotterdam. This implies the use of heavily used transport whose capacity limits are close to being reached. The COLD study examined two routes. The traditional route to Hamburg via train was compared to a sea-transport route via Constanta (Romania) and the Danube River. Compared to the other European Inland waterways Rhine and Seine; the Danube River has been used relatively little for inland transport. The study showed that the alternative route would have approximately the same transit time, but CO_2 emissions and total supply chain costs would be reduced considerably by using the alternative route.

Direct rail services from China to Europe[13]

Trade between the EU and China is increasing in volume. Subsequently a trial container train service from Beijing to Hamburg was opened in January 2008. The journey with rail took 20 days less than a typical trip from Beijing to Hamburg by sea. The rail goes through six countries: Germany, Poland, Belarus, Russian Federation, Mongolia and China.

The Bosphorus Europe Express[14]

Ljubljana in Slovenia has been connected with Istanbul in Turkey by way of a container train running on weekly basis since early 2008. The route has the potential of being significantly important for the East-West transport in Europe. Road transport for this route takes approximately 60 hours. The train route is already faster and has managed to complete the route in 35 hours, while in the long run a 25 hours journey is planned. The project is a good example of what the rail sector is able to deliver through cooperation between companies. Five companies from Slovenia, Serbia, Croatia, Bulgaria and Turkey are involved in the

[12] According to: www.via-donau.org/
[13] According to: www.unece.org/trans/doc/2010/wp5/ECE-TRANS-210e.pdf
[14] According to: www.unece.org/trans/doc/2010/wp5/ECE-TRANS-210e.pdf

Bosphorus express and the train passes through various electrified systems on its more than 1,500 kilometre long journey.

Rail freight corridor: Rotterdam – Genoa[15]

The rail corridor from Rotterdam to Genoa serves two seaports, six inland ports and 40 intermodal terminals on its 2,100 kilometre journey. Five companies and four countries are involved in this transport link: Netherlands, Germany, Switzerland and Italy. The route includes major infrastructure projects, such as the 57 km long Gotthard Tunnel trough the Alps.

Canada's Gateways strategies[16]

The Government of Canada launched the Asia-Pacific Gateway and Corridor Initiative in 2006 and later added the Continental and Atlantic Gateways. The objective is to engage all levels of government, from federal to municipal and private stakeholders to develop and implement an integrated strategy that includes inter-modal transportation infrastructure as well as non-infrastructure measures. The overall objective is to improve the national competitiveness, by acknowledging that the efficiency of modern supply chains not only depends on the existence of physical infrastructure, but also on how well all elements of infrastructure work together.

The Uzen-Bereket-Etrek-Gurgen railway: A bridge from Europe to Asia[17]

Turkmenistan is expanding their rail and road infrastructure network in order to unlock the economic growth potential of the region. The expansions include a North-South Corridor which can be seen as a bridge from Europe to Asia, connecting countries of the Indian Ocean and the Persian Gulf with Eastern Europe. The project is expected to shorten the travel time by a factor three. The project has led to many dynamic effects, including the creation of new villages, new jobs and increased exploration of natural resources.

Best practice – International accessibility

Financing Mechanism for the Gotthard Tunnel, the Longest Railway Tunnel in the World

In October 2010 Switzerland celebrated the breakthrough of the Gotthard Tunnel, when the boring machine removed the last pieces between the south and north ends of the Gotthard Rail Tunnel. The Tunnel is the longest rail tunnel in the world with its 57 kilometres which is longer than the Channel Tunnel (50.5 kilometres). This 12 billion Swiss francs (2010 estimate) project is part of the AlpTransit or "New Railway Link through the Alps" (NLRA) project that aims at building faster North-South rail links through the Swiss Alps. It is financed through the fund for major railway investments, called the Finöv-Fond. The main funding source is the toll on heavy goods vehicles (55%), about 10% are funded through a fuel tax and the remaining one third are financed through taxes.

[15] According to: www.unece.org/trans/doc/2010/wp5/ECE-TRANS-210e.pdf
[16] According to: www.canadasgateways.gc.ca
[17] According to: www.turkmenistan.gov.tm/_en/?idr=2&id=110105a

The Role of UNECE in improving international accessibility

Infrastructure agreements

UNECE Infrastructure agreements cover road, rail, inland waterways, and combined transport. These agreements strengthen relations between ECE countries through coordinated plans for the construction and development of their transport infrastructures of international importance. They provide the technical conditions the transport infrastructure should confirm to be part of the international network and to get a number, an "ID" in the network. Thus these agreements ensure that the international transport infrastructure in these networks look and is more or less the same from the Atlantic to the Pacific. They are legally binding for the States who become Contracting Parties.

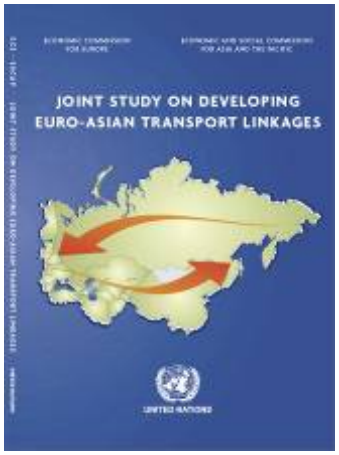
There are six major international infrastructure agreements:

1.	Declaration on the Construction of Main International Traffic Arteries, of 16 September 1950
2.	European Agreement on Main International Traffic Arteries (AGR), of 15 November 1975, basis of the in E roads network
3.	European Agreement on Main International Railway Lines (AGC) , of 31 May 1985 and its Annex 1
4.	European Agreement on Important International Combined Transport Lines and Related Installations (AGTC), of 1 February 1991
5.	Protocol on Combined Transport on Inland Waterways to the European Agreement on Important International Combined Transport Lines and Related Installations (AGTC) of 1991
6.	European Agreement on Main Inland Waterways of International Importance (AGN), of 19 January 1996

Sub-regional infrastructure projects

Complementing the international agreements, the UNECE carried out three sub-regional infrastructure projects, together with participating countries:

1. Trans European Motorways (TEM)
2. Trans European Railways (TER)
3. Euro-Asian Transport Links (EATL)



The main objectives of the projects are the facilitation of road traffic in Europe among and through participating countries as well as development of a coherent and efficient international road, railway and combined transport system in the region. Projects are developed in accordance with the UNECE Pan European infrastructure agreements. TEM and TER Projects are the backbone of Pan-European Road Corridors in Central and Eastern

Europe and represent an important instrument of institutional inter-country cooperation and coordinated actions of the countries in Central, East and South-East Europe.

The TEM and TER Master Plan reflecting the priority transport infrastructure needs of 21 Central, Eastern, and South-Eastern European countries, was published in 2006. It identifies the backbone road and rail networks in those countries and presented a realistic investment strategy to gradually develop these networks. As many as 491 projects with an aggregate estimated cost of 102 billion Euros have been evaluated and prioritized. The implementation of such an investment plan would contribute to the economic growth of the countries concerned and to the well being of their populations, as well as assisting the integration and harmonization of transport within Europe and beyond. [18]

The Master Plan provides a useful tool and framework for intergovernmental cooperation towards coordinated development of a coherent international transport infrastructure networks in Central, Eastern and South Eastern European countries and their integration into the pan-European networks. With this Plan, TEM and TER Projects contributed to the extension of the European Union's TEN-T (Trans-European Transport Network); the practical implementation of Pan-European Transport Corridors; the promotion of intermodal operations and complementarities of transport modes.

The Euro-Asian Transport Links (EATL) project was implemented in the course of 2003 to 2007 as a joint undertaking of UNECE and the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) with designated national focal points from 18 participating countries[19], whose objective was to identify main Euro-Asian road and rail routes for priority development and cooperation in the Euro-Asian region. Countries have also evaluated and prioritized a large number of projects along these routes. Among them projects in the value of 43.4 billion United States dollars were identified for implementation in 15 countries involved. A geographical Information System (GIS) database was also developed, and a preliminary analysis of border crossing obstacles and recommendations for reducing them was made. Recognizing the importance of further development of Euro-Asian transport links, participating countries stressed the need to continue with the project and to set up a permanent monitoring mechanism.

In 2008, the EATL Expert Group was created for the implementing the commitments originating from the "Joint Statement on Future Development of Euro-Asian Transport Links" signed by Ministers of Transport on 19 February 2008 in Geneva, under a new Phase II of the EATL project. The Expert Group, consisting of Government experts from 27[20] countries as well as experts from international organizations, has elaborate studies and research work concerning key Euro-Asian transport issues, including an EATL Strengths - Weaknesses -

[18] According to: www.unece.org/trans/main/tem_ter.html?expandable=99

[19] The eighteen countries from the Euro-Asian region were: Afghanistan, Armenia, Azerbaijan, Belarus, Bulgaria, China, Georgia, Iran, Kazakhstan, Kyrgyzstan, Moldova, Romania, Russian Federation, Tajikistan, Turkey, Turkmenistan, Ukraine and Uzbekistan. At a later stage, Greece also joined the work.

[20] The nine countries involved in EATL Phase II, in addition to the eighteen originally involved, are: Finland, Greece, Latvia, Lithuania, Luxembourg, Germany, Mongolia, Pakistan and the Former Yugoslav Republic of Macedonia.

Opportunities - Threats (SWOT) analysis; assessment of transport volumes and trends along the EATL routes; study on economic viability of inland transport options between Asia and Europe; and analysis of non-physical obstacles to international transport. Experts and consultants were also engaged in extending, updating and identifying infrastructure - road, rail and inland waterway - routes and priority infrastructure investments, in developing a GIS internet application to present the collected transport data and project results, as well as strengthening national capacities and sharing experiences and best practices. The preliminary results of the EATL Phase II include the identification of 378 priority infrastructure projects of a total cost for 169 billion United States dollars from data available for 20 of the 27 participating countries, of which over 190 road projects of a total cost of 112 billion United States dollars.

Identification of bottlenecks, missing links and quality of service in infrastructure networks

Inland transport infrastructure in the pan-European region continues to be provided mainly by governments at prices set well below the long-run marginal cost. Therefore, an administrative process is needed to identify bottlenecks and potential investment.

Box 3.1

Kyrgyzstan a land-locked mountainous country

Kyrgyzstan is a good example of a transition country with geographical characteristics that makes transport policy challenging. The country has no direct access to the sea and is located between Uzbekistan, Kazakhstan, Tajikistan and China and thus dependent on the use of their transport links. In addition to being landlocked Kyrgyzstan is a mountainous region and is often exposed to severe weather conditions.

Eminent experts have argued that international bottlenecks are likely to have causes and solutions that are different from national ones. If the bottleneck is between countries or if an internal bottleneck is mostly a problem because it reduces international traffic flows, the root cause may well be related to rivalry between States that pursue narrow national interests or the lack of an adequate international funding mechanism. All experts agree that bottlenecks depend on prices. In other words, there will always be a price high enough for the bottleneck to disappear. For instance, fixed rail rates in Canada that do not allow for seasonal variations result in seasonal traffic congestion. In contrast, flexible rail rates in the United States of America remove seasonal traffic congestion.

UNECE developed a robust methodology for the identification of bottlenecks[21] and missing links in the early 1990s, using a pragmatic performance indicators/links profile approach. This approach leaves the task of identification to national authorities on the basis of shared

[21] UNECE (2009), *A Methodological Basis for the Definition of Common Criteria regarding the Identification of Bottlenecks, Missing Links and Quality of Service in Infrastructure Networks,* United Nations, New York and Geneva (http://unece.org/trans/doc/2009/wp5/ECE-TRANS-205e.pdf).

and technically explicit guidelines. The methods used to identify bottlenecks are mode specific. The focus should be primarily on bottleneck identification because methodology for recognizing missing links is less well developed and because their identification is better done from an overall, pan-European network perspective rather than link-by-link or country-by-country. The UNECE also maintains an inventory of bottlenecks and missing links of the European network of inland waterways of international importance.

Trade and transport facilitation (TTF) – special attention to land-locked countries

The UNECE member states include nine "landlocked transition countries" as classified by the Office of High Representative for the Least Developed, Landlocked Developing Countries and Small Island Developing States (OHRLLS). They are: Armenia, Azerbaijan, Kazakhstan, Kyrgyzstan, Republic of Moldova, Tajikistan, the Former Yugoslav Republic of Macedonia, Turkmenistan and Uzbekistan.

Border crossing

The multilateral agreements on transport and border crossing facilitation enable international mobility of cargo, vehicles and their drivers at the disposal of the countries. The so-called TIR Convention and Harmonization Convention are good examples of the UNECE's work in this area. 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, be it for health reasons (medico-sanitary, veterinary, phytosanitary), for reasons of compliance with technical standards or for quality inspections in general, and is applicable to all goods in import, export or in transit. Fifty-three States and the European Community are Contracting Parties to this Convention. The Harmonization Convention also establishes commonly agreed upon requirements for coordinated border management. In May 2008, a new Annex 8 to the Convention came into force. This was the first time that an annex to the Harmonization Convention deals with a particular mode of transport, i.e. road transport, in recognition of the fact that the road transport industry should be considered as the main beneficiary of the facilitation measures set out in the Convention. New Annex 8 covers, inter alia, facilitation of visa procedures for professional drivers, standardized weighing operations and vehicle weight certificate, minimum infrastructure requirements for efficient border crossing points and provisions to monitor the border crossing performance.

The TIR convention

The TIR Convention has proved to be one of the most effective international instruments prepared under the auspices of UNECE. It was drawn up originally for European transport only. But this system has gradually been extended to other areas in the world, including Central Asia, the Middle East, North Africa and Latin

America. The TIR system applies to goods carried in road vehicles or containers, provided that at least a portion of the journey is undertaken by road. Sixty-seven States and the European Community are Contracting Parties to the TIR Convention. More than 40,000 operators are authorized to use the TIR system and around 3 millions TIR transports are carried out per year. In substance, the tremendous increase in the use of the TIR Customs transit system can be explained by the special features of the TIR regime which offer transport operators and Customs authorities a simple, flexible, cost-effective and secure Customs regime for the international transport of goods across frontiers. To make it even more attractive, work continues on the computerization of the TIR procedure, in particular the so-called e-TIR project which will provide for Customs-to-Customs information exchange as well as a system for managing of guarantee information. The TIR computerization is expected not only to facilitate goods transit operations, but also to contribute significantly to the security of the international supply chain.

Trade facilitation

Trade facilitation has an important impact on the performance of international transport links. In landlocked transition economies the procedures related to document preparation and Customs clearance can take more time than the physical transport procedures. For example, in Kazakhstan documentary and customs related procedures take 60% of the overall time required for importing goods into the country[22].

In the United Nations, UNECE is the focal point for setting global standards, recommendations and best practice to facilitate international trade. UNECE develops these standards in its Centre for Trade Facilitation and electronic Business (UN/CEFACT). The Centre provides important standards for efficiency and security of cross border trade such as the UN Layout Key for Trade Documents (UNLK) for simplification of international trade and transport documents, the UN Trade Data Elements Directory (UNTDED, ISO 7372) for standardization and simplification of trade data, the UN Recommendation on establishing a Single Window and recommendations on the use of code lists for trade information[23].

The Centre also develops international standards to automate the electronic exchange and processing of information along the trade and transport supply chain: UN/EDIFACT (UN Electronic Data Interchange for Administration, Commerce and Transport[24]) is the leading, global standard for data interchange for the Customs, transport and the logistics sector. Currently, the Centre is developing a set of new, Internet related eBusiness standards including UN/CEFACT XML Message specifications[25] and the UN/CEFACT Core Component Library[26] (CCL) which is a library of information and data definitions and structures used in trade; for example, in the Data Model of the World Customs Organization.

[22] Source: World Bank, www.doingbusiness.org/data/exploreeconomies/kazakhstan/trading-across-borders/
[23] www.unece.org/cefact/recommendations/rec_index.htm
[24] www.unece.org/trade/untdid/welcome.htm
[25] www.unece.org/cefact/xml_schemas/index.htm#2009B
[26] www.unece.org/cefact/codesfortrade/unccl/CCL_index.htm

Ports and their hinterland connection

The liberalization of international trade and increasing geographical dispersion of manufacturing over the last two decades generated some unforeseen problems. Considerable pressure has been placed on port - hinterland connections, with consequent economic, environmental and social problems. In particular, inefficient hinterland links lead to increased supply chain costs and greater adverse environmental impacts.

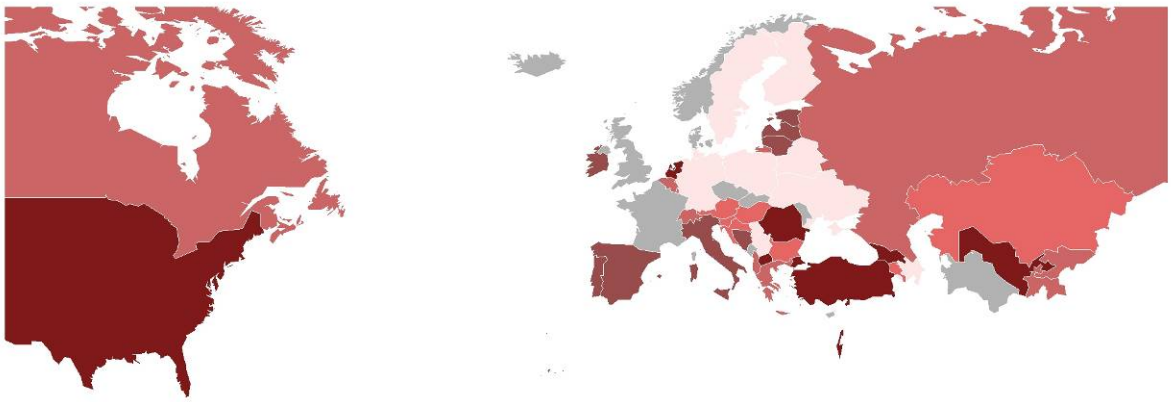
4. Affordability: Making mobility affordable for the individual and the society

4.1 Individual affordability: Social inclusion through affordable transport

Transport is indeed vital to the well functioning of the economic activities, to the production and distribution of goods, as well as to trade. Transport ensures everyday mobility of populations and allows them to perform their economic and social activities. It provides access to basic services such as health and education. Furthermore, transport is crucial for the integration of regions, particularly those that are peripheral or isolated, and for the reduction of unbalances among them. Transport and mobility are therefore a necessary precondition for social and economic development. Figure 4.1 shows that income inequality is high in some regions of the UNECE. It is a key challenge for governments to ensure that individual mobility does not depend on individual wealth. Furthermore it is not only wealth, but also special needs, ethnicity and gender that may affect mobility. Only with mobility can individuals achieve individual economic development and social sustainability.

Affordable transport ⇨High Mobility ⇨ Access to education, food, health and employment ⇨ **Social inclusion, individual economic development and reduced inequality!**	
Key challenges	➢ Income inequality is high in some regions of the UNECE ➢ Spending on transport depends on income. ➢ Low income groups are more dependent on public transport.
UNECE	➢ Provides an intergovernmental platform for sharing of best practices ➢ Provides statistical and analytical information that assists government in recognizing and handling individual affordability of transport.

Figure 4.1
Income inequality in the ECE region in 2008, or newest year available.



GINI index (0= income is totally equal distributed, 100 total inequality)	Missing data	0-28.8	28.8-31.2	31.2-34.3	34.3-36.3	>36.3

Source: The World Bank

The current situation

Income and transport expenditure are linked in theory…

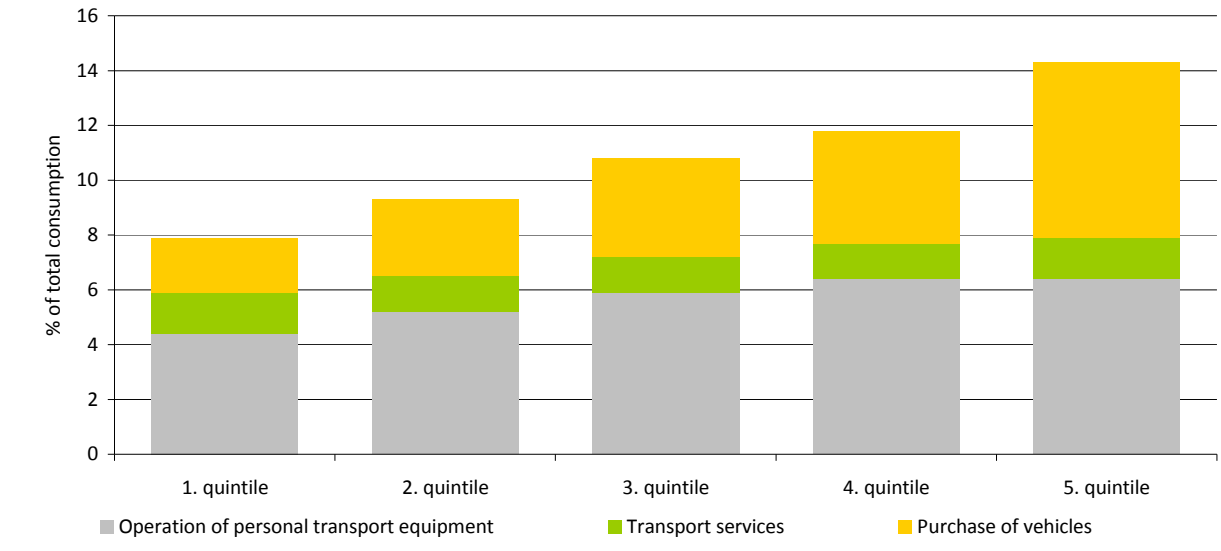
There is a clear theoretical relationship between mobility and income. The higher the individual income level, the more can be spend on transportation and the more efficient transport modes can be chosen. The reverse causality does however hold as well. The more mobile, the greater the job market, the more opportunities and the higher the potential income. If the relationship between income and mobility is high, it may become a social problem, as individuals get "locked" with low income and low mobility and face the risk of a social exclusion, as attending social activities becomes more difficult.

…and in practice

Did you know? When the wealthiest households spend 100 Euro on new vehicles, the poorest households spend only 11 Euro on new vehicles, in the EU!

The latest EU-household survey reveals considerable differences in transportation spending across income levels. Figure 4.2 shows that the share of income spent on transport services is about 2% independent of income group. Expenditure on private transportation, i.e. purchase of vehicles and operation of transport equipment increases in income. The share of consumption spending on transportation is 78% higher in the fifth quintile than in the first quintile. It is important to remember that high income individuals also have a larger consumption budget. The spending of the fifth quintile is – according to the latest Eurostat survey – 3 times higher than the first quintile. This implies that for every 100 Euros the wealthiest households spend on purchasing vehicles, the poorest spend 11 Euros. When the poorest households spend 100 Euros on transport services, the wealthiest spend 280!

Figure 4.2
Household spending on transport in the European Union in 2005



Source: Eurostat

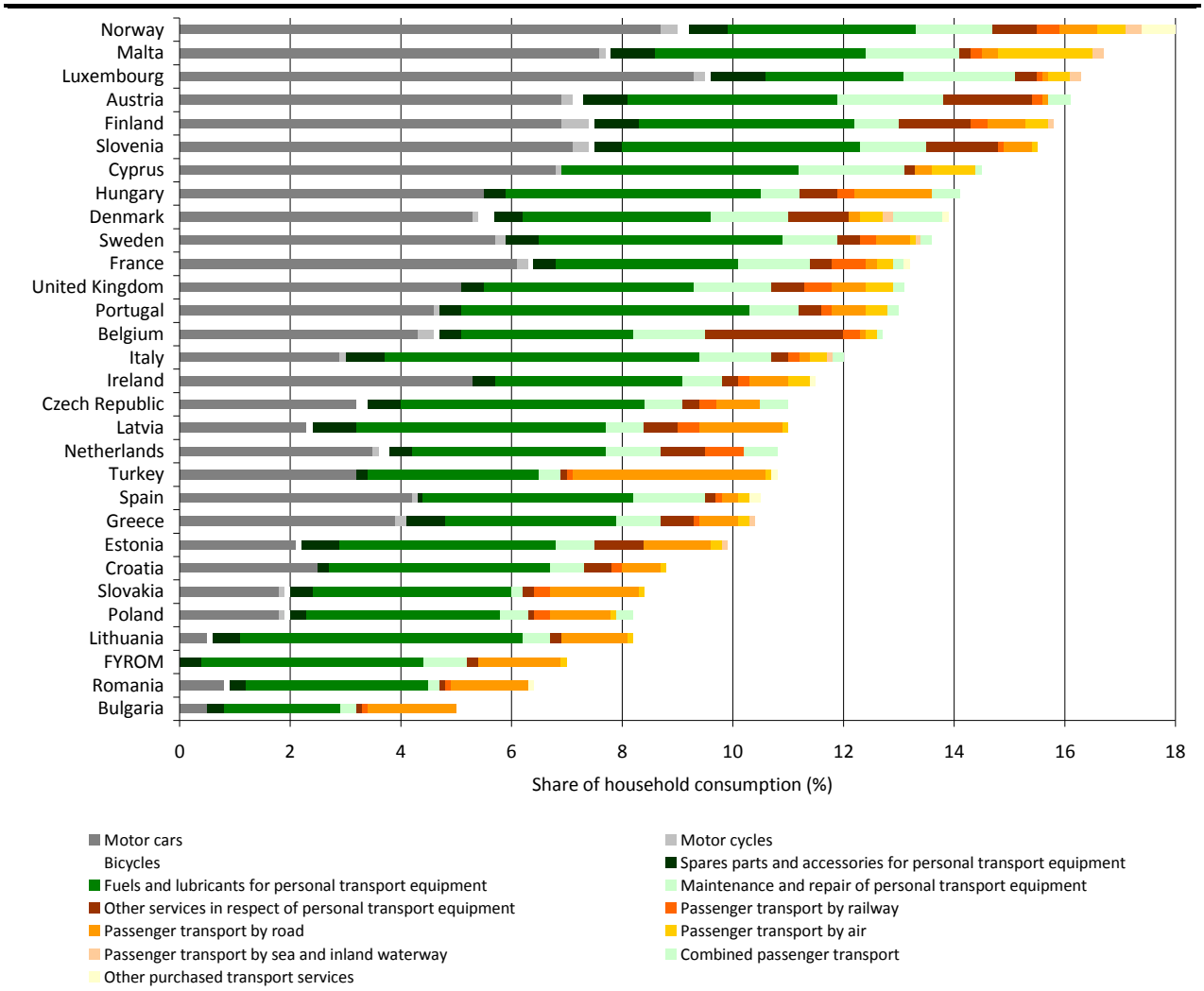
Consequences of transport spending patterns

When some groups spend more on transport it must either be because they buy quantitatively more transport, i.e. have a greater mobility; or qualitatively more, i.e. travel more comfortably and safer. Therefore variations in transport spending may be a social problem, because high income individuals are more mobile and they can therefore engage more in social activities and in the labour force, secondly high-income households may travel safer and may be at a lower risk than low income households!

Country specific consumption patterns

Figure 4.3

Country specific spending on transport in 2005



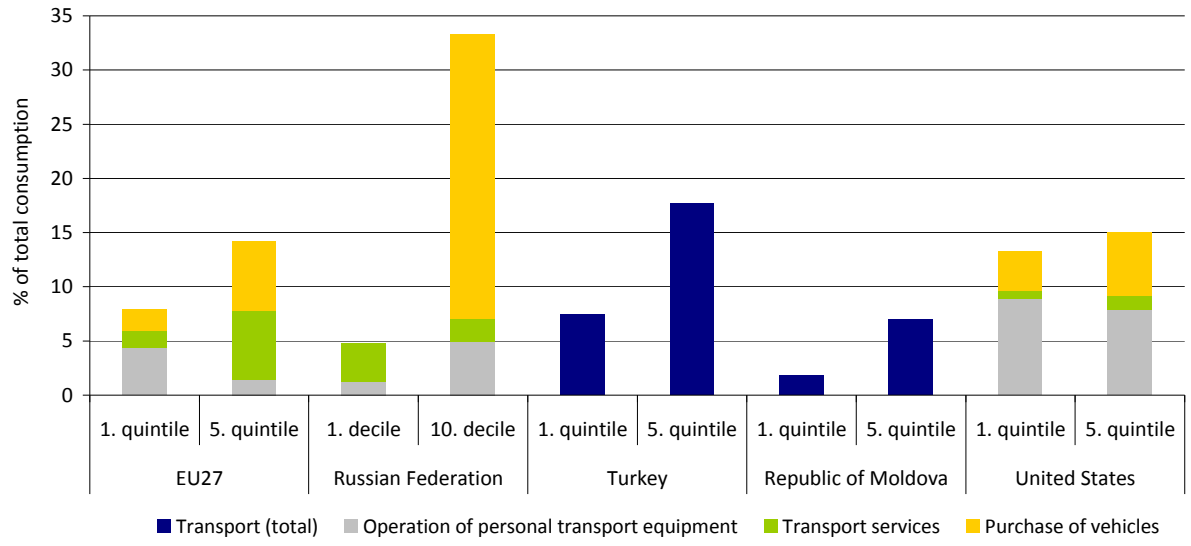
Source: Eurostat

Figure 4.3 provides a decomposition of the household expenditures by country. In Norway, households spend on average 18% of the total expenditures on transportation, which is the highest share in the region. In Bulgaria, households spend on average five per cent of total household expenditures on transportation. This difference can be attributed mainly to the purchase of motor cars; which in Norway constitutes for more than eight per cent and in Bulgaria for well less than one per cent.

Spending by income outside the European Union

Figure 4.4 shows the household spending on transport by income quintile. Note that in the Russian Federation, Turkey and the Republic of Moldova the difference between rich and poor is considerably larger than for EU27 and the United States of America.[27]

Figure 4.4
Household spending on transport by income quintile.



Source: Eurostat and National Statistics. Data for EU27 is from 2007, for Russian Federation and Moldova from 2008; for Turkey and United States from 2009. The first quintile is the group of the 20% poorest households, The first decile is group of the 10% poorest. Transport Services for the United States is only Public Transport, all other transport services are included under Operation of Vehicles.

Spending in rural versus urban areas

The details of the household survey for EU reveal that transportation spending differs only slightly over geographic areas. Individuals in densely populated areas spend on average 11.7% of their total consumption on transport, while individuals in rural areas spend on average 13%. As expected, individuals in rural areas spend a larger share on private transportation (about 10% compared to 9% for urban) and a lower share on transport services (1.2% compared to 1.5%).

[27] Note however that the data for Russian Federation is on deciles, the difference may be greater due to this fact.

Age dependent spending on transport

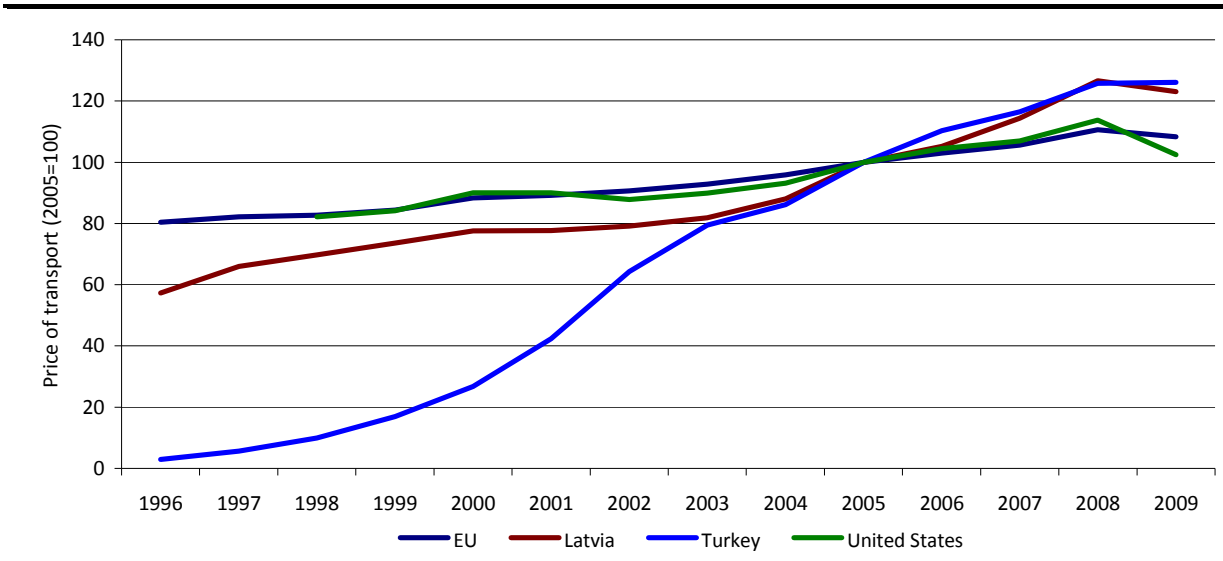
In households where the reference person is over sixty years of age, the share of total consumption spent on transport is on average 7.7%, while for households of less than thirty years of age, the share is 12%. About three quarter of the transport spending is on private transportation, independent of age. As a result younger people are – everything else equal – more than fifty percent more mobile than the elderly.

The price of transport

Figure 4.5 shows the development in the price index for transport in selected areas of the UNECE during the last decades. Firstly note that the European Union and the United States of America have had an almost identical development in the price of transport. From 1996 to 2009 the price of transport in the EU increased by on average 2.3% annually. The overall average inflation rate in the EU for this period was 2.0% per year, so that transport has become relatively more expensive. The price of transport in Turkey has increased considerably over the period, with an average annual growth rate of 33.6%; the average annual inflation rate in Turkey for the same period has however also been high at 32.8%.

Figure 4.5

Development in the price of transport in selected UNECE areas, 1996-2009

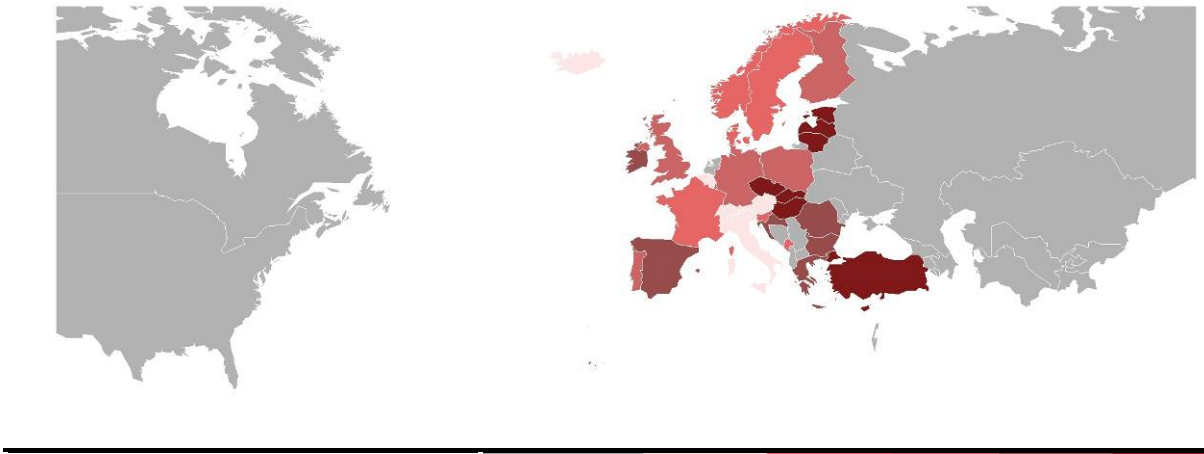


Source: Eurostat

Public transport is becoming more expensive

By means of the EU consumer price index it is possible to track the price development of specific transport elements. In figure 4.6 the development in the relative price of transport services (typically public transport) to purchasing transport vehicles is shown. Light grey areas imply that buying transport services has become relatively cheaper compared to buying vehicles, in the period 2005-2009. Note that Switzerland, Iceland and Austria are the only countries where transport services have become relatively cheaper.

Figure 4.6
Development in the relative price of public transport to private transport 2005-2009.



Development of relative price of public to private transport 2005-2009	Missing data	<0.6%	0.6-6.0%	6-11%	11-17%	>17%

Source: Eurostat

Challenges and Best Practices

Challenges

Transport services are important for low income groups

Low income households spend less on all types of transport than high income households, moreover transport services play a more important role in the transport budget of low income household, as it constitutes for almost 20% of their transport spending, while it only constitutes for about 10% for high income households. Unfortunately transport services are becoming relatively more expensive in major parts of the ECE region. This will – everything else equal – reduce the mobility of low income households.

Price development of transport services is worrying!

On a first sight the increase in the price of transport services may be a result of more expensive air transport, but a decomposition shows that especially public rail and road passenger services are becoming relatively more expensive than private road transport. The development in the price of transport is a political challenge that needs to be handled, because the mentioned marginalized groups are often dependent on public transport and a further relative increase in the price of public transport not only compared to private transport but also to transportation in general will reduce the mobility and thereby reduce the social inclusion of these groups.

Funding mechanisms and price setting of public transport

How the price of public transport is determined is important and detailed studies are needed. The undesired price development of transport services may be a result of major improvements in quality of public transport and as a result, public transport may be as attractive as before. Looking at a longer run, it is however undesirable if the price of transport services continue to increase at rates seen in recent years. Public transport is often

provided at a price below marginal costs, because serving rural areas is rarely financially beneficial for transport itself, but a necessary condition for the social and economic inclusion of these areas. Supply of public transport is therefore often dependent on public subsidies. How to handle this issue is not straightforward, and it is therefore important that the UNECE member states share their experiences and best practices.

Focus on marginalized groups

The EU-household study has also shown that spending on transport varies considerably across age. Younger households spend more on transport and are therefore – everything else equal – more mobile than older households. The current demographic development is moving towards an older population. The social and economic inclusion of the elderly population is therefore becoming increasingly important, and transport policies have to pay special attention to the requirements of older inhabitants. Moreover there may be differences across, especially in rural areas, where the decency on private transport is higher, and the female access to transport may be lower than the male populations' access.

UNECE specific challenge – Individual affordability

Transport and social exclusion[28]

A study by the Transport Studies Group at the University of Westminster evaluated the impact of transport on social exclusion in G7 countries. For all countries it was emphasized that low car availability is a major factor of social inclusion. The study showed that in for example France, Canada, Germany and the United Kingdom about every fourth household has no access to a car (ranging from a low of 21% in Canada to 29% in the United Kingdom), but among the poorest quintile it is less than half of the households that have access to a car. Moreover elderly, people with disabilities, women and ethnic minorities are less likely to have a drivers license and more likely to live in a household without a car. The paper notes that costs of public transport are rising, while private transportation is stable. However, most countries apply fare subsidies or free travel for certain groups of the society. For the United States of America it is found that lack of transportation is the largest challenge for job seekers to obtain employment. For the United Kingdom lack of transportation is also a barrier for obtaining upper secondary and higher education.

Best Practices

Free travel for disabled and older people[29]

The social inclusion of elderly and individuals with special needs depends on their mobility. The National Concessionary Travel Scheme introduced in England in 2008 gives every resident in England above the age of 60 or with a disability the right to free off-peak travel

[28] According to information from: Transport and Social Exclusion: A G7 Comparison Study, by Dr. Karen Lucas. Transport Studies Group at the University of Westminster.

[29] According to: www.pteg.net/NR/rdonlyres/570FF969-98D6-4C06-B9DB-9837A732E835/0/ptegTransportandSocialInclusionreportMay10.pdf

on local buses in the United Kingdom. Some local areas have expanded the system, for instance in Manchester and the West Midlands Train and Trams are free as well.

Best Practice – Individual Affordability

Affordable access to employment in Birmingham[30]

The West Midlands' Passenger Transport Executive is working in close cooperation with the local job agencies to improve the affordability of employment for job seekers. Unemployed cannot afford to travel on public transport to job interviews, and in case they get a job they cannot afford travelling to the job. As a result the project called WorkWise was introduced in Birmingham, England. It provides job-seekers with free travel information with public transport, free travel with public transport to job interviews and free travel passes for the first month of work. An evaluation of the scheme showed that 80% would not have obtained their job without the scheme!

Best Practice – Individual Affordability

Setting the price of public transport in agreement with public authorities[31]

How the price of public transport is set by the operator typically depends on the type of public transport. In most countries public transport in urban areas is the responsibility of local authorities, while non-urban public transport is organized in cooperation with the state. For instance in Croatia, the price of public transport on roads is freely set by the operator with the exception of urban areas, where the local authorities set an upper limit on the price. The price for rail transport in Croatia is set by the operator but has to be approved by the Government. The same system is seen in several other UNECE member States. The agreement between the operator and the public authorities typically includes a public service obligation (PSO). This often means that the public authority offers an auction for servicing a route-network and the winning company then has a monopoly in this network with subsidies when needed. This is necessary because profitability of some routes is often so low that the free market won't result in a service. The PSO also includes requirements on minimum frequency, network capacity and ticket pricing.

The Role of UNECE in improving individual affordability

Sharing best practices and capacity building

The UNECE is a unique intergovernmental platform for sharing best practices for making transport affordable. Creating affordable transport is complex and challenging, because it

[30] According to: www.pteg.net/NR/rdonlyres/7110110D-CFCA-4F2A-8777-99707BDE122C/0/TransportandSocialInclusionGoodPracticeGuide2005.pdf

[31] According to the information given by Albania, Armenia, Croatia, Czech Republic, Latvia, Poland and Switzerland. in the questionnaire on Transport for Sustainable Development, December 2010.

has to balance the wish to make transportation affordable for the individual and for the society. Making all public transport free is therefore not a sustainable solution, instead - using means like the WorkWise project in Birmingham - the public sector can support the social inclusion of the individual. It is – as in this case – often only for the first steps that the individual needs public support, once employment is found, the individual receives an income and can afford transportation. Therefore special and unconventional measures are needed for promoting individual affordability. The UNECE provides contact between national governments and thereby assists the sharing of best practices and challenges.

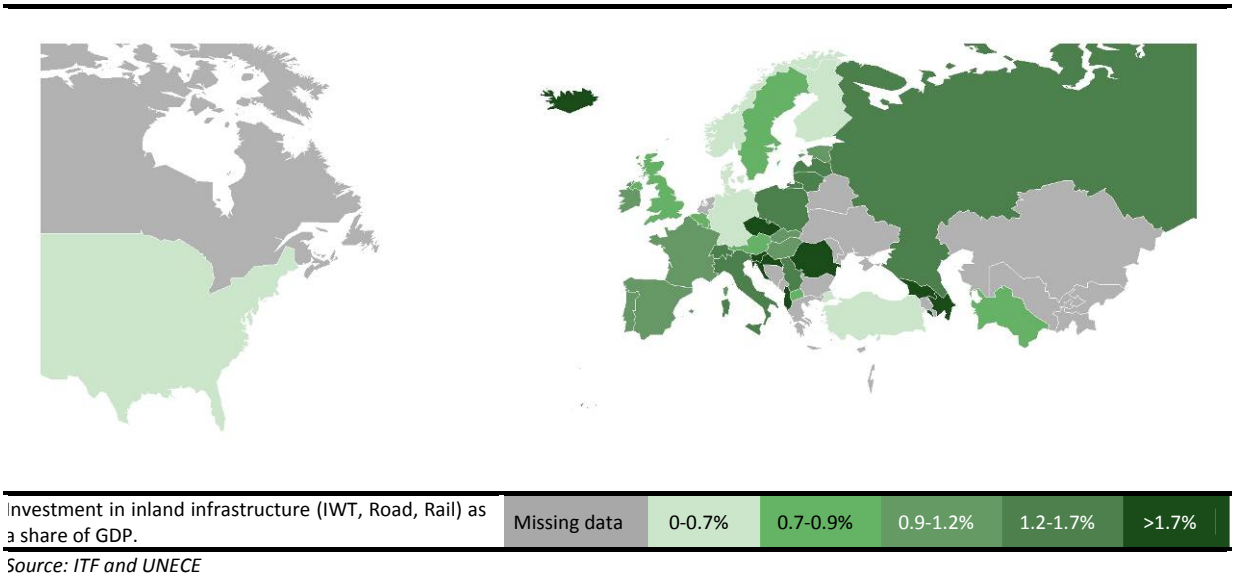
The UNECE provides information material on the affordability of transport and the price of transport. The information material also provides governments with concrete best practices and policy action that the governments can apply for increasing the individual mobility.

4.2 Social affordability: Making funds last longer!

Provision of a safe, efficient and environmentally sustainable infrastructure network is costly. Transport networks are far from being adequately coherent and integrated, particularly at pan-European level. Transport networks in Central, Eastern and South-Eastern European countries as well as in the Caucasus and Central Asia, in spite of the progress made in recent years, still suffer from decades of neglect and under-investment under the former regimes and lag far behind the networks in Western Europe, both in terms of capacity and quality. All these network problems are aggravated by the lack of sufficient funds to address them successfully. Infrastructure represents huge investments. They are basically planned and financed within national budgets, in competition with other basic needs like education, health, housing or security, and under macro-economic constraints like deficits or public debt. The recent financial crisis increased the pressure on national budgets and reduced the available funds for infrastructure investments. In order to obtain the safety, environmental and social targets, infrastructure expenditures have to be prioritized. It is therefore important that policy makers apply a long term investment and expenditure strategy for transport.

	Long term planning ⇨ Thorough preparation material⇨ Prioritizing transport projects⇨ Private sector participation⇨	Socially affordability
Key challenges	➢ Pressure on transport infrastructure capacity ➢ Public funds are scarce, especially after the global financial crisis ➢ Transport projects are long term and politically less interesting	
UNECE	➢ Provides guidance in Public Private Partnerships ➢ Provides a common framework for socio-economic analysis	

Figure 4.7
Infrastructure investment as a share of GDP, 2008 or newest year available



Source: ITF and UNECE

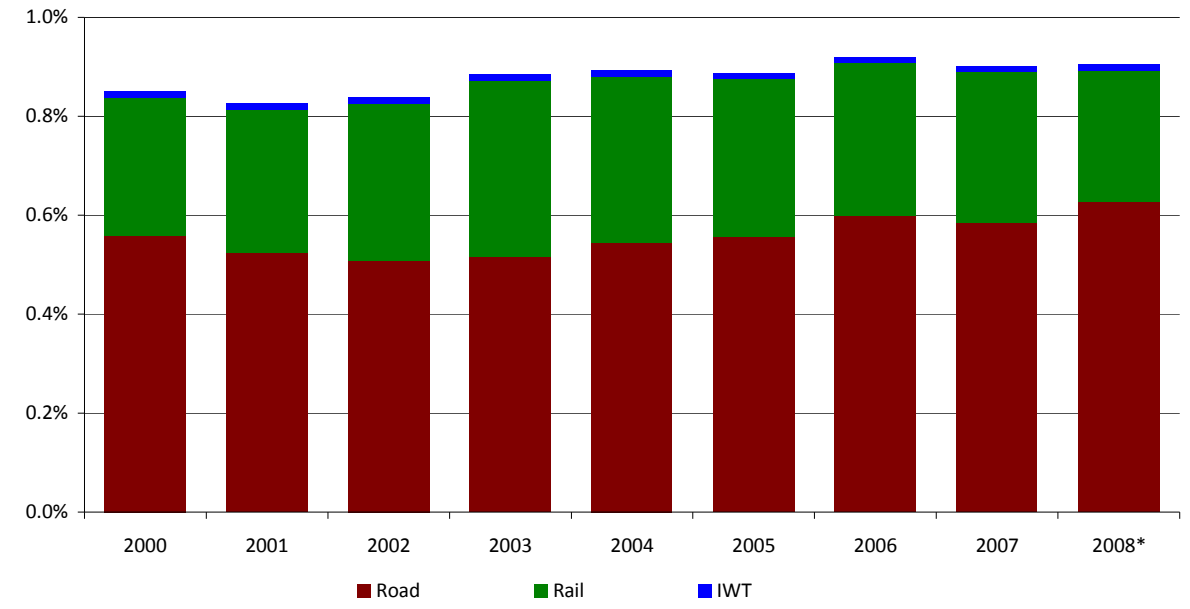
The current situation

Public investment in infrastructure

Did you know? The UNECE provides a set of guidelines for cost-benefit analysis of infrastructure projects.

Figure 4.7 shows that a public investment in inland transport infrastructure (IWT, road and rail) varies considerably from country to country within the UNECE. In Albania about 5.7% of the national income is invested in new infrastructure. While in for example Denmark and the United Kingdom, considerably less than one percent of the GDP is spent on infrastructure investments. In the region on average 0.9% of GDP is spent on investment in infrastructure. And as figure 4.8 shows this share is relatively constant. Figure 4.8 also reveals that the most funds are directed to road infrastructure. In 2007 66% of the investments in inland transport infrastructure were directed to road infrastructure.

Figure 4.8
Investment in inland transport infrastructure as a share of GDP



Source: ITF and UNECE.
Covers: Albania, Austria, Azerbaijan, Belgium, Canada, Croatia, Czech Republic, Denmark, Estonia, Finland, France, The Former Yugoslav Republic of Macedonia, Georgia Germany, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Norway, Poland, Portugal, Romania, Russian Federation, Serbia, Slovakia, Slovenia, Spain, Sweden, Turkey, United Kingdom. Data for 2008 is unavailable for Austria, Georgia, Italy, Lithuania, Norway and Portugal. There is no data on rail infrastructure investment for Canada.

Emphasize on road transport

Road transport is the most dominant transport mode and it is therefore no surprise that concerning transport, the largest share of GDP is invested in road infrastructure. Especially in countries such as Turkey, which is dominated by road transport, a shift towards railways can only be achieved if investments in rail infrastructure are made. Investments in rail infrastructure in 2008 are only larger than investments in road infrastructure in Georgia, United Kingdom and Austria. The share of investments in road infrastructure constitutes

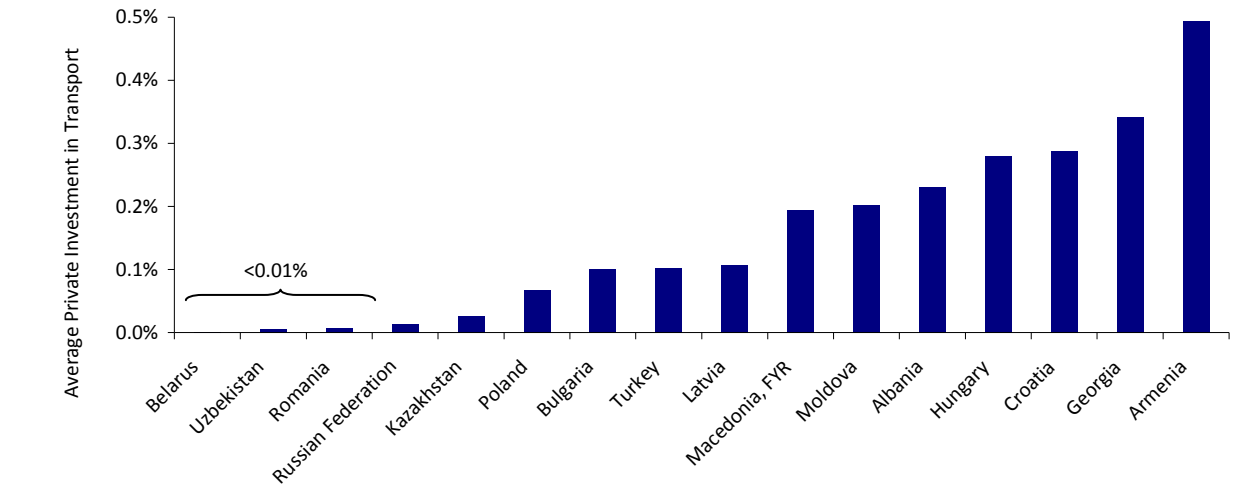
more than three-quarter of the total transport infrastructure investments in 18 of the countries shown in figure 4.7.

Did you know? The UNECE has published a guidebook for public-private partnerships.

Private involvement in infrastructure investment

Involving private funds in transport investments is becoming increasingly popular. Figure 4.9 shows the investment in transport with private participation since 1990. Private investment in infrastructure is concentrated in a few Eastern European countries and South-Eastern European countries. A necessary condition for the attractiveness of these kinds of projects is an a priori sound economic impact evaluation. These pre-investment studies are also necessary for pure public investments as they serve as a prioritization instrument. Cost-benefit studies must be used as an instrument for policy makers to evaluate the soundness of any project, but may not be the only decision instrument. They should be supplemented by socio-economic and environmental impact analysis.

Figure 4.9
Private investment in transport infrastructure, 1990-2009



Source: The World Bank

Challenges and Best Practices

Challenges

Scarce public funds

Many UNECE member states are still feeling the consequences of the global financial crisis and government budgets are tight. Available funds for infrastructure projects have been reduced, but it is important to remember, that especially in times of economic downturn investment in infrastructure should be prioritized. Most infrastructure projects have direct positive impact on employment. Infrastructure can therefore have both short-run and long-run positive effect on the national economy and be a measure to reduce unemployment.

Sound decision making knowledge and practices

Scarce public funds and many infrastructures needs require prioritization. An appropriate prioritization can only be carried out if the necessary information is present. Infrastructure projects should therefore be based on detailed financial a priori research about there rent ability, but also on socio-economic studies that analyze the impact on employment, economic development and social inclusion. Carrying out these studies is not straight forward and requires knowledge of tools and expected scenarios. In this setting international sharing of experience is invaluable.

Maintenance backlogs reduce sustainability of transport systems

Investments in maintenance of the existing infrastructure are important in order to keep safety levels, fluidity and reliability high. Years of neglected maintenance can lead to substantial backlogs that are financially significant and reduce the sustainability of the transport system. The UNECE asked its member states about the main obstacles in the development in transport and several pointed the backlog in maintenance investments. For example the Kazakhstan now faces a railway infrastructure that is highly depreciated and operated by an outdated technology. Add to this the shortage of rolling stock and the outcome is a considerably reduced transport service, making rail transport less attractive. The government of the Kazakhstan has reacted to this issue by approving a program for the Development in Transport Infrastructure running from 2010 to 2014. Tajikistan is facing similar challenges, where old infrastructure struggles to match demand due to reduced efficiency because of maintenance backlogs. Investment backlogs are however not only an issue for low and middle income countries. In April 2009 the U.S. Department for Transportation published the Rail Modernization Study in which the investment backlog for the seven largest rail transit operators is estimated. The backlog is estimated to be 50 billion United States dollars (2008 level) for these seven agencies. The study further showed that only two out of the seven countries "use a rigorous process to help rank and prioritize their investment needs"[32].

Public Private Partnerships are not the universal tool to all financing needs

Public Private Partnerships have become increasingly popular during the last decades and are often regarded as a solution to the lack of funds. However, without careful use of private sector participation, PPPs can be a costly and inefficient solution. The private sector should be included when there are efficiency gains and not as a last resort in case of budgetary constrains and investment needs. For instance in Hungary the creations of the M5 and M6 motorway are carried out in the framework of a PPP. According to the Hungarian Ministry of Transport these projects are a heavy burden on the state budget and will remains so for the next decades. The Ministry therefore concludes that PPPs are not the optimal solution for transport infrastructure investment. The same holds for Serbia, where recently two build-Operate-Transfer PPP projects had to be terminated. As a result the Belgrade-Novi Sad-Horgoš E-75 route of 175 km has not been finished yet. It is however important to emphasize that private sector inclusion can be beneficial for transport infrastructure, the

[32] According to: www.fta.dot.gov/documents/Rail_Mod_Final_Report_4-27-09.pdf.

cooperation should however only be done when there are efficiency gains. Many UNECE countries have had very good experiences with PPPs, for example in Israel as the following best practices will show.

UNECE specific challenge – Social Affordability

It is all about the Money

A UNECE survey carried out in December 2010 showed that the major obstacle for the development of transport is lack of funds in a majority of countries. [33] This emphasizes the need for thorough planning, prioritization and cooperation with the private sector. Furthermore a number of countries, for example Belgium, mention that decades of disinvestment in rail infrastructure has led to backlog in rail infrastructure investment as the supply could not match the increasing demand. The recent severe weather conditions especially in winter time have increased the needs for funding, as roads and rails had to be repaired. These incidents confirm the need for climate change adaptation of the infrastructure system which will require further funding as well.

Best Practices

Including the private sector[34]

Israel's highway 6 is 300 kilometres long and runs from south of Beer Sheva to the Galilee in the North of Israel. This highway, also known as the Cross-Israel Highway, was built based on a "build, operate and transfer" (BOT) model of a public private partnerships. It was financed through a 90% commercial debt and 10% equity, the total construction costs were 1.3 billion United States dollars, and includes a unified tolling and traffic management system. The private company has reported a substantial profit, and the project has had a positive impact on accessibility, road safety and air pollution. Several UNECE member countries have managed to commence cooperation between the private and public sector in order to fund and operate infrastructure. For instance in the Russian Federation ten major projects have been implemented through the Investment Fund of the Russian Federation and extra budgetary sources, for example the construction of the Saint Petersburg Highway[35].

A standardized evaluation system[36]

Germany introduced the first systematic assessment guidelines for infrastructure projects in the 1970s, called the Guidelines for Road Planning and Construction - Part on Economics. At that time the assessment method included direct costs (construction, operation) and benefits (time savings) as well as a few external effects (noise and pollution). The evaluation procedure has been updated on several occasions and contains the following steps: 1) Project recommendations are received from the Federal States, the German Rail operator (DB) and the German Ministry of Finance; 2) A traffic forecast is carried out for every mode; 3) A cost benefit analysis, based on impact on environment, safety, accessibility,

[33] According to the information given in the questionnaire on Transport for Sustainable Development, December 2010.
[34] According to: www.unece.org/ceci/publications/ppp.pdf
[35] According to the information given in the questionnaire on Transport for Sustainable Development, December 2010.
[36] According to:http://internationaltransportforum.org/europe/ecmt/pubpdf/05RT128.pdf

interconnection of sea-ports and airports, spatial impact and other criteria; Economic assessment and cost-benefit analysis; 4) Analysis of spatial impacts and environmental risk; 5) an evaluation of the interdependence of projects; 6) An assessment of the political trade-off and ranking of projects. This systematic approach of every infrastructure project ensures consistency and solid decision making material.

Best practice – Social affordability

Creation of an Infrastructure Fund in Switzerland[37]

Switzerland launched the "Infrastructure Fund for Agglomeration Transport, the National Road/Motorway Network and Major Roads in Mountain and Peripheral Regions" in 2008 which is an infrastructure fund with a time perspective of 20 years. It includes a budget of more than 20 billion Swiss francs. The fund is financed by among other means, the motorway vignette system and fuel taxes. The long time horizon allows for a better planning and prioritization of infrastructure projects. More than one-quarter of the funds are earmarked to agglomeration projects and about 5.5 billion Swiss Francs are designated to the elimination of congestion hotspots.

The Czech Republic has also created an infrastructure fund. The State Fund of Transport Infrastructure (SFDI) was established in 2002 and aims at supporting the development, maintenance and modernization of Czech rail, road and inland waterways infrastructure. The fund is financed through road taxes and fuel taxes as well as other sources. This ensures that revenues from transport are spent in the sector.

The Building Canada Fund is a long-term infrastructure plan representing approximately 0.8% of Canada's GDP. The fund has three objectives: building a stronger Canadian economy with a clean environment and strong and prosperous communities. Investments will be targeted towards and improvement of the efficiency and safety of gateways and trade corridors; optimize and integrate transport modes; minimize environmental impact and reduce bottlenecks and the growth of congestion.

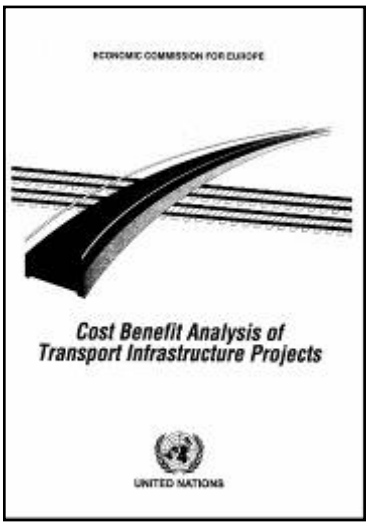
The role of UNECE for achieving social affordability

Socio-economic analysis of transport investment projects

In the pan-European region, the international transport infrastructure planning has been carried out on the basis of four major infrastructure agreements (AGC, AGN, AGR and AGTC) and a common UNECE methodology for the identification of bottlenecks. Data collection and the prioritization of the infrastructure investments needed to improve pan-European traffic flows and links to peripheral countries are additionally used to support the planning process. Whereas detailed planning processes take place at the national level, the UNECE process

[37] According to: www.are.admin.ch/themen/verkehr/00250/00460/index.html?lang=en and according to the information provided by Switzerland in the questionnaire on Transport for Sustainable Development, December 2010.

entails intergovernmental coordination within the Inland Transport Committee and its subsidiary bodies dealing with infrastructure agreements, transport statistics and economics, sub-regional and interregional projects.



UNECE Governments have agreed on common methodologies for transport planning and statistics. In the 1990s cost-benefit analysis became an increasingly important planning tool for the assessment of transport infrastructure projects in North America and Western Europe. UNECE provides a set of guidelines[38] for applying cost-benefit analysis in the specific institutional context of the CIS. This contribution, based on the so-called "TINA Guidelines" developed earlier for the EU-candidate countries, is important in the sense that it presents a planning tool that can facilitate considerably the appraisal and selection of transport infrastructure projects in countries with transition economies**.**

The UNECE work on international networks has been based on a multi-criteria approach that complements the quantitative analysis of the available data with the qualitative evaluation of strategic and political concerns.[39] This planning tool has been applied in three international infrastructure development projects: Trans-European Motorway (TEM) and Trans-European Railway (TER) projects of the UNECE as well as the joint UNECE-UNESCAP project on the development of Euro-Asian Transport Linkages (EATL). TEM and TER networks as well as Euro-Asian linkages within the ECE region coincide to a large extent with the pan-European transport corridors and axes identified by the European Commission. The UNECE infrastructure planning tool prioritizes transport investment projects in a well defined series of steps, including the evaluation of each project according to socio-economic criteria. The underlying idea is that policy makers should have a good understanding of the social and political consequences of transport infrastructure projects in order to make informed investment decisions.

Public Private Partnerships in infrastructure development

For several years the UNECE has been active in promoting a better understanding of Public Private Partnerships (PPPs) in all fields of infrastructure development. through facilitation of networking information-sharing and exchange of practical experience in public-private partnerships among UNECE member States, to elaborate guides on best practices and contribute to the implementation of a capacity-building programs for public and private sector officials from catching-up economies on this topic.

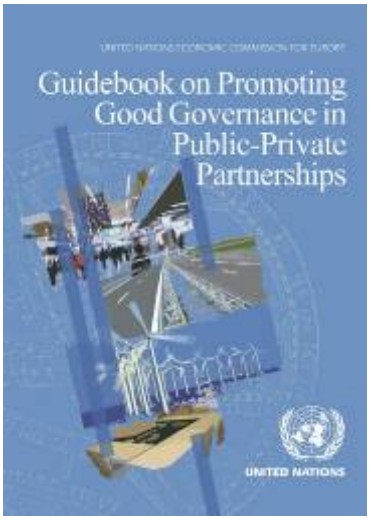
[38] Both versions are available at the website of the Working Party on Transport Trends and Economics <www.unece.org/trans/main/wp5/wp5.html>.

[39] For a detailed description of the multi-criteria model used in UNECE infrastructure planning projects, see Tsamboulas, D. (2007), A tool for prioritizing multinational transport infrastructure investments, Transport Policy, vol. 14, pp. 11-26.

Guidebook on PPPs

To strengthen the governance of PPPs, the UNECE has elaborated a Guidebook on Promoting Good Governance in PPPs, setting out seven principles of good governance, where environmental concerns are included. It shows how PPPs can give incentives to deliver public services in a more environmentally friendly way. It also suggests a number of action points to ensure that governments and private sector reflect on green case for PPPs, such as wider dissemination best practices case studies where public service was delivered applying a PPP model and in a more environmental sensitive way and improving policy coordination between the economic and finance ministries that have usually responsibility for relevant PPP projects or program, and environmental ministries.

Training module on PPP and sustainable development



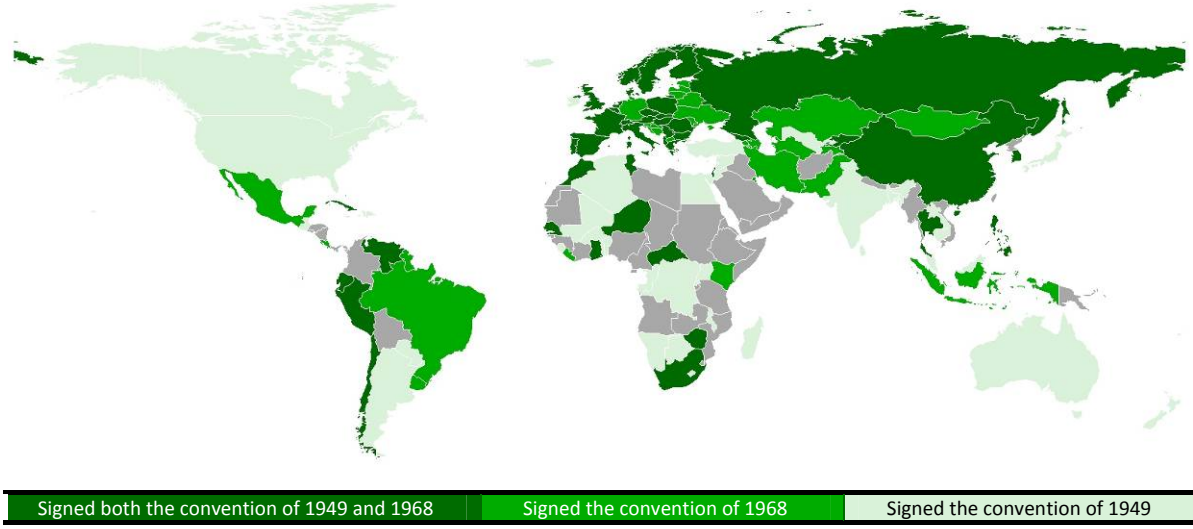
Based on the principles set out in the Guidebook, UNECE has also developed a Toolkit on "How to do PPPs" consisting of approximately 20 training modules and covering all the issues around implementing PPP projects. Elaboration of the training module and sustainable development and including it into the UNECE PPP training and capacity-building activities for various PPP actors will help to timely address environmental sustainability. C*onsultations with the Governments on elaboration of pathfinder PPP projects:* Within the framework of its capacity-building program UNECE provides support to emerging PPP countries on developing pioneering projects that can generate evidence based success and further replicated.

5. Transport safety: Entering the decade of action for road safety!

Transport can have direct negative impacts on human health. In the ECE region more than 120 thousand individuals are killed in road crashes every year, causing, in addition to human suffering, overwhelming costs running into billions of dollars amounting in some countries between 1 and 3% of GDP. Road safety depends on driver behaviour, infrastructure quality and vehicle quality. Only by considering all these elements can road safety be improved. Over the last decades road safety has been improving in many regions, but work for safer roads should never stop, each person killed on roads, is one to many!

Prevention and mitigation **Safe driver behaviour + safe infrastructure + safe vehicles + mitigation of impact**	
Key challenges	➢ Overall the development is positive, but we are still far from zero road fatalities and injuries! ➢ Some regions face a negative development with increasing road fatalities. ➢ Motor cycles are overrepresented in road crashes. ➢ Underreporting in statistics is a serious issue, especially for road injuries.
UNECE	➢ Provides a framework for international agreements on road traffic and on road signs and signals. For example the Vienna Conventions of 1968 on Road Signs and Signals. ➢ Provides an intergovernmental platform for sharing best practice. ➢ Provides statistical and analytical information that enables regions to identify problems and develop optimal policies.

Figure 5.1
Contracting parties to the Conventions on Road Traffic

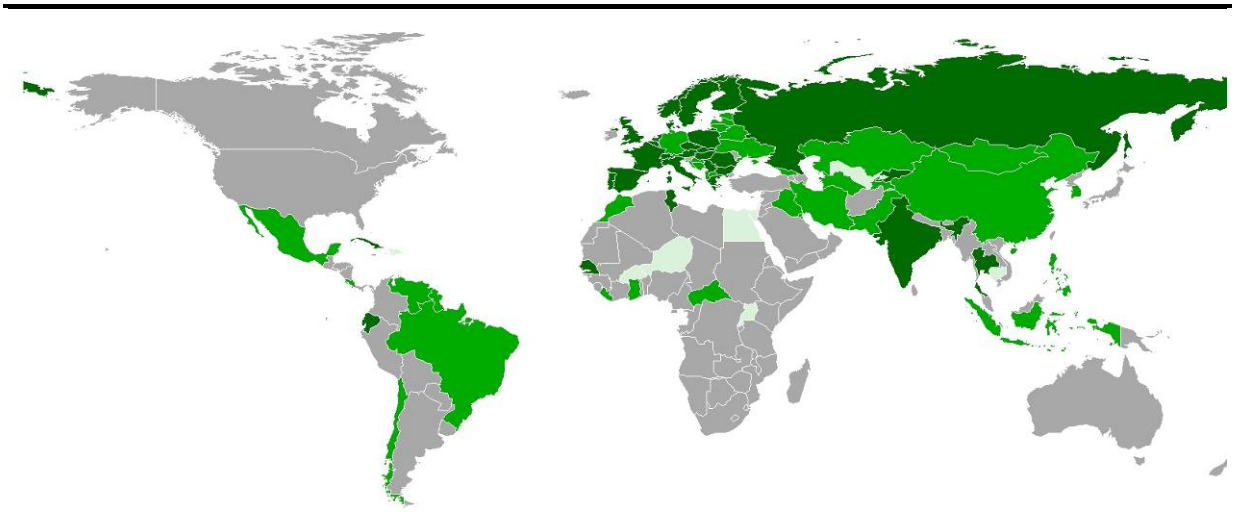


Conventions on Road Traffic and on Road Signs and Signals

The Conventions on Road Traffic and on Road Signs and Signals from 1949 were followed up by the so called Vienna Conventions on Road Traffic and Road Signs and Signals from 1968. These conventions aim at increasing road safety by standardizing traffic rules (Road Traffic) and the road signs, traffic lights and road markings (Road Signs and Signals). Regarding road signs and signals one of the newest amendments came in 2003, when new amendments on priority in roundabouts and signs in tunnels were adopted.

Figure 5.1 shows a map of the current status of contracting parties of the conventions on Road Traffic, while figure 5.2 shows a map of the contracting parties of the conventions on Road Signs and Signals.

Figure 5.2
Contracting parties to the Conventions on Road Signs and Signals



The current situation in Road Safety

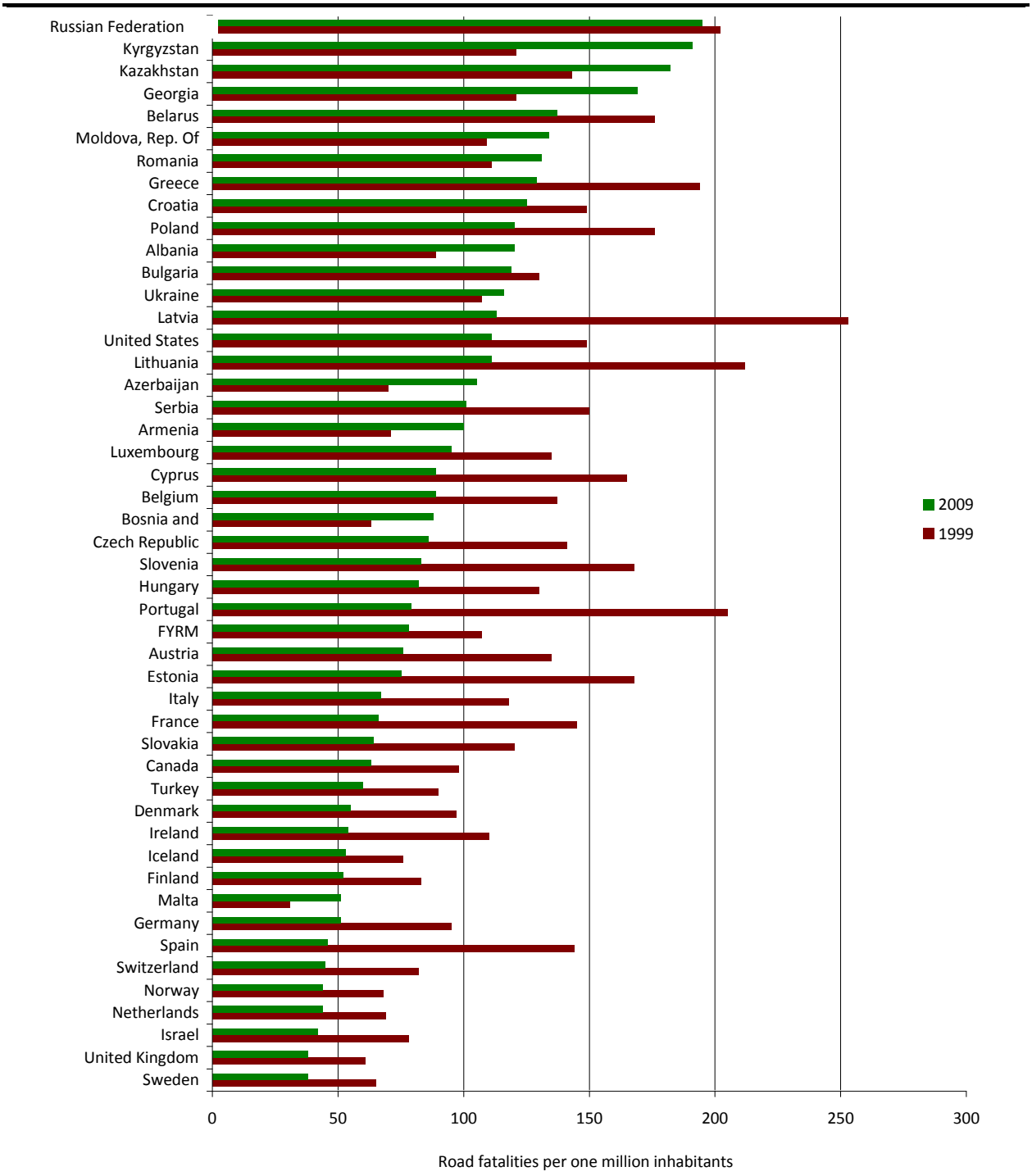
Road fatality levels in the ECE region

Did you know? Road traffic is the world's ninth biggest cause of death!

Within the last decades several low and middle income countries in Eastern and South-Eastern Europe and Central Asia have experienced high growth rates. Transport demand and motorization levels have increased rapidly in these regions leading to a backlog in road safety policies. As a result the road fatality rate has been increasing in many of these regions.

The UNECE average crossed the 100 mark in 2009 with 99 road fatalities per one million inhabitants. Figure 5.3 shows the current situation of road fatalities. It is seen, that the more economically developed UNECE member States especially the old EU member States have a lower road fatality rates compared to the less developed regions.

Figure 5.3
Road fatalities in the ECE region, 1999 and 2009



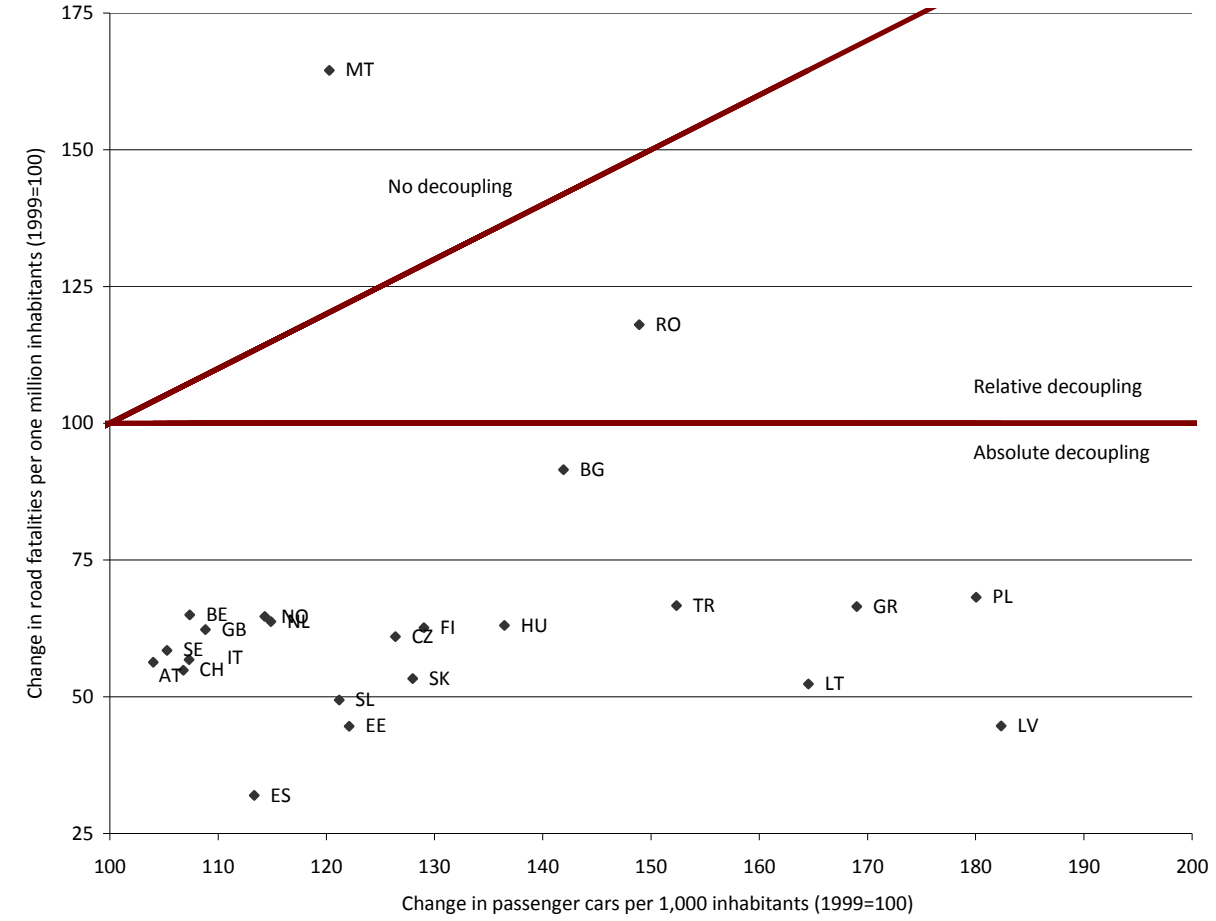
Source: UNECE

Trends in motorization levels and road fatalities

The majority of UNECE member States have been able to decouple motorization level (passenger cars per 1,000 inhabitants) from road fatalities over the last decade as shown in figure 5.4. Malta is the only country located above the red 45 degree line, indicating that no

decoupling has occurred. In contrast, the road fatality rate has increased more than the motorization level in Malta.

Figure 5.4
Change in motorization levels and road fatalities in the ECE region, 1998-2008



Source: UNECE and *The World Bank*

The countries between the red 45 degree line and the red horizontal line in figure 5.3 have managed a *relative* decoupling of motorization and road fatalities. In other words road fatalities have increased by less than motorization level. The major part of the UNECE member states shown in figure 5.4 have managed an absolute decoupling and are thus located below the horizontal red line, where the road fatality rate has been reduced and motorization levels have been increased.

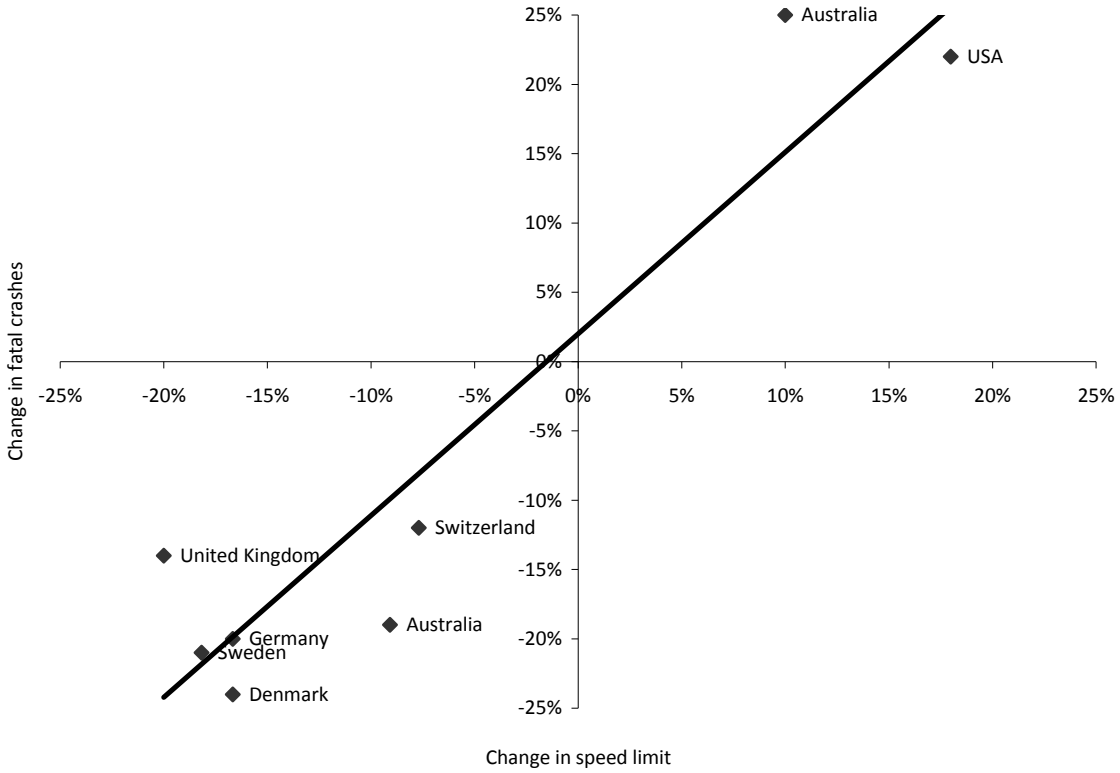
Did you know? The UNECE agreements ensure that you find uniform traffic signs and signals no matter where you are in the world!

Speeding

Driving behaviour is an important element of road safety. Speeding and drink-driving are well known issues that reduce the road safety. Figure 5.5 shows the relationship between changes in speed limits and the number of fatal crashes

based on empirical evidence. A close relationship is identified. The fitted line has a slope above one, indicating that a 1% percent increase in speed limit leads to a more than 1% increase in the number of fatal crashes! Looking at national speed limits in the ECE region, it is seen that many countries have now reduced the speed limits within town to 50 km/h and in some specific areas within town even to 30 km/h. On motorways the speed limit in UNECE countries varies from 100 to 130; the findings that are shown in figure 5.5 show that such a variation of 20-30 km/h makes a crucial difference for the number of fatal crashes.

Figure 5.5
Examples of Change in speed limits and the effect on road crashes



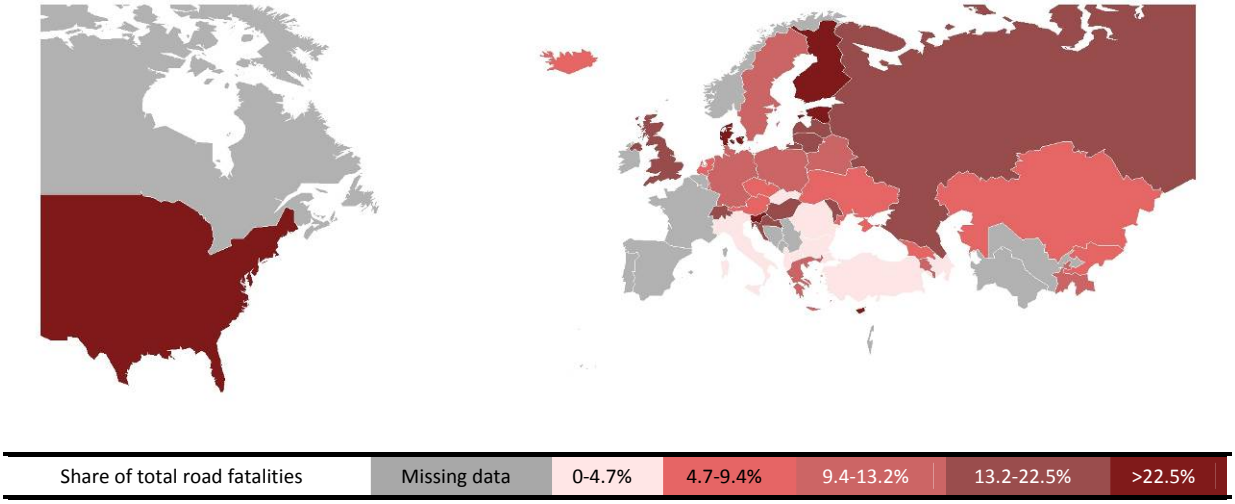
Source: Review and Analysis of Posted Speed Limits and Speed Limit Setting Practices in British Columbia

Drink driving

Drink driving is a major issue in several UNECE member states. The majority of the countries apply a maximum allowed blood concentration level of alcohol of 0.05%. Nevertheless the share of road fatalities attributed to alcohol remains high in many countries as shown by the map in figure 5.6. Slovenia tops the list, where alcohol was involved in 42% of all road fatalities in 2004, second is the United States of America (39% in 2004), followed by Denmark (29% in 2004). The best performing countries are Turkey (1% in 2007), Italy (2% in 2002) and Romania (2% in 2003).

Figure 5.6

Share of road fatalities with alcohol involvement in the ECE region, 2008 or newest year available



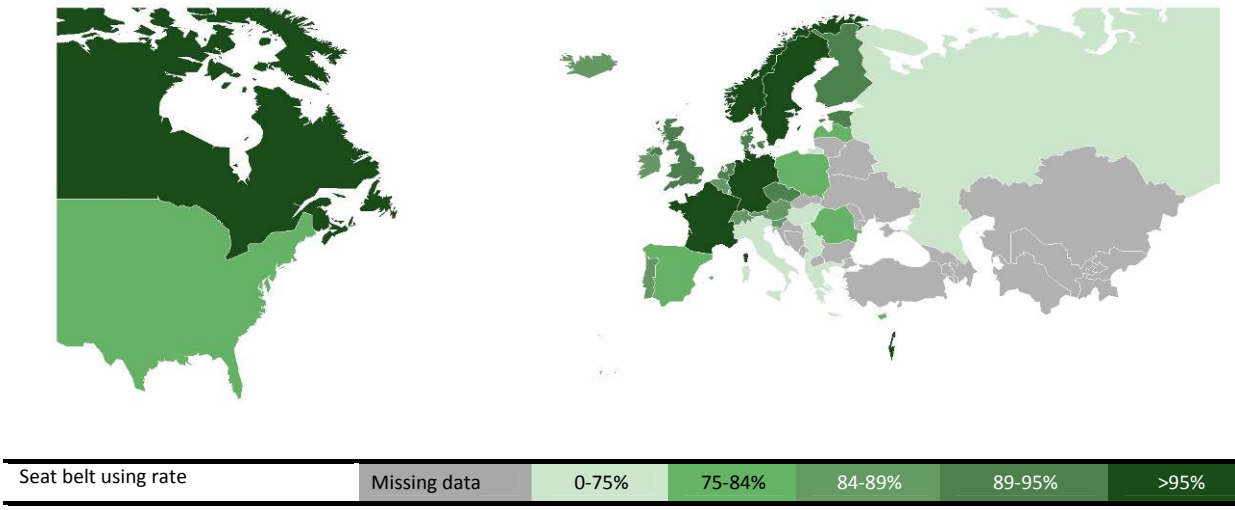
Source: UNECE

Seat belt use

The impact of road crashes on human health can be improved by the use of seat belts. The use of seat-belts is obligatory in most UNECE member States today and most countries have a usage rate above 90%. However a few countries are lagging behind, as shown by figure 5.7. The seat belt use on front seats in the Russian Federation and Albania are estimated to be respectively 33% and 30% in 2007.

Figure 5.7

Seat belt use on front seat in the ECE region, latest estimate (2005-2010)



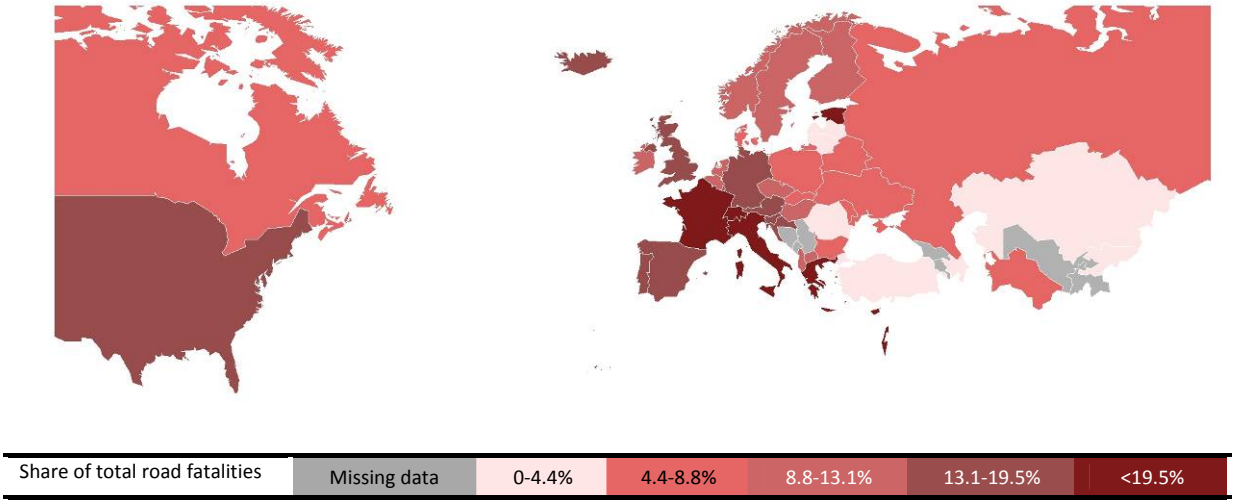
Source: WHO and IRTAD

Motorcycles

Motorcycles are overrepresented in road accidents compared to the distance travelled. For instance in the United States, motor cycles constitute for less than 0.33% of all vehicle kilometres in 2002, but almost eight percent of the road fatalities. From figure 5.8 it is seen that it is mainly in the Western European member states that motorcycles are an issue.

Figure 5.8

Motorcycles share of road fatalities, 2008 or newest year available



Source: UNECE and IRTAD

Challenges and Best Practices in Road Safety

Challenges

Reduce road fatalities

At least 300 people were killed on roads every day in the ECE region in 2009. Despite great improvements in road safety in many UNECE countries over the last decades, we are still very far from zero fatalities. The work for improving road safety should never stop. Many countries both in the ECE region and globally have managed to steadily reduce the number of road fatalities and injuries over the last three to four decades. But there is no reason stop this development. Special attention is needed in regions that recently have experienced rapid growth rates in transportation, economic development and motorization levels.

Special attention to injuries

Target levels and statistics are often only specified for road fatalities. However road injuries often also cause large costs for the individual and the society. Injuries can have a lifelong impact on physical and psychic health, reducing the individual welfare and the social productivity. Underreporting in statistics is a special issue, especially for pedestrians and cycles and single accidents.

Motorcycles

Motorcycles are an issue in especially well developed economies and improving their safety is an unsolved issue. Riders of motorcycles are very vulnerable as the protection level is far away from cars, but speeds are often at least the same. France had 741 registered road fatalities on motorcycles in 1999; in 2007 the number was 1,237. The United States had 2,122 motorcycle fatalities in 1999 and 4,553 in 2007.

Silent vehicles as a safety risk

Special attention is needed for elderly and individuals with specific needs. Cars and roads are getting quieter, especially with the introduction of electrical vehicles. This is an issue for individuals with impaired vision who rely on the hearing when navigating in traffic. Especially at low speed manoeuvres can quiet vehicles be a risk. Bikes are almost noiseless as well, which is problematic in cases with missing cycling infrastructure, so that cyclists share the pavement with pedestrians. They are a safety risk for all pedestrians, but especially for those who are not able to see them.

Young road users

Children have less experience and are often difficult to see in road traffic. Early education of road safety rules, blind spots and good cycling and walking habits is essential for the safety of the youngest road users.

UNECE specific challenge – Road Safety

Impaired driving

Over the period 1996 to 2007 more than 200,000 individuals died on roads in the United States of America because of drink driving! From 1995 to 2007 the annual number of road fatalities with alcohol involvement in the US has only been reduced by 4%. Germany has more than halved the number of road fatalities with alcohol involvement over that period.

Blind spots

Trucks and buses have blind spots. Avoiding accidents caused by these spots action by all road users is needed. The driver needs to pay special attention to these spots, but independent of how many mirrors and cameras he can apply, the full safety can only be achieved if the pedestrian on cyclist is aware of the blind spots.

Black Spots

An area with a high risk of a road accident, based on historical events is defined as a black spot. This can be at sharp corners, due to fast speeds, reduced vision, missing signs or other reasons. The removing of black spots should of high priority. Removal can be done by improving signing, reduce maximum speed, increase law enforcement, installation of mirrors or other assisting infrastructure.

Best practices

Educational campaign for young road users[40]

Gochem the Armadillo is a campaign for children between the age 4 and 12 in the Netherlands. The campaign was introduced in 2004 to increase the use of seat belts among children. A rubber Toy called "Gochem the Armadillo" is given to children that were fastened correctly. The objective of the toy is to make it fun to use the seat belt. An evaluation showed that after the first campaign (2004) 95% of the parents had been reached! It has been estimated that in 2004 75 of the children in Netherlands were fastened correctly and in 2006 the number was 90%!

Bob the designated driver[41]

The Belgian Bob campaign was aimed at reducing drink-driving, by introducing the designated driver who does not drink and drive. The campaigns objective is to increase the knowledge, change the behaviour and attitude towards drink-driving. An idea of the campaign is that a person can "be a Bob", i.e. be the one who drives his friends and family safely home. The campaign was introduced in 1995, and in 2000 an evaluation showed that more than one-third of the respondents had been a Bob.

Enforcement of drink-driving laws[42]

Several UNECE member states apply a random breath testing system. Drivers are stopped randomly and tested for drink-driving by the policy. In Finland, 34% of the population has been tested and in Sweden 17%. Strong sanctions combined with a rehabilitation program are applied in for example Sweden. In Sweden the system has led to reduction in the share of injury accidents that involved drink-drivers from 14% to 9%.

Collision free roads[43]

Sweden began the introduction of so called "collision free roads" in 1998. On a collision free road the barrier between the lanes of opposing traffic. The barrier is typically a guardrail. The rate of seriously injured has been reduced by about 50%. In December 2010 the UNECE asked the Swedish authorities about the most effective measure for improvement of road safety that has been applied in Sweden. Despite the great success with Speed Cameras, the answer was the collision free roads.

Northern European Cooperation on traffic law enforcement[44]

The traffic police of the Northern European countries cooperate on the enforcement on traffic laws. This implies that the national authorities have a mutual acceptance of requests for investigations of speed limit violations of foreign citizens. Investigations and court processes can be carried out in the country of citizenship, independent of whether the violation occurred in that country or in another Nordic country. The EU Transport Council

[40] See: http://ec.europa.eu/transport/roadsafety_library/publications/supreme_f1_thematic_report_education_and_campaigns.pdf
[41] See: http://ec.europa.eu/transport/roadsafety_library/publications/supreme_f1_thematic_report_education_and_campaigns.pdf
[42] See: http://ec.europa.eu/transport/roadsafety_library/publications/supreme_f6_thematic_report_enforcement.pdf
[43] See: www.vti.se/EPiBrowser/Publikationer/R636ASve.pdf
[44] According to the information provided by Sweden and Denmark in the questionnaire on Transport for Sustainable Development, December 2010.

proposed a new directive that will enable the cross-border traffic law enforcement in the European Union. These offences include speeding, failing to stop at traffic lights, lack of seatbelt wearing, driving under influence of drugs or alcohol, lack of helmet use, use of the emergency lane for driving and driving while using a handheld mobile phone.

Special focus on motorcycles[45]

Sweden has launched a 2010-2020 strategy for improvement of the road safety of moped and motorcycle riders. The objective is to reduce the number of seriously injured motor cyclists and moped drivers by 25% in 2020 compared to 2010 and halving the number of fatalities. Measures to obtain these targets include fitting motorcycles with ABS brakes, reducing the number of speed limits violations and increase the helmet usage. An evaluation of the motor cycle accidents in Sweden showed that 58% of the fatalities were due to legislative violations.

Trial Driver License in Germany[46]

Germany introduced a system in 1986 (in West Germany) where all novice drivers receive a probationary license for two years. The driver has to show within these two years, that he is able to act safely in the traffic. If the driver commits a serious traffic crime or is involved in an accident, the probationary license period is extended by two years, and the driver has to attend a driver improvement course. A study showed a five per cent reduction in serious accidents for 18-19 year old males, but now impact on females.

Vehicle quality[47]

The EuroNCAP system classifies new cars according to a safety measure with stars ranging from one (low safety) to five (high safety). The tests are carried out by an independent operator and include analysis of the impact of frontal crash, side crash and accidents with pedestrians. The result is saved in a database that was introduced in 2004. The system enables the consumer easily to identify the cars safety level and thereby gives the car manufacturer an incentive to produce safer vehicles.

Setting road safety targets[48]

The EU continues to set targets on road fatalities. The last target of halving the number of fatalities from 2001 to 2010 was not fully achieved, but a positive development was realized so the EU renewed this target and aims at halving the number of road fatalities in 2020 compared to 2010[49]. Several national governments are applying road safety targets as well. Albania aims at reducing the risk of a road fatality or injury by 50% in 2019 compared to 2009. Armenia aims at reducing the number of road fatalities by 10% from 2010 to 2015. Croatia aimed at reducing the fatality rate from 138 fatalities per one million inhabitants in

[45] According to: http://publikationswebbutik.vv.se/upload/5542/2010_043_improved_safety_for_motorcycle_and_moped_riders.pdf
[46] According to: http://ec.europa.eu/transport/roadsafety_library/publications/supreme_f2_thematic_report_driver_education_training_licensing.pdf
[47] According to: http://ec.europa.eu/transport/roadsafety_library/publications/supreme_f4_thematic_report_thematic_report_vehicles.pdf
[48] According to questionnaire replies and attachments.
[49] According to: http://ec.europa.eu/transport/road_safety/pdf/com_20072010_en.pdf

2004 to 100 fatalities per one million inhabitants in 2010. Latvia adopted the EU target for 2010, but increased it for 2013 for which a 70% reduction in fatalities compared to 2001 is targeted. Sweden aims at halving both road fatalities and injuries in 2020 compared to 2007. Several countries set additional specific targets. For instance Croatia has set specific targets for seat belt use, helmets use and speed dispersion.

Several countries have shown that targets are achievable, for example in Spain the EU target of halving the number of road fatalities from 2001 to 2010 was more than achieved when in 2010 the road fatality rate was 57.5% lower than in 2001. The number of road fatalities in 2010 was even lower than in 1963, despite the fact that there are now more than 31 million vehicles on Spanish roads, when in 1963 there were 1.7 million vehicles in use in Spain[50].

Best Practice – Road Safety

Fight against fatigue: The digital tachograph

The behaviour of the driver can be recorded, which is especially useful for professional road users. The driving behaviour can therefore be evaluated and for instance speeding can be reported to the driver's supervisor immediately. Studies[51] have shown that the impact of this system varies from 5%-30% reduction in accidents, a 5.5% reduction in fatalities and a 3.5% reduction in serious injuries. Fatigue is a severe road safety risk and therefore 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 was a severe problem with the traditional tachographs, but since the introduction of digital tachograph the possibilities to tamper the system have been reduced considerably.

Speed cameras[52]

In a period from 2002 to 2004 the Swedish authorities installed 335 automatic speed cameras that covered 750 km of roads. Early studies showed that the preliminary impact of fatal crashes was a reduction of 50% and on total injuries the reduction was 25%, the speed reduction is estimated to be 5-10km/h! In the United Kingdom speed cameras have lead to an estimated reduction in fatal crashes of 40%. In a scientific study covering 14 cases found that in all but one, the speed cameras were proven effective in improving road safety[53].

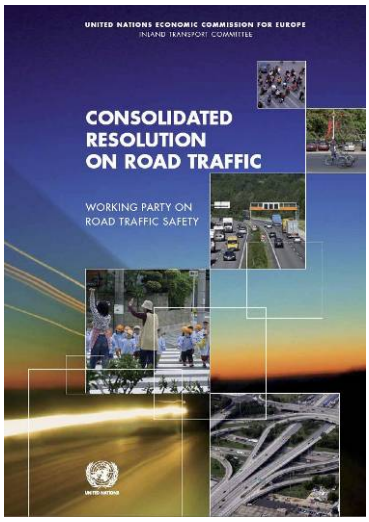
[50] According to: http://www.lapri.org/sites/default/files/9-Road_Safety_Balance_final.pdf
[51] According to http://ec.europa.eu/transport/roadsafety_library/publications/supreme_f4_thematic_report_thematic_report_vehicles.pdf
[52] According to: http://ec.europa.eu/transport/road_safety/specialist/knowledge/pdf/speeding.pdf
[53] Pilkington, P. & Kinra, S. (2005) Effectiveness of speed cameras in preventing road traffic collisions and related casualties: systematic review. British Medical Journal, BMJonline, BMJ.com, doi:10.1136/bmj.38324.646574. AE

The Role of UNECE in improving Road Safety

The United Nations General Assembly resolution proclaiming a Decade of Action for Road Safety 2011-2020 was tabled by the Government of the Russian Federation and cosponsored by more than 90 countries. The UNECE as a member of the UN Road Safety Collaboration welcomes this proclamation which seeks to save lives by halting the increasing trends in road traffic deaths and injuries world-wide. UNECE's work focuses on improving road safety through developing and updating legal instruments. They are aimed at internationally harmonized traffic regulations, construction and technical inspection of vehicles as well as for the transport of dangerous goods. These regulations have assisted many countries in developing and enforcing traffic rules and measures, producing safer and cleaner road vehicles, reducing the risk of accidents with dangerous goods and hazardous materials and ensuring that only safe and well-maintained vehicles and competent drivers are allowed to participate in traffic. Transport infrastructure agreements developed under the UNECE auspices have given Europe coherent pan-European and safe road transport networks.

The UN Road Safety Forum

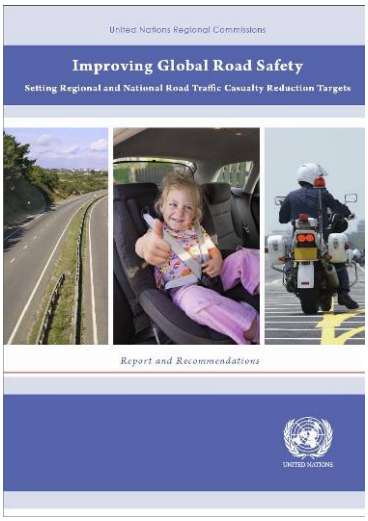
The UNECE Working Party on Road Traffic Safety (WP.1) is the only permanent intergovernmental body in the United Nations system dealing with road safety. WP.1s primary function is to serve as guardian of the United Nations road safety legal instruments. The Conventions on Road Traffic and on Roads Signs and Signals of 1968, and other UNECE legal instruments addressing the main factors of road crashes i.e. the road user behaviour, the vehicle and the infrastructure, are significant contributors to improved road safety. In addition to its regulatory work, WP.1 is involved in development and promotion of best road safety practices. Among its main achievements are a unique set of road safety best practices contained in the Consolidated Resolutions on Road Traffic (R.E.1) and on Road Signs and Signals in order to bring them in line with the dramatic developments in road safety.



Improving global road safety: setting regional and national road traffic casualty reduction targets

With financial support from the United Nations Development Account (UNDA) the project "improving global road safety: setting regional and national road traffic casualty reduction targets" was implemented through 2008 and 2009, by the five United Nations Regional Commissions, in cooperation with other international organizations and NGOs active in the field of road safety. The project recognized the value of targets in improving road safety and

was set up to help countries with economies in transition to develop regional and national road traffic casualty reduction targets and to provide them with examples of good road safety practice that could help them to achieve the targets selected by 2015. Activities under the project included organization of seminars under the auspices of each regional commission, report on setting and achieving road safety targets, and inputs for the Global Ministerial Conference on Road Safety that took place in Moscow on 19-20 November 2009.



Vehicle safety

Among the essential improvements of vehicle safety, the World Forum (WP.29) has adopted new provisions for the mandatory installation of Brake Assist Systems (BAS) and Electronic Stability Control (ESC) systems which are major achievements in the field of active vehicle safety. Their regulatory implementation, make these technologies applicable on a worldwide scale. Furthermore, Daytime Running Lights (DRL), Adaptive Front-Lighting Systems (AFS) and contour markings for commercial vehicles are efficient technologies to also improve the active safety of vehicles (crash-avoidance). New requirements to increase passive safety of buses, like the mandatory installation of safety-belts and safety-belt anchorages as well as fire detection systems in coaches have contributed to reduce the consequences of traffic accidents.

Helmet use for two-wheelers

A significant percentage of the global 1.3 million fatalities per year due to road crashes occur because many motorcyclists do not wear helmets while driving. While wearing a helmet correctly can cut the risk of death by almost 40%, and the risk of severe injury by 72%, The most recent amendments agreed by the World Forum regarding UNECE Regulation No. 22 (protective helmets), have resulted in one the most relevant sets of requirements for the construction of motorcycle helmets at the world level (New York Times, 6 May 2010). Since motorcycle usage is growing fast, particularly in the transition countries, adherence to WP.29 requirements on helmets could massively contribute to road safety improvement.

Road safety statistics

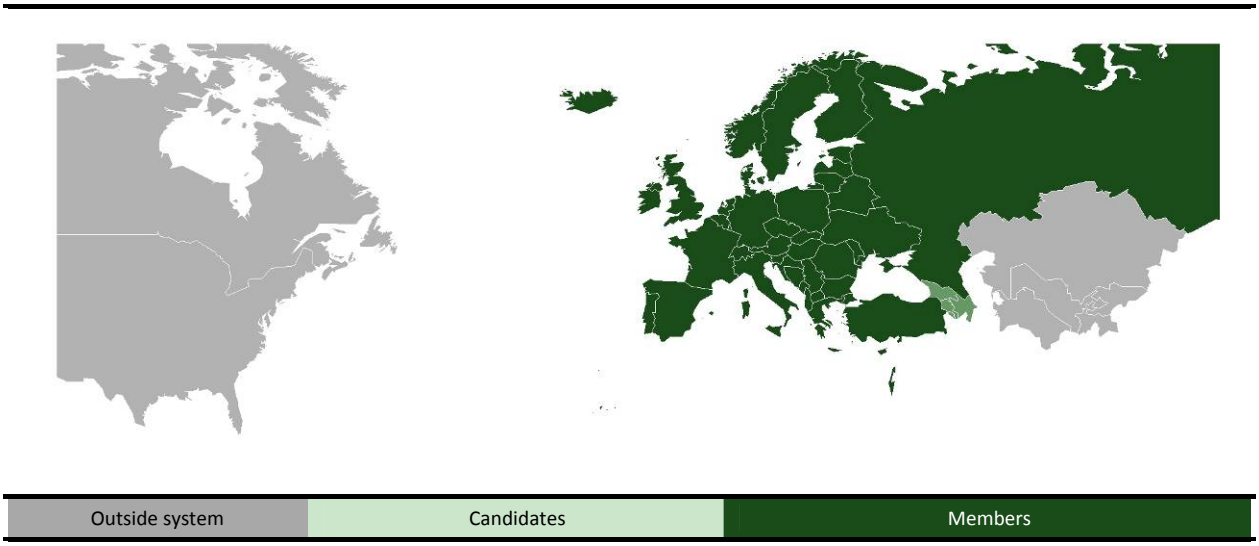
For many years the UNECE is undertaking the regular compilation and dissemination of road traffic accident statistics in Europe and North America a rich collection of detailed data (including on-line) relating to road traffic accidents and casualties by country, year, location, time of occurrence, road condition, nature of accident, age group and accidents under influence of alcohol

Green Card System

In 1947 the UNECE began the work towards a system that coordinates between authorities and insurance organizations in order to avoid conflicts when traffic accidents involve vehicles registered in a different country. This work led to the Recommendation number 5,

(E/ECE/TRANS/145 - E/EEC/TRANS SC1/C 39). In the 1950ies the Council of Bureaux (COB) was created and in 1953 the Green Card System was born based on the agreement No 43 by the ECE. Ever since then the COB has maintained this international insurance system. The geographical area of coverage of the system continues to increase. As figure 5.9 shows, there are currently three candidates for membership.

Figure 5.9
The Green Card System



Source: Council of Bureaux; Note: In the United States of America and Canada an alternative system is applied.

Main achievements by the World Forum for Harmonization of Vehicle Regulations regarding road safety

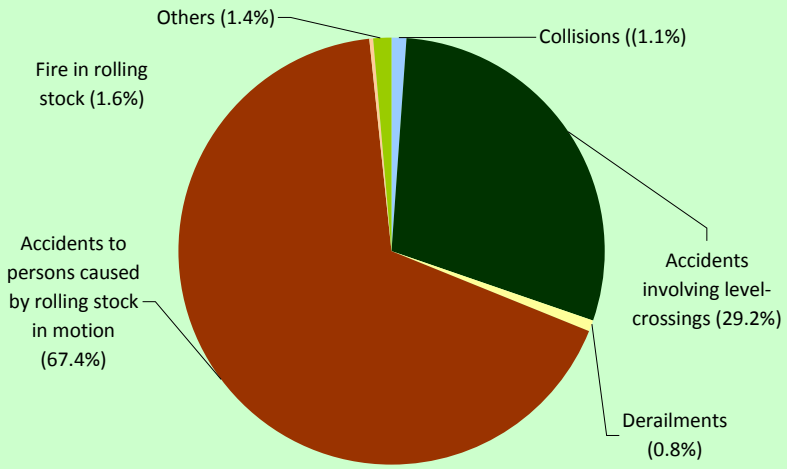
The World Forum for Harmonization of Vehicle Regulations (WP. 29) has adopted 130 vehicle regulations since its establishment in 1952. Many of these regulations have improved road safety, for example the regulations on child restraints, safety belts, airbags, electric vehicle safety, indirect vision systems (mirrors & camera monitoring), safety glazing materials, superstructure of buses and coaches, vehicle alarm systems, protective helmets and burning behaviour.

Special attention: Rail safety

Rail transport is one of the safest transport modes. It is operated exclusively by professionals ensuring a high level of driver behaviour.

The figure below provides a decomposition of the rail fatalities in the EU27 from 2006 to 2009. 97% of these fatalities happened at level crossings or were caused by rolling stock in motion. More than two-thirds of the fatalities or almost 4,000 fatalities were due to accidents caused by rolling stock in motion.

Figure 5.10
Decomposition of the Rail fatalities in the EU27, 2006-2009



Source: Eurostat

The Role of UNECE in promoting rail safety

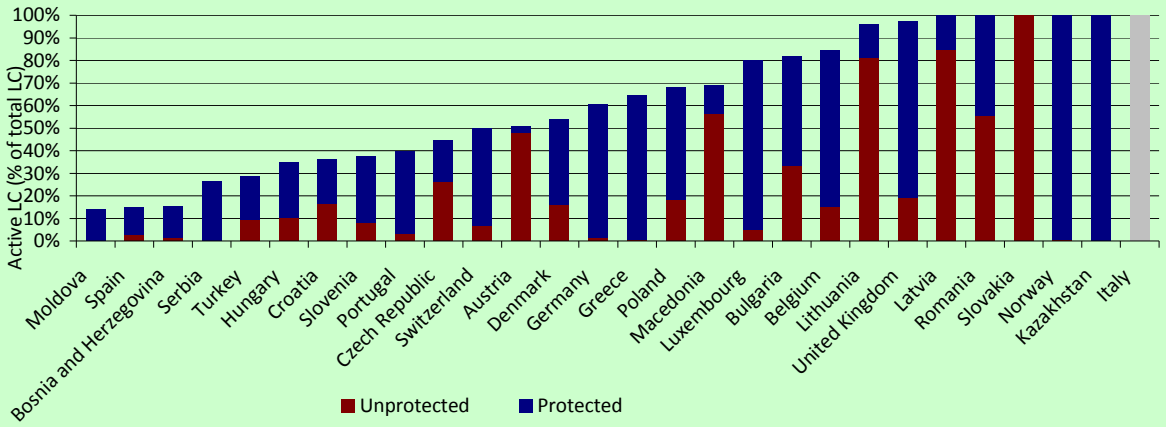
Informal Task Force on Rail Security

The UNECE informal task force on rail security deals with the continuous terror threat to the railway system and provides a framework for sharing of best practices. The task force works on the key issues on a risk-based approach. The UNECE Working Party on Rail transport works together with the International Union of Railways to raise awareness of the importance of security in the railway sector. The cooperation involves workshops, joint meetings and knowledge sharing.

Special attention: Safety at level crossings

Level Crossings are a special challenge as they involve two different modes with very different operational characteristics. The road user is typically private and flexible. A train drives after according to a schedule and less flexible.

Figure 5.11
Protected Level Crossings in 2009



Source: IUC, Int. Railway Statistics 2009. Note: An active level crossing means that users are either warned (unprotected) or protected (by a barrier/gates). Data for Norway is from 2008.

A level crossing is an intersection between road lines and rail tracks. In most UNECE member countries Trains have priority at level crossings, and often, the road users are warned through audible signals such as horns our bells, visible signals by means of lights and/or physical signals through vibration of road bumps.

International Level Crossing Awareness Day

In the framework of the International Level Crossing Awareness Day on June 22, 2010 more than 40 countries, including Estonia, Russian Federation, Germany, Poland, Portugal, England, France, Italy and Lithuania created special awareness raising videos, posters and other information material. The first level crossing awareness day was held in June 2009 with a European scope, but for the 2010 event the scope was expanded to cover all five continents. In 2011 the international awareness day will be in June 11. The videos produced are available on the homepage www.ILCAD.org.

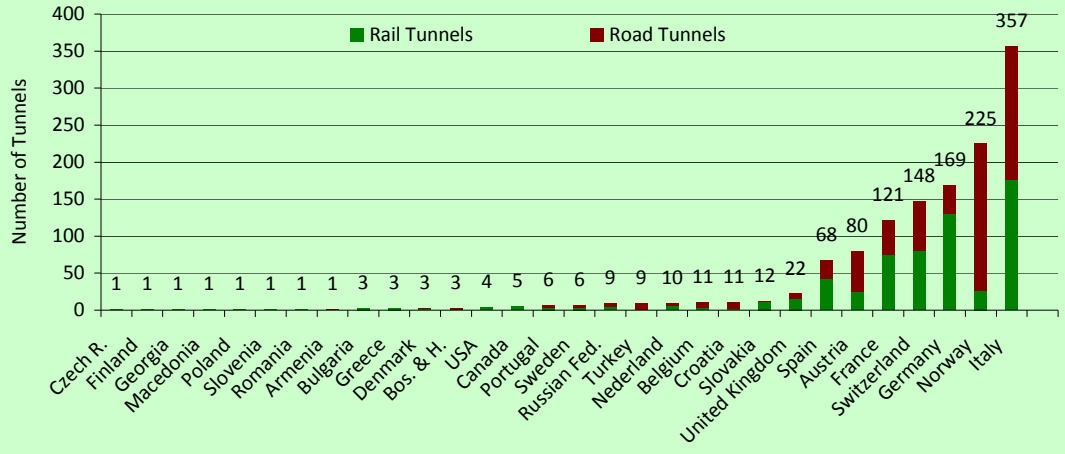
The Role of UNECE

The UNECE working party on road safety (WP. 1), the working party on rail transport (SC. 2) and the working party of road and rail infrastructure (SC. 1) provide an excellent framework of knowledge sharing and capacity building. Therefore it has been suggested that a multidisciplinary group of experts, including members of each working party and other stakeholders should be created in order to improve the safety at level crossings

Special attention: Tunnel safety

The UNECE was concerned about tunnel safety a long time before the three major accidents occurred in the Alpine tunnels in 1999 and 2001 killing in total 62. These accidents did however emphasize the risk in tunnels and lead to considerable work and improvement of tunnel safety by the UNECE and other organizations.

Figure 5.12
Rail and road tunnels in the ECE region



Sources: Data on road tunnels is taken from a UNECE questionnaire in 2001; data on rail tunnels is from a UNECE questionnaire from 2002. Note that some tunnels may have been in the planning phase at that time. Only tunnels longer than 1,000 m are included.

For road tunnels there is evidence that show that accidents rate are higher in bi-directional tunnels (up to 40% higher) than in unidirectional tunnels. According to the World Road Association the frequency of breakdowns is around 1,300 per 100 million vehicle kilometres in tunnels under rivers and urban areas, between 300-600 in tunnels in open countryside, and 900 and 1,900 in tunnels through mountains. The World Road Association has further found (for 1999) that the frequency of fires in road tunnels is about 25 per one million vehicle-kilometres[54].

The Role of UNECE in promoting safety

Recommendations of the multidisciplinary group of experts on safety in rail tunnels

The accidents and fires in the road tunnels of Mont Blanc and Tauern in 1999 and St. Gotthard in 2001 raised the awareness about the tunnel safety issue. Following these incidences UNECE created a Multidisciplinary Group of Experts on Safety which dealt with safety in road tunnels. The Inland Transport Committee subsequently set up a group of experts to consider the issue of safety in rail tunnels. These experts from member states of the UNECE, the International Union of Railways and other experts presented their work and recommendation in December 2003 (Recommendations of the Group of Experts on Safety in Rail Tunnels).

[54] See: "Fire and Smoke Control in Road Tunnels", PIARC Committee on Road Tunnels (C5), 1999."

Special attention: Safety in transport of dangerous goods.

Transport of dangerous goods needs special attention, as accidents can have severe consequences for the involved individuals and the environment. The dangerous goods transported include toxic, corrosive, explosive, radioactive or flammable substances. Mitigation of the risk from transport of these goods requires special safety precautions and the UNECE plays a key role in the development of related regulations.

Safety conditions for transport of dangerous goods

The UNECE provides the secretariat for the United Nations Economic and Social Council's Committee of Experts on the Transport of Dangerous Goods (TDG) and on the Globally Harmonized System of Classification and Labelling of Chemicals (GHS). This Committee elaborates recommendations on classification and listing of dangerous goods, use of packagings and tanks, their construction and approval, their marking and labelling, as well as consignment and operational procedures for international transport.

Its recommendations are published as:

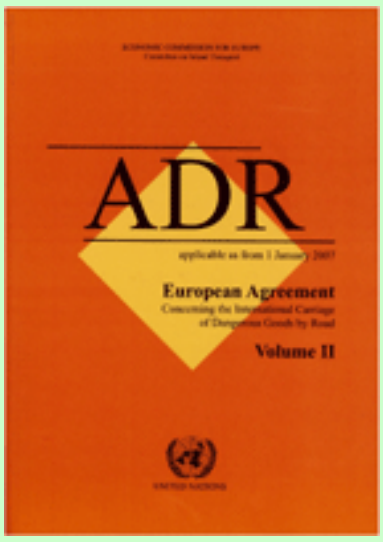
- The Recommendations on the Transport of Dangerous Goods, Model Regulations;
- The Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria;
- The Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

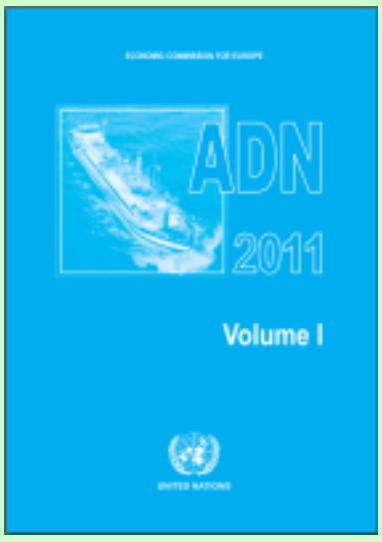
These recommendations are implemented not only at country level but also through international instruments administered by UNECE or by other international organizations such as the International Maritime Organization (IMO) and the International Civil Aviation Organization (ICAO). These instruments which include not only the provisions of the Model Regulations but also mode specific requirements are:

- The International Maritime Dangerous Goods Code (IMDG Code) administered by IMO;
- The Technical instructions for the Safe Transport of Dangerous Goods by Air administered by ICAO;
- The European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), administered by UNECE;
- The European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways (ADN) administered by the UNECE in cooperation with the Central Commission for Navigation on the Rhine (CCNR);
- The Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) administered by the Intergovernmental Organisation for International Carriage by Rail (OTIF) in cooperation with UNECE.

RID, ADR and ADN apply to international transport, but Member States of the European Union apply their provisions to domestic traffic as well. Furthermore, the European Union has aligned its legislation on classification, labelling and packaging of substances and mixtures to the GHS.

In response to developments in technology and the changing needs of users, the Model Regulations on the Transport of Dangerous Goods and the GHS are amended and updated every two years by the Committee of Experts. The new version (17th revised edition) of the Recommendations on the Transport of Dangerous Goods, Model Regulations, is to be published in 2011, and the new provisions contained therein will be reflected in the modal legal instruments (RID, ADR, ADN, IMDG Code, ICAO Technical instructions) for application as from 1 January 2013.

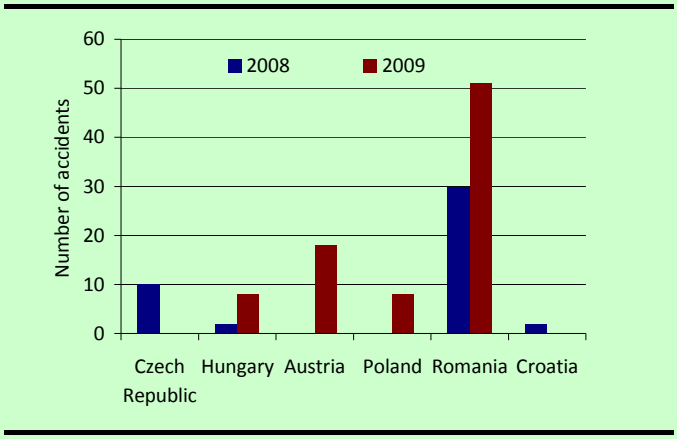




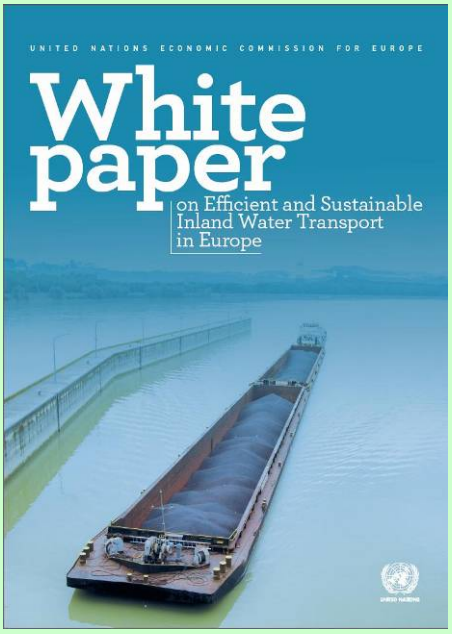
Special attention: Inland waterways, a safe transport mode

In contrast to road and rail, inland waterways are mainly used for freight transport and operated by professional users. The risk of accidents for human lives is therefore limited. This is confirmed by the statistics showing very low accident rates. IWT is a safe and sustainable transport mode.

Figure 5.13
Accidents on inland waterways



Source: Eurostat



The UNECE promotes the use of IWT as a safe transport mode.

In the area of inland water transport, the UNECE has been dealing with a wide range of issues, including Identification and further development of a European network of inland waterways, rules and signs used on inland waterways, technical requirements for inland vessels, recognition of boatmaster's and crew's certificates, river information services, pollution prevention etc.

The UNECE Working Party on Inland Water Transport maintains the inventory of the parameters on E-network of waterways of international importance (Blue Book), based on the European Agreement on Main Inland Waterways of International Importance (AGN). It also develops and maintains pan-Europeans technical and safety requirements for inland navigation, such as the European Code for Inland Waterways (CEVNI) that provides model rules for national and international legislation on rules of the road, signalling and marking of inland waterways and vessels. Similarly, UNECE Resolution No. 61 on Harmonized Europe-Wide Technical Requirements for Inland Navigation Vessels, that are compatible with those applicable in the EU, provide harmonized provisions on the recognition of ship's certificates, on the limitation of air, water and noise pollution as well as on minimum manning requirements and on working and rest hours of crew. I

In 2011, the UNECE published a second White Paper assessing the IWT development in the region and identifying the key areas for common Pan-European action.

6. Transport security: Protection against terror and criminal activities

The last decade showed how vulnerable the transport system is towards terror threats. At the attacks in New York in September 11, 2001, transport systems were misused as weapons. At the attacks in Madrid in March 2004, the ability of transport to bring together masses was misused, likewise the following year in London, and most recently the attacks on the Metro network and Airport in Moscow. Within the last decade several inter-governmental initiatives have been launched to improve security. The UNECE was one of the first to realize the importance of transport facilitation, and is therefore now a focal point for regulatory and technical intergovernmental development.

Transport Security	
Key challenges	➢ Transport systems brings together masses ➢ Transport system covers wide areas ➢ Large parts of the transport systems are not under surveillance
UNECE	➢ Is a global platform for regulatory and technical agreements ➢ Has created a Multidisciplinary Group of Experts on Inland Transport Security

Minimize terror threats and prevent attacks

Transport systems are a vulnerable and attractive terror target. Infrastructure such as roads, rail lines and inland waterways, including bridges and tunnels, are located in the open areas and are largely without surveillance. Furthermore transport systems bring together masses in a predictable manner. Transport systems are complex and involve thousands of companies. And finally transport systems operate across borders, which increases the complexity as national regulations and norms typically differ. Harmonizing and aligning national security standards across borders are therefore needed.

The transport sector should therefore demonstrate willingness to reduce and eliminate the underlying security threats. Terrorist threats should be addressed preventively and action should be taken at early stages to avoid threats and attacks without hindering mobility. This requires close cooperation of transport authorities with other authorities such as intelligence, security, customs and border services. The overall objective is to improve the security of domestic and international transport systems by reducing the likelihood of transport being a target or used as a vehicle for terrorism.

Especially rail and air transport is facing the terror threat as they collect masses and offer a vulnerable target. This has unfortunately been confirmed by the incidences of the last decades. Air transport is therefore taking increasing security measures including new technology on airport scanners as well as tighter restrictions. However mobility and security must be balanced. More control often leads to longer queues and delays. The railway sector

has not taken similar measures to increase security, but has instead increased surveillance as well as improved the material to minimize the impact of explosives.

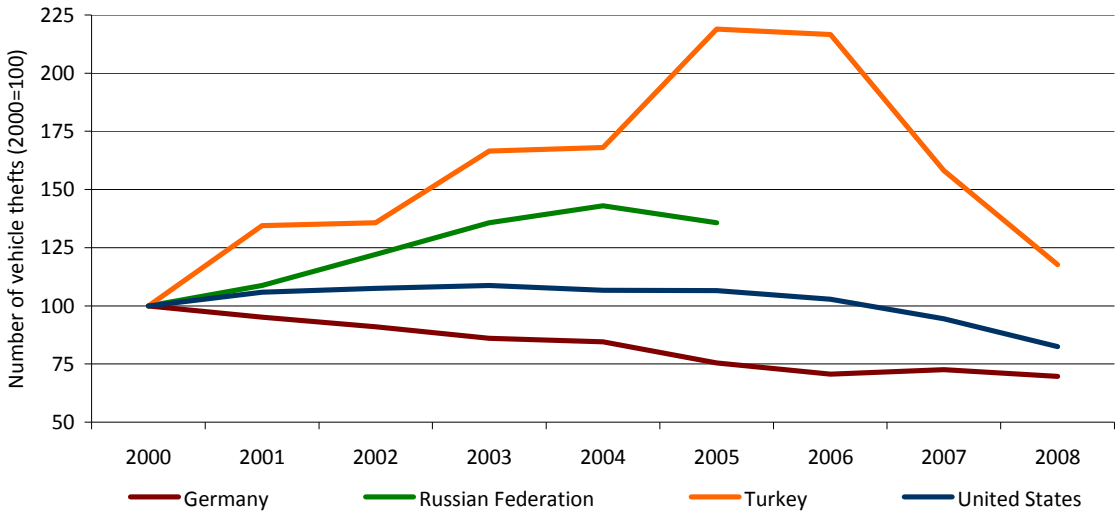
The European Conference on Ministers of Transport developed a Ministerial Declaration on Combating Terrorism in Transport, which was approved by the Council of Ministers in 2002. The Ministers declared their determination to work continued smooth and secure flow of goods and people nationally and internationally, unhindered by the threat of terror action.

Criminal activities

Transport is also vulnerable towards burglaries and other criminal activities. A survey on drivers of heavy goods vehicles showed that about one out of six drivers had been attacked within the period 2003 to 2008[55]. Concentration of transport activities, chaos at borders and lack of safe border facilities increase the risk, especial for professional road users. Theft of goods and vehicles and fraud in road transit systems is an issue for road transport, while theft of goods illegal immigration and transit fraud are issues that require special attention in rail transport.

Analytical data is generally missing for transport security. However the International Transport Forum estimated that up to 1% of vehicles are stolen annually[56]. For the United States it has been estimated that in 2004 a vehicle was stolen every 26 seconds and only 13% of these thefts were cleared by arrests[57].

Figure 6.1
Development in the number of vehicle thefts in selected UNECE countries



Source: Eurostat

[55] According to: www.unece.org/trans/events/docs/inlandsecurity_forum10_pres3.pdf
[56] According to: www.internationaltransportforum.org/europe/ecmt/crime/pdf/JScopenh03.pdf
[57] According to: www.auto-theft.info/Statistics.htm

Figure 6.1 shows the development in the number reported vehicle thefts in four UNECE countries over the last decade. In both Germany and the United States we the level in 2008 was lower than in 2000, while Russian Federation and Turkey have had considerable issues. For Germany it is worth noting that the number of reported vehicle thefts more than halved in the period 1993 to 200. Bikes are also at high risk due to the lack of proper security measures and safe parking space. For instance in Copenhagen on average 60 bikes were reported stolen every day in 2009. [58]

The Role of UNECE in improving Transport Security

Regulatory and technical platform

The UNECE is a focal point for regulatory and technical intergovernmental agreements in transport facilitation for road, rail and inland waterways transport. The UNECE administers several international and global legal instruments, including the TIR Convention (1975) and the Harmonization Convention (1982). Within the last decade a large number of initiatives have been started to improve and address the security issues. From the prospective of international transport and global supply chains, the major development was the adoption in 2005 of The Framework of Standards to Secure and Facilitate Global Trade (SAFE) by the World Customs Organization (WCO). UNECE and its Inland Transport Committee (ITC) have given careful consideration to transport security. This work was first conducted in the framework of various Working Parties which addressed the underlying issues within their field of competence.

Multidisciplinary Group of Experts on Transport Security

To ensure a comprehensive inter-sectoral approach to this topic, ITC established a Multidisciplinary Group of Experts on Inland Transport Security which worked from 2007 to 2009 and developed a final report consisting of private sector's standards, industry initiatives, guidelines and best practices in the field of inland transport security. The Expert Group consisted of experts from UNECE member States as well as relevant international governmental and non-governmental organization. The work showed that internationally there is a lack of organizational work for the improvement of passenger safety in especially urban transport. Secondly, inland transport systems compared to ports and airports are relatively unprotected due to their open area coverage. So that inland transport often is the weakest link in supply chain security. As an example the working group mentions that containers are well protected at ports but as soon as they leave the ports by inland transport modes the security disappears. Moreover there the group of experts concluded that there is a lack of international body for security in inland transport modes that is comparable to IMO (Maritime Transport Security) and ICAO (Air Transport Security). Therefore the group of experts emphasized the importance of a strengthening of the UNECE work on inland transport.

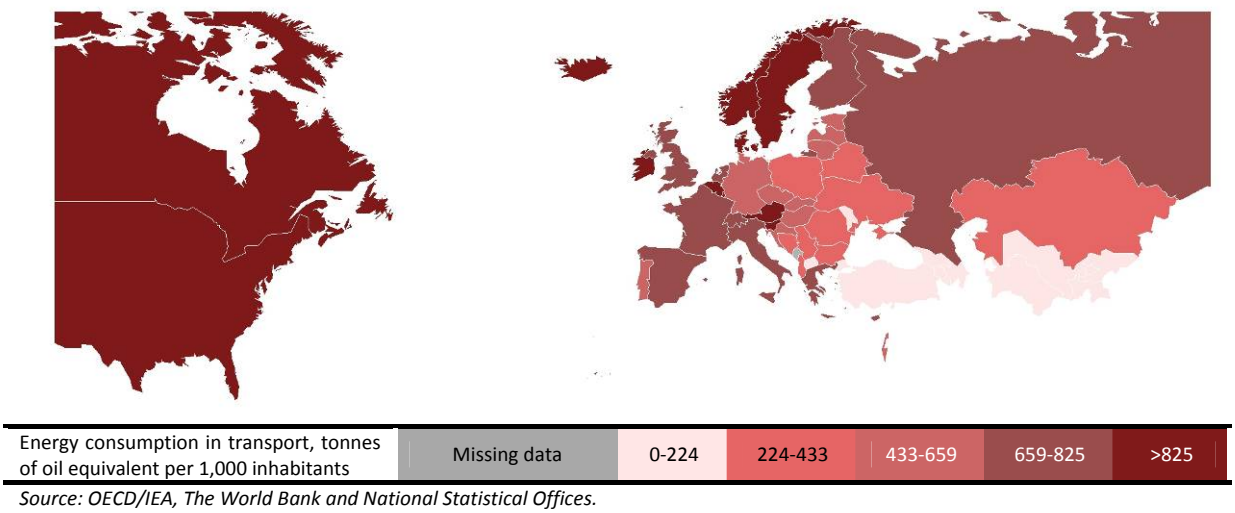
[58] According to: www.statistikbanken.dk/383

7. Environmental sustainability through, regulations, technology and behaviour!

Transportation requires infrastructure, which implies land-use and loss of natural habitat. Movement - independent of mode - requires energy. Walking requires energy and so does driving a car. Unfortunately many of the most popular transport modes depend on non-renewable energy sources; which additional to the direct reduction in natural resources also are related to emission of greenhouse gases and harmful pollutants. Much can be done to reduce the negative impact of transport on environmental sustainability. New and renewable energy sources are found and used, intelligent transportation systems are used to improve efficiency and engines are becoming increasingly efficient.

	Energy efficient behaviour ⇨ Renewable energy sources ⇨ Low emission technologies ⇨	Environmentally sustainable transport
Key challenges	➢ Transport constitutes for almost one-third of the total energy consumption. ➢ Energy consumption in especially road transport is increasing ➢ Greenhouse gas emissions from transport are increasing. ➢ Noise from transport is affecting large shares of populations in agglomerations.	
UNECE	➢ Provides a global forum for agreements on vehicle regulations ➢ Encourages governments to pursue an integrated approach to transport policy ➢ Defines regulations limiting the maximum admissible level of vehicle emissions for various gaseous pollutant	

Figure 7.1
Energy use in transport per capita in the ECE region in 2008



Source: OECD/IEA, The World Bank and National Statistical Offices.

The current situation

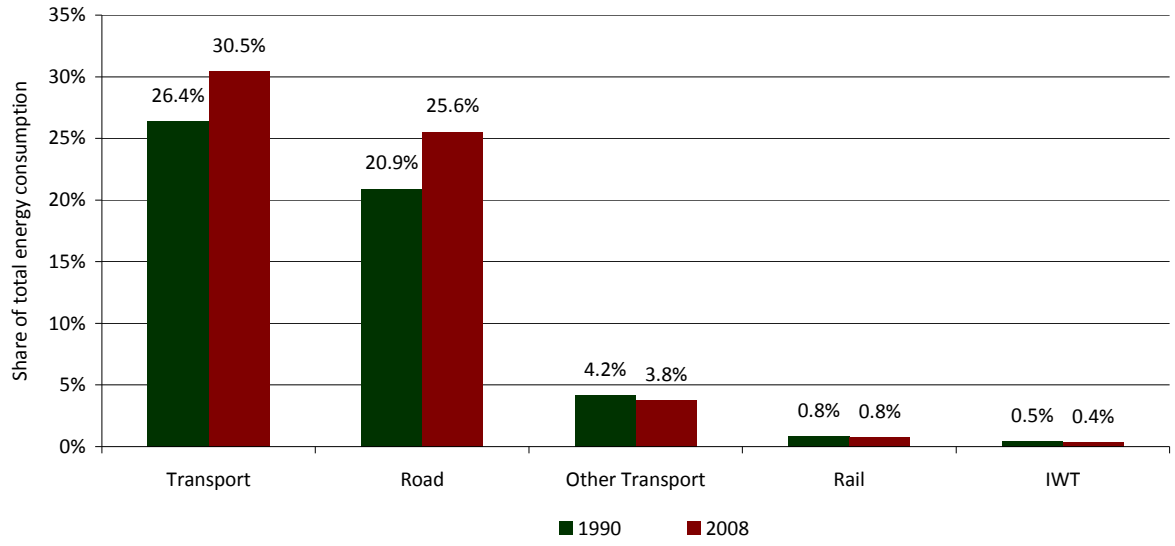
Energy use in transport

Did you know? The Austrian Postal services reduced the annual fuel consumption by 2 million litres through eco-training of the drivers.

The energy use in transport varies considerably within the ECE region as shown by figure 7.1. In the United States the annual energy use per capita in transport is 2 tonnes of oil equivalent energy, while in Tajikistan an average inhabitant consumes 0.015 tonnes of oil equivalent energy. There is of course a close relationship between mobility and energy use in transport and an ongoing challenge is to improve mobility without increasing energy use. As figure 7.2 shows the share of energy use in transport has increased over the last decades. This is a result of two forces. The total energy consumption has been reduced and the energy use in transport has increased. Both rail and IWT has reduced its energy use, but over the last two decades the energy use in road transport has increased by more than 20% measured in tonnes of oil equivalent energy.

Figure 7.2

Share of energy use in transport of total energy consumption in the ECE region, 1990-2008



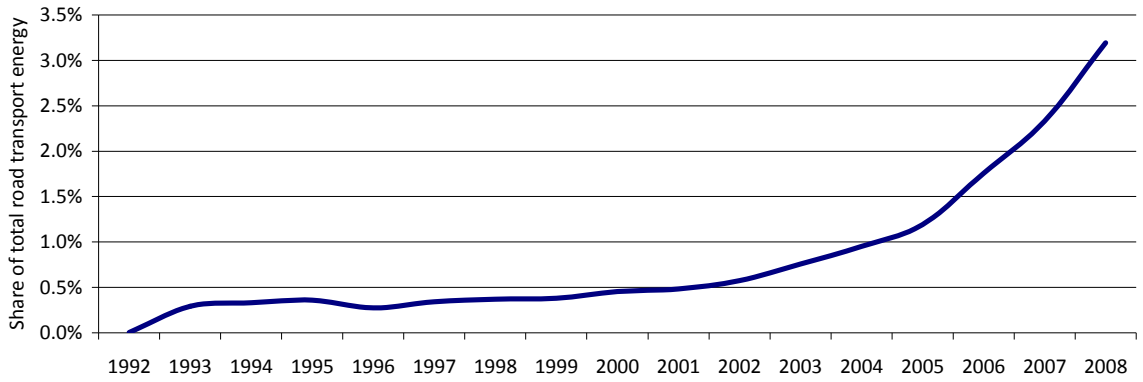
Source: OECD/IEA

Renewable energy

Through research and development alternative and renewable energy sources are found ad increasingly introduced in especially road transport as figure 7.3 shows. In the ECE region the use of renewable energy sources in road transport has increased much more than total energy use, leading an exponentially increasing share of renewable energy. From 2000 to 2008 the use of combustible renewables and waste in road transport has increased almost eight-fold, while total energy use in road transport has increased by about 9%. However levels are still low, within the ECE region the share of combustible renewables and waste in energy use in transport was 3.2% in 2008, highest in Germany with 6.2% while several countries still have a have shares of zero percent.

Figure 7.3

Share of combustible renewables and waste of total energy use in road transport in the ECE region



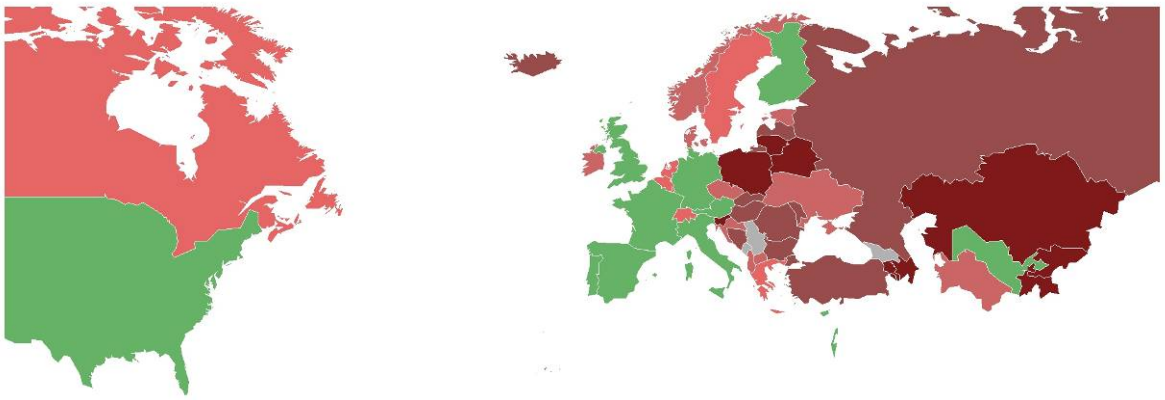
Source: OECD/IEA

Global effects: Climate change

Call for mitigation: Combusting of fossil fuels leads to the emission of harmful emissions. [59] Reduction of emissions from transport is important for several dimensions of sustainability. The most famous emission, the emission of CO_2 is not a pollutant per se but it contributes to the global warming and thus to climate change.

Figure 7.4

Change in CO_2 emissions from transport per capita in the UNECE, 2000-2008



Change in CO_2 emissions per 1,000 inhabitants, 2000-2008.	Missing data	<0%	0-3.8%	3.8-20%	20-33%	>33%

Source: OECD/IEA

[59] It is useful to make the distinction between pollutants and greenhouse gases. Carbon Dioxide (CO_2), which is an inevitable product of burning a fuel which contains carbon (as all petroleum products do). CO_2 does not an air pollutant *per se*, but a greenhouse gas and, therefore, contribute to global warming. Pollutants on the other side have a locally harmful impact on the environment.

Emission of greenhouse gases from transport has been increasing in the ECE region overall over the last decades. In 1990 2,764 million tonnes of CO_2 were emitted from the transport sector in the ECE region and in 2008 3,222 million tonnes were emitted, an increase of 17%. Measured in emission per capita a number of Western European countries in the UNECE have managed to decrease the emissions over the last decade as shown in figure 7.4. The road sector constitutes for an increasing share of transport CO_2 emissions, and in 2008 85% of total transport CO_2 emissions originated from road transport. CO_2 emissions from road transport increased by 23% from 1990 to 2008 in the ECE region, despite the fact that vehicles are becoming more efficient and new technologies reduce the amount of emissions. This effect is however opposed by the increasing transport demand.

Call for adaptation:

The popular perception that UNECE countries are not significantly affected by climate change has been recognized as fundamentally wrong over the past years. Furthermore, the most serious climate change impacts in the UNECE countries increase vulnerabilities in other parts of the world. Melting of the ice-belt, for example, can drastically redesign global transport routes and consequently marginalize countries along the present international corridors.

Summer heat deteriorates road surface and rail tracks (e.g. Central Europe, Central Asia etc.) in many parts in the region to the extent that traffic has to be limited, diverted or ceased - maintenance and rehabilitation costs are becoming particularly high, while the public expenditure capacity is not able to cope even with the normally needed maintenance and rehabilitation requirements, not to speak about clearing the backlogs and the new demand due to climate change impacts. Extra precipitation in some rural communities cuts them off and keeps them isolated for longer period of the year (e.g. Southern parts of the Russian Federation, South-Caucasus); degradation of the perma-frost causes concerns for airports in Siberia and for the Trans-Siberian railways. Ice roads are less and less available in some Baltic countries and in Russian Federation where they are useful, and in some cases their limited availability may disconnect mines and exploitation centres from the rest of the world - thus undermining economic performance of a country. Moreover, extreme weather conditions pose further road safety hazard in countries where fast motorization over the past two decades has not been cushioned with adequate institutional reforms and by enforcement of traffic rules.

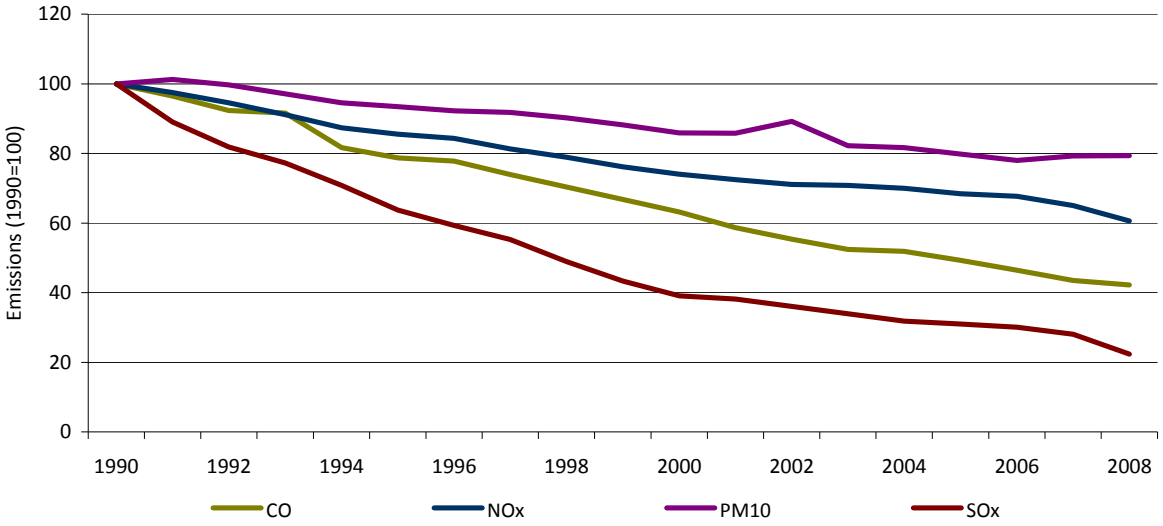
These changes exacerbate the already severe infrastructure problems. The legacy of Eastern Europe include shortcomings in infrastructure management systems, poorly built infrastructure and the numerous transition traps (low governance in public infrastructure, lack of available funds) make parts of the ECE region even more vulnerable.

Several countries have already analysed the situation, and we are witnessing a new wave of national transport strategies that address adaptation challenges. Transport investment plans more and more incorporate projects that are driven by adaptation strategies.

Local impact[60]: Air pollutants and Noise from transport

Transport also emits directly polluting emissions such as Carbon Monoxide (CO), which is product of incomplete combustion. CO reduces the blood's ability to carry oxygen. It's dangerous for people with heart disease. In high concentrations, it is poisonous. Hydrocarbons (HC), also known as "Volatile Organic Compounds (VOC)", are made up of unburned or partially burned fuel. Being toxic, they cause liver damage and even cancer. Nitrogen Oxides (NOx) are generated when nitrogen N_2 in the air (78% N2, 21% O_2) reacts with oxygen (O_2) at high temperature and pressure in engine combustion chamber. NOx can be an irritant to the lungs and is a precursor to "photochemical smog" and acid rain. Particulate Matter (PM) is very small particles (micrometer size range), mostly of unburned carbon. PM causes respiratory health effects in humans and animals. Vehicle particle filters have significantly reduced the PM emissions.

Figure 7.5
Emission of selected local pollutants in the EU27



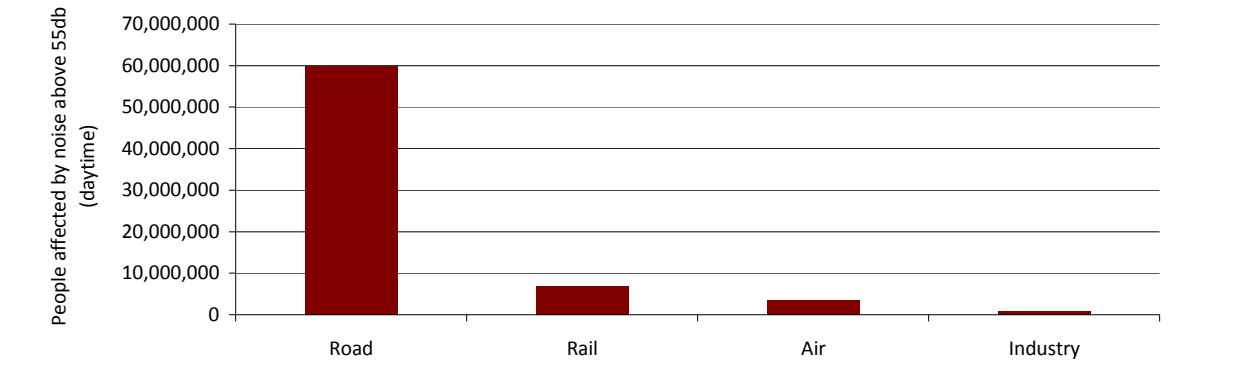
Source: EEA

Figure 7.5 shows that the EU member States have managed to reduce the emission of CO, NOx, PM10, SOx and NOx over the last decades. While the emission of SOx has been reduced by almost 80%, the emissions of SOx only have been reduced by only 20%. Moreover a number of countries within the UNECE countries did not have a similarly positive development.

Noise from transport is a serious health issue especially in agglomerations. Where, as shown in figure 7.6, at least 60 million people within the European Union is exposed to road noise above 55db every day. Road transport affects considerably more people in agglomerations than rail or air transport and the industry sector. Noise can damage physiological and

psychological health. It can cause stress, heart diseases and sleep disturbances and other harmful effects.

Figure 7.6
Exposure to noise above 55db in daytime in selected EU countries, 2007-2009



Source: EC. Note: Covers agglomerations in Norway, Estonia, Germany, France, Netherlands, Finland, Lithuania, Sweden, Poland, Denmark, Hungary, Italy, Spain, Slovenia, Romania, United Kingdom, Austria, Czech Republic, Bulgaria, Ireland and Slovakia

Challenges and Best practices

Challenges

Taxation of fuels

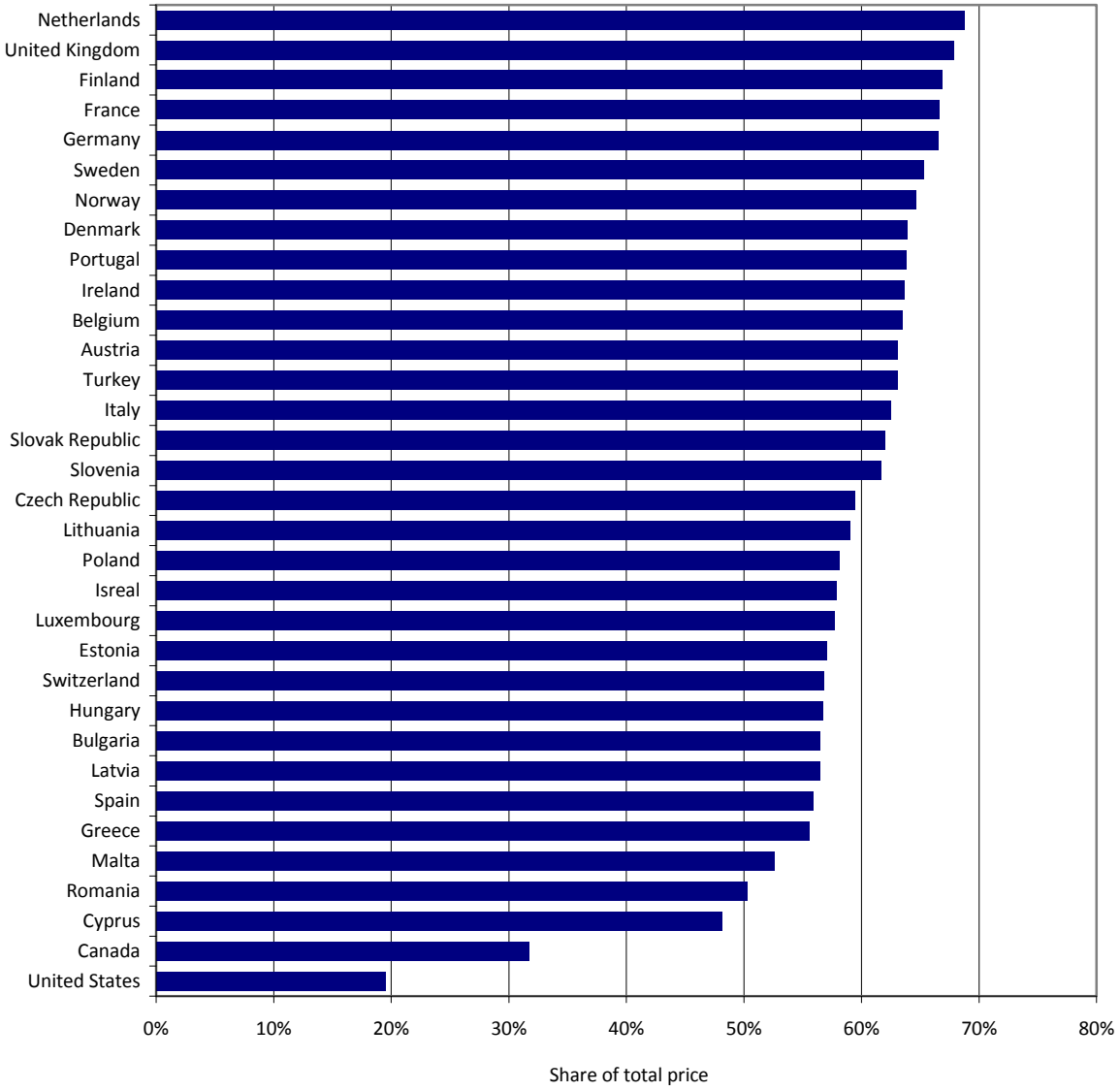
The main challenge is thus to improve energy efficiency in road transport. One way to achieve this is to increase the price of energy for road transport and thereby encourage road users to more energy efficient driving behaviour and consider other transport modes. Figure 7.7 shows that all but three UNECE countries for which data is available applied a fuel tax that constitute for more than 50% of the total price in 2009. The fuel taxation is considerably lower in the United States (20%) and Canada (32%). These countries are among the countries with the highest energy consumption per capita in transport but also among the countries with highest mobility levels.

Reduce usage of non-renewable energy sources in transport

The consumption of non-renewable energy is directly harmful for environment as it reduces the stock of natural resources. Combustion of these energy sources often also lead to harmful emissions. Research and development allows us to introduce new and more environmentally friendly energy sources. Bio-fuels are one of the most prominent alternative energy sources. However, introduction of new energy sources require solid research in the consequences, as there may be undesirable impacts on other elements of sustainability. For instance the first generation bio-fuels were based on basic feedstock such as grains and sunflower seeds. The promotion of these fuels can have adverse and undesirable effects, since these resources also are used for human or animal food. Later generations of bio-fuels are based on non-food resources and are therefore more sustainable. Another increasingly popular energy source is electricity, especially in road transport. In general research and development are needed to increase efficiency and find

new energy sources. But technological progress is not sufficient, as political will is a necessary condition for the introduction of the new technologies.

Figure 7.7
Fuel (Unleaded 95 RON) taxation in UNECE countries in 2009



Source: OECD/IEA

Minimize impact on natural habitat and biodiversity

Infrastructure requires land use, but the impact on natural habitat and biodiversity must be minimized. By using modern Intelligent Transport Systems (ITS) technologies and thereby utilizing the capacity of the infrastructure optimally, the need for new infrastructure can be reduced. By internalizing the impact on natural habitat in the planning project of new infrastructure projects, many harmful effects can be avoided.

Reduce noise from transport

There are basically four ways to reduce the noise from transport: (a) through barrier walls, individuals can be protected from road, rail or air-traffic noise; (b) sound masking can be implemented to cancel the harmful noise, but it may also lead to more noise; (c) isolation of houses will reduce the impact of transport noise inside ones house, but it still affects outdoor activities and (4) by making cars and trains as well as infrastructure less noisy, the source is controlled and the overall noise impact is minimized.

UNECE specific challenge – Environmental sustainability

Reduce emission of greenhouse gases and pollutants

Fuel combustion leads to the emission of greenhouse gases and harmful pollutants. Many regions have managed a relative reduction, but there is still a far to go for an absolute reduction in emissions. Especially in road transport it does not seem the case that technology progress is able to keep up with the pace of increasing transport demand, as emissions from road transport are increasing despite the fact of more efficient vehicles. It is therefore not enough to rely on research and development; human behaviour can make the difference. In the EU, the average car occupancy rate is only 1.5 despite the fact that most cars have a passenger capacity of 5. A typical car with only one occupant will produce more greenhouse gases per passenger kilometre that a full Airbus A380 airplane!

Best practices

Financial instruments: Giving road users incentives to energy efficiency

Differentiated vehicle taxes[61]

Taxation of new cars can be used to promote energy efficient and low emitting vehicles. For instance Austria introduced a differentiated tax system on the purchase of new vehicles in 2005 (it has been adjusted in 2008). Cars are taxed according to CO_2 emission level and the purchase of special equipment is subsidized. From 2005 to 2008 the share of new diesel cars with particle-filters increased from 10 to 80%. The share of cars emitting less than 120 g/km tripled in this period. In the Russian Federation, a regional transport tax in Moscow depends on the engine power. Since 2009 owners of vehicles with more than 125 horsepower must pay 20-50% more in tax, while owners of engines with less than 70 horsepower are exempt from this tax. For trucks and buses a different system is applied. These vehicles are taxed according to their age in order to promote the renewing of the vehicle fleet.

Bonus systems for replacing vehicles[62]

Replacing cars with more environmentally friendly versions can be promoted with bonus programme, such as the Belgian system, where a bonus is given for replacing a car with a less-emitting vehicle, under condition that the CO_2 emissions are lower than 146g/km. A

[61] According to: www.un.org/esa/dsd/dsd_aofw_ni/ni_pdfs/NationalReports/austria/Full_Report.pdf.
[62] According to: www.un.org/esa/dsd/dsd_aofw_ni/ni_pdfs/NationalReports/belgium/Transport.pdf

penalty is given to individuals who replace their car with a vehicle that emits more than the old the car.

Road tolling and congestion charging[63]

Taxation of the use of cars can be applied in various forms and can promote the use of more environmentally friendly transport modes and more efficient use of cars. In Sweden a congestion tax has been applied where a fee is paid when entering and leaving the capital, Stockholm. Some vehicles are exempt from the fee, for instance electrical vehicles. Road tolls are implemented in several countries in form of a vignette, which is a fee the road user pays for a fixed time period (typically annually), this system is seen in Austria, Bulgaria, Czech Republic, Hungary, Romania, Slovakia, Slovenia and Switzerland. Germany expanded the vignette system for trucks to the "LKW-Maut" system in 2005. In the new system trucks are charged according to the distance travelled and the truck's emission levels. In 2001, Switzerland introduced a performance-related heavy vehicle fee levied on all trucks of more than 3.5 tons. They are charged on the whole Swiss road network, according to the kilometres driven, the total weight and the vehicle's emission levels.

Taxation of fuels[64]

Taxation of fuels has undergone major adjustments in most UNECE member States within the last two decades. By increasing taxation on fossil fuels, the consumers' incentive for eco-efficient driving increases and the attractiveness of other modes and public transport increases. For instance in Estonia, taxation of petrol and diesel fuels has been increased to now 50% while bio-fuels are free from this excise tax. A similar system is seen in many countries, and for instance Austria reported that they experienced immediate consumer responses towards other energy forms as a reaction.

Non-tax instruments for promoting environmentally sustainable transport

Dynamic speed limits[65]

Dynamic speed limits to reduce air pollution have been implemented in for example Austria. On highways around Tyrol ion case car pollution exceeds the given threshold; the speed limit is reduced from 120 to 100 km/h. In Belgium the Walloon and Flemish Governments have introduced flexible speed limits that reduce the speed from 130 to 90 km/h for highways in sensitive zones.

Be an example[66]

Several countries have introduced environmental rules for government authorities that serve as good examples for the population. For instance in Sweden, government agencies are only allowed to buy environmentally friendly vehicles.

[63] According to: www.un.org/esa/dsd/dsd_aofw_ni/ni_pdfs/NationalReports/germany/transport.pdf
[64] According to: www.un.org/esa/dsd/dsd_aofw_ni/ni_pdfs/NationalReports/estonia/ESTONIA_TransportCSD18.pdf
[65] According to: www.un.org/esa/dsd/dsd_aofw_ni/ni_pdfs/NationalReports/austria/Full_Report.pdf
[66] According to: www.un.org/esa/dsd/dsd_aofw_ni/ni_pdfs/NationalReports/sweden/Transport.pdf

ecoACTION: Using Less – Living Better

The ecoACTION initiative by the Canadian Government aims at protecting the environment and health and further economic prosperity. One of the elements within this framework is the ecoTRANSPORT strategy which includes the following initiatives: ecoMOBILITY to promote sustainable urban passenger transport; ecoTECHNOLOGY for vehicles; ecoFREIGHT to reduce the environmental and health impact of freight transport by means of technology; the rebate program ecoAUTO and ecoENERGY which provides motorists with environmental information.

Labelling[67]

Labelling provides the user with easy to recognise information about the vehicles eco-friendliness. In Israel, new cars are a labelled on a scale from 1 to 15 according to their emission levels. Moreover it is mandatory to include fuel consumption level in advertising vehicles. Switzerland also applies eco-labelling since 2003; since 2010 the information on CO_2-emissions and energy consumption was improved. Figure 7.8 shows an example of label suggested for the market in the United States

Eco-driver training[68]

Vehicle fuel efficiency depends on driving behaviour. Driver training programmes have shown that fuel savings of 5 to 10% are possible by optimizing driving behaviour. The measures are simple and include habits such as shifting up as soon as possible, maintaining a steady speed, anticipate traffic slow, smooth accelerations and keeping a correct tyre pressure. As a part of the campaign *klima:aktiv mobil* Austria has launched a number of eco-driving campaigns. Activities include a driving competition among citizens that compete in fuel efficient driving. An eco-driver training initiative at the postal bus services in Austria led to an annual reduction in fuel consumption of 2 million litres.

Data[69]

A databank on vehicle fleet can be introduced to ensure knowledge on the quality and age of the vehicle fleet and implement optimal scrappage schemes. For instance Belgium is improving their system by linking the vehicle owner to the vehicle in the database “Mobivis Project”.

Figure 7.8
An example of vehicle labelling

Source: www.epa.gov

[67] According to: www.un.org/esa/dsd/dsd_aofw_ni/ni_pdfs/NationalReports/israel/transport.pdf
[68] According to: www.un.org/esa/dsd/dsd_aofw_ni/ni_pdfs/NationalReports/austria/Full_Report.pdf
[69] According to: www.un.org/esa/dsd/dsd_aofw_ni/ni_pdfs/NationalReports/belgium/Transport.pdf

Carpooling[70]

Encouraging car-pooling for more efficient car use can be done as in Belgium, where since 2003, traffic lanes can be dedicated for vehicles with more than one occupant. Carpooling is not new, one of the first initiatives were taken in the early 1970s in Los Angeles and the concept gained popularity all over the United States in the end of the 1970s and into 1980s. However since then the use of carpooling has decreased considerably. Cooperatives and public authorities have recently started new initiatives to revitalize the use of car pooling in the United States.

Vehicle maintenance[71]

Bulgaria has introduced a system of annual mandatory vehicle checks, which include checks of CO_2 emissions. Public transport vehicles are checked twice annually. Scrappage schemes are used to promote replacement of old cars with newer and more energy efficient cars. Germany for instance provides a 2,500 Euro (2009) bonus for individual's who replace a car that is at least nine years old. In Israel the car has to be at least 20 years, but then it gives a bonus of about 800 United States dollars (2009 level).

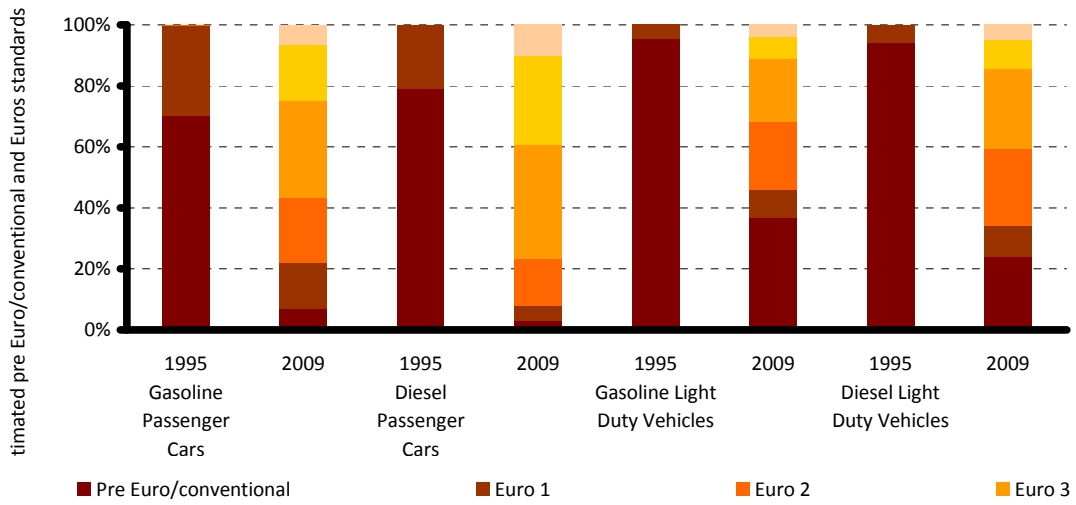
Emissions standards

One way of reducing pollution is by setting regulations of the maximum allowed emission levels of new vehicles. Based on the initiative of the UNECE the EU has defined emissions standards for new vehicles through a number of EU directives. Figure 7.9 shows how this implementation has worked through the last two decades. The figure shows the estimated shares of the different EURO standards for various vehicle types. A positive development is definitely seen. But since motorization has increased rapidly, the implementation or the levels may not be strict enough. These EURO standards set limits for the maximum allowed emission levels per driven kilometre. For instance EURO 6 which will be implemented in September 2014 for passenger cars sets the maximum allowed level of CO to 0.5, of NOx to 0.08 and of PM to 0.005 gram /kilometre for all new diesel cars. For comparison, the EURO1 had the following levels: 2.72, -, 0.97 and 0.14 gram/kilometre respectively.

[70] According to: www.un.org/esa/dsd/dsd_aofw_ni/ni_pdfs/NationalReports/belgium/Transport.pdf
[71] According to: www.un.org/esa/dsd/dsd_aofw_ni/ni_pdfs/NationalReports/bulgaria/TRANSPORT.pdf

Figure 7.9

Estimated Euro standards in vehicles in EU27, Norway, Switzerland and Turkey



Source: EEA

Best Practice – Environmental Transport

Tax instruments to promote environmentally friendly vehicles

By applying a differentiated tax system to vehicles dependent on the environmental performance, Governments can provide individuals with economic incentives to act environmentally sustainable. UNECE member States have shown that this is possible, and that the system has a great impact. The exact definition of the system differs considerably from country to country. Examples are:

- Vehicle tax according to emission levels (g/km) as seen in, for example, Austria
- Vehicle tax according to engine size (horse power) as seen in the Russian Federation

The role of UNECE in promoting environmental sustainability

Vehicle construction regulations and technical inspection of vehicles

The UNECE World Forum for Harmonization of Vehicle Regulations is the unique global forum where vehicle regulations are developed. As a regulatory body, its responsibility for "greening the transport sector" is therefore huge. Fifty-three countries (including the European Union) are Contracting Parties to at least one of the two United Nations Agreements on vehicle regulations (1958 and 1998 Agreements) 72 and apply the vehicle regulations adopted by the World Forum (WP.29). These countries, representing the 5

[72] The World Forum WP.29 administers the following 3 Agreements: The 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, 1958 The 1997 Agreement Concerning the Adoption of Uniform Conditions for Periodical Technical Inspections (PTI) of Wheeled Vehicles and the Reciprocal Recognition of Such Inspections, 1997. The 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, 1998

Continents (almost all the European countries, U.S.A., Canada, Japan, China, India, Korea, Thailand, Malaysia, Australia, New Zealand, South Africa, etc.), manufacture more than 80% of vehicles worldwide. Other countries (Vietnam, Philippines, Cambodia, Argentina, Brazil, Mexico, the Community of the Arab Gulf Countries, the Southern African Developing Community (SADC), the South East Asian Nations (ASEAN), etc.) are either in the process of acceding to the 1958 and 1998 Agreements or have shown interest in acceding to them. With regard to the *reduction of the greenhouse gas emissions* in the transport sector, the World Forum and its subsidiary Working Parties consider or have already considered a large number of measures to improve the energy efficiency of the vehicle fleet, especially:

a) innovative engine technologies, i.e. the development of Environmentally Friendly Vehicles (EFV) such as Plug-in Hybrid Electric Vehicles (PHEV), Hydrogen and Fuel Cell Vehicles (HFCV), Electric Vehicles (EV), etc.

b) advanced engine management systems (e.g. stop and go function, gearshift and eco-drive indicators).

c) efficient vehicle powertrains (e.g. low friction components, tyres with low rolling resistance, tyre pressure monitoring systems.

d) the use of other alternative energy sources such as liquefied petroleum gas (LPG), compressed natural gas (CNG) and sustainable bio-fuels (liquid and gaseous).

e) development of quality specifications for market fuels in relation with the vehicle emission levels and engine technology type.

f) installation electric devices on vehicles of with a low energy consumption to reduce the energy consumption (e.g. headlamps with Light Emitting Diode (LED) technologies).

g) development of Intelligent Transport Systems (ITS) to avoid traffic congestion and driver assisting features.

Main achievements by the World Forum for Harmonization of Vehicle Regulations regarding environmental sustainability

Many of the 130 regulations adopted by the World Forum for Harmonization of Vehicle Regulations (WP. 29) have improved environmental sustainability of transport. For example the regulations on emissions of gaseous pollutants, noise emissions of motor cycles, Measurement procedure for CO2 emissions (Fuel consumption), emission limits, fuel quality standards, electric vehicles and noise measurement methods.

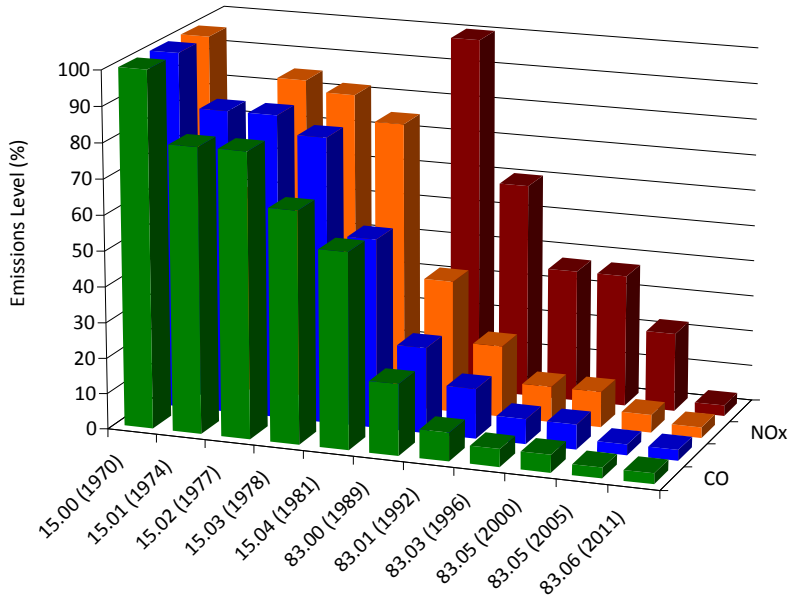
Regulation of emission limits

In the framework of the 1958 Agreement the World Forum for Harmonization of Vehicle Regulations (WP. 29) has developed several UNECE regulations limiting the maximum admissible level of vehicle emissions for various gaseous pollutants (CO, HC, NOx) and particulate matters. The successive amendments of these UNECE Regulations have resulted in substantial abatements, of 95 to 97%, of the emission limits of CO, HC and NOx for new private passenger cars as compared with the limits established in the 1970's, see figure 8.10. This means that the latest emission limits established by UNECE Regulations for these

pollutants are today more than 20 times lower than those established 30 years ago. Similarly, the amendments to the relevant UNECE Regulations have reduced emission limits of particulates by over 90% as compared with those established in 1990, which means that the latest limits approved are over 10 times lower than those in 1990.

The emission limits for heavy-duty vehicles have also been abated although with lower percentages and work is under way to abate them further as shown in figure 7.10.

Figure 7.10
Evolution of UNECE emission limits 1990-2011



Source: UNECE

Noise reduction

With regard to noise reduction, recently, the World Forum for Harmonization of Vehicle Regulations adopted a new noise measurement method, which better reflects the noise emissions of real traffic conditions. These new provisions will soon be supplemented with new performance requirements (i.e. limit values for maximum noise level).

The Transport, Health and Environment Pan-European Programme

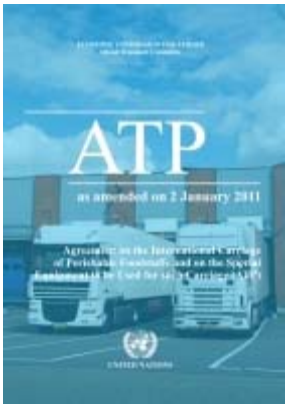
The Transport, Health and Environment Pan-European Programme (THE PEP) addresses key challenges to achieve sustainable transport patterns and to encourage governments, at national and local levels, to pursue an integrated approach to policymaking and to put sustainable mobility at the top of the international agenda. THE PEP comprise, inter alia, activities related to sustainable urban transport, health impacts of transport, cycling and walking as feasible non-motorized transport modes for urban areas, the Clearing House project, and consideration of institutional arrangements for policy integration. In addition, concrete projects are developed by THE PEP Steering Committee, composed of UNECE and

WHO/Europe Member State representatives from the transport, environment and health sectors, in cooperation with international and non-governmental organizations.

For Future Inland Transport Systems

The UNECE is in the lead of a global UNDA funded project on the development and implementation of a monitoring and assessment tool for CO_2 emissions in Inland Transport to facilitate climate change mitigation. The project involves all United Nations regional commission and will develop a uniform tool based on a standard and transparent methodology to evaluate the CO_2 footprint of land transport and a transport policy converter that will help decision makers to optimize their interventions. The project will pave the way **for** the **F**uture **I**nland **T**ransport systems (ForFITS).

Transport of perishable foodstuffs (refrigerated transport)



In 1970, the UNECE Working Party on the Transport of Perishable Foodstuffs (WP.11) adopted the Agreement on the International Transport of Perishable Foodstuffs and on the Special Equipment to be used for such Transport (ATP). The ATP provides common standards for temperature controlled transport equipment such as road vehicles, railway wagons and (for sea journeys under 150km) sea containers and the tests to be done on such equipment to ensure that it meets the standards[73].

The transport of chilled and deep-frozen foodstuffs has an impact on global warming on a number of levels. Firstly, it depends on containers or refrigerated vehicles which are insulated using foams. The refrigerated and chilled transport industry is actively involved in finding new insulating foams and blowing agents that are both safe for the ozone layer and highly effective. Secondly, energy efficiency is a major concern both 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 recently added to the ATP Handbook details of a procedure for determining the fuel consumption of vehicle-powered refrigeration units[74]. 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 has to be compensated by a direct increase in the working time of the thermal engine. The influence of aging on the thermal capacity is a subject of frequent discussion by WP.11. The ATP defines the method to be used for measuring this thermal capacity. A solution to this problem would be the acceptance of a rule limiting the number of simplified renewal tests (pull-down tests) allowed. This is not currently specified in the ATP which leads to frequent renewals without checking of the K value.

Energy labelling schemes or minimum efficiency standards already exists for many appliances used in the cold chain, for example domestic refrigerators or supermarket display

[73] (http://unece.org/trans/main/wp11/atp.html).
[74] http://unece.org/trans/main/wp11/atp_handbook.html

cabinets. These schemes have been shown to have the effect of pushing the market towards more energy efficient products. Various proposals have been made to extend such schemes to the refrigerated transport industry.

The 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.

The Blue Corridor Project

The Blue Corridor Project was proposed in the year 2000 with the objective of establishing transport corridors for vehicles using compressed natural gas (CNG) as fuel instead of diesel for the transport of goods, both because of its economic and environmental advantages.

The advantages of natural gas include the following: it is one of the cleanest burning alternative transportation fuels available; it is safe, lighter than air and does not pool on the ground like gasoline. Natural gas is also economic, on average 40% cheaper than gasoline and it is more sustainable from the point of view of security of supply. Moreover, natural gas is a natural bridge to hydrogen fuel cell transportation systems of the future.

The Project was included in the programmes of work of ECE's Working Party on Gas and Inland Transport Committee. These two intergovernmental bodies decided to set up a Task Force in 2002 with experts from both the gas and transport sectors to assess the technical and economic viability of the Project.

Feasibility studies were carried out for three pilot Blue Corridors that were selected by the task force: Moscow – Minsk – Warsaw – Berlin (along the E 30); Berlin – (Czech Republic – Austria) – Rome (along the E 55 and E 45); and Helsinki – St. Petersburg – Moscow (based on the use of liquefied natural gas (LNG) along the E 18 and E 105) . The final report of the Task Force was issued in 2003[75]. Aggregate data for the three pilot corridors based on projections showed significant fuel savings and reductions in harmful exhaust emissions.

In May 2005, representatives of the European Commission expressed the following opinions regarding the Project: Firstly, CNG was only cheaper than diesel because of tax breaks, and government policy towards CNG might change in the future. Secondly, conversion of vehicles would be more costly than envisaged. Thirdly, CNG was less suitable for long distances because trucks had to be refuelled every 280-300 km. However, the EC said it would be prepared to participate in a conference on the Blue Corridor to investigate sources of funding to implement the Project. At their meeting in June 2006 in St. Petersburg, the G-8 agreed that, with the aim of making transportation more energy efficient and environmentally friendly, the Blue Corridor Project should be studied further.

[75] www.unece.org/pub/blue1.pdf

8. Current modal split is an overarching sustainability concern

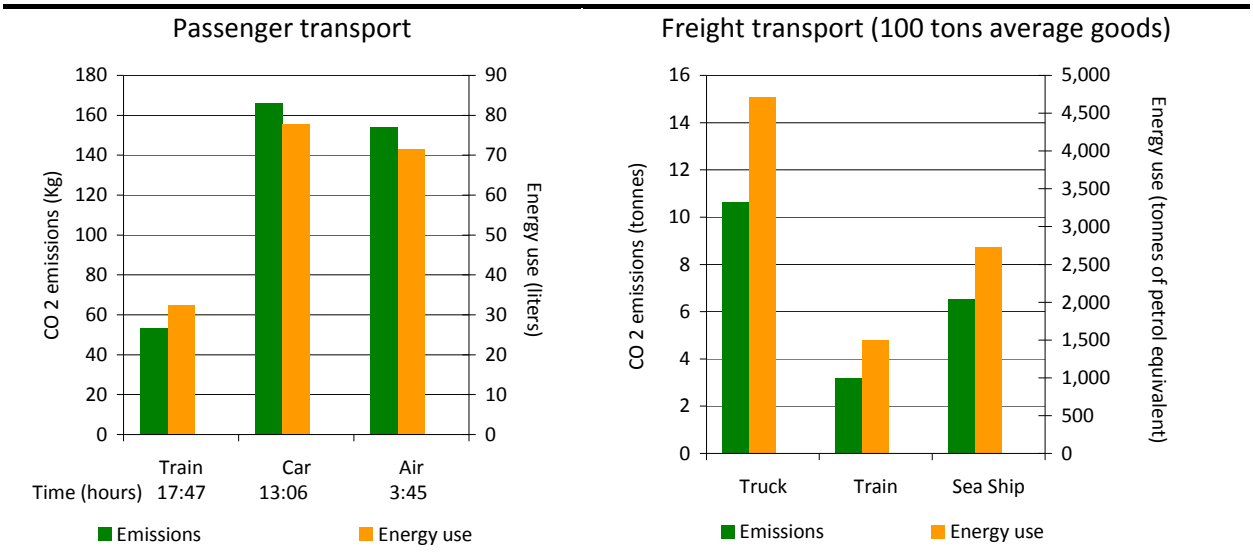
Economic, social and environmental sustainability can only be achieved with an integrated transport system. By letting water, road and rail working together, the comparative advantage of each mode can be exploited optimally leading to an efficient, safe and sustainable transport system. Integration of transport systems is a complex task with many dimensions. Cooperation across transport modes, regions and borders as well between public and private operators are needed. Creating an efficient integrated transport system therefore requires international cooperation, for which UNECE is a perfect framework.

What is the optimal modal split?

Did you know? In the EU27 road transport constitutes for 76% of all inland freight transport in 2008.

It is important to realise that there is no general optimal modal split. Improving modal split is not about minimising the use of one transport mode; in contrast, the objective should be to have an integrated transport system where each mode is used when it is optimal. While road transport is less environmentally friendly as shown by an example in figure 8.1, it is also a key for individual access and social inclusion. The optimal modal split of freight and passenger transport will therefore depend on a country's geographic, demographic and economic conditions. The numbers and charts in the following paragraphs show that the modal split of both passenger and freight transport varies considerably from country to country. Much of this variation can be explained by historic, demographic and geographic characteristics.

Figure 8.1
Berlin to Rome: Transport alternatives



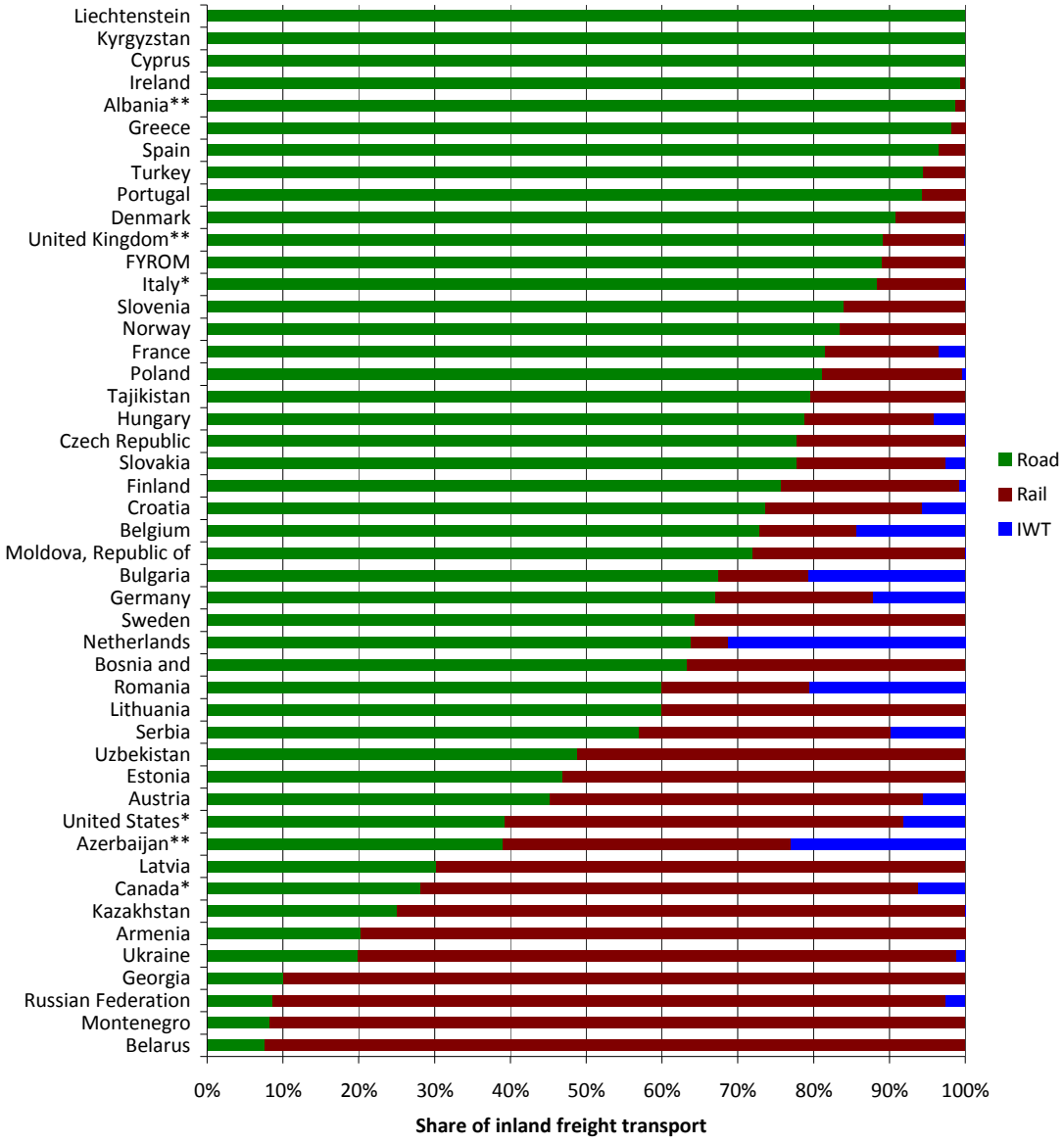
Source: www.ecopassenger.org (for passenger transport) and www.ecotransit.org (for freight transport). Calculations include transport to and from airports, as well as intermodal transfers for train and sea ship transport.

Modal split of freight transport

Figure 8.2 gives an interesting insight in the modal split of freight transport in the ECE region. In the European countries inland freight transport is dominated by road transport, while in Canada, Russian Federation and the United States the rail lines are the preferred choice for transporting goods. Measured by million tonne-kilometres goods transported rail transport constituted for 66% of total inland freight transport in Canada in 2007, in the Russian Federation the share of rail transport was 89% in 2009 and in the United States it was 53%, also in 2007. Switzerland is one of the few exceptions in the European area with a relatively high share of rail transport; this is also the case in Lithuania and Latvia.

Figure 8.2

Modal split of inland freight in the ECE region 2009



*Source: UNECE and OECD/ITF. Note: Measured in tonne-km. ** Data is for 2008, * Data is for 2007.*

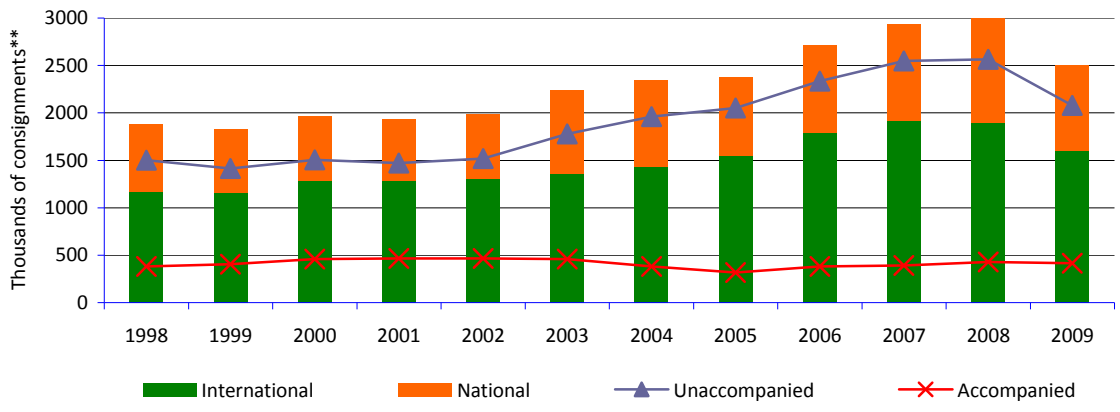
It is not uncommon that road transport constitutes for more than 80% in the European area. In the United Kingdom and Italy 88% of inland freight transport is carried out on roads, in Portugal it was 93% and in Spain 96%. Inland waterways play a considerable role in some UNECE member states. In the Netherlands inland waterways constituted for 53% of total inland freight transport and in Belgium for 16%. Figure 8.3 shows the modal split for the ECE region. The dominant role of road transport is confirmed. Out of the 47 countries for which data is available, 25 have a road share above 70% and 10 have a share of more then 90%.

Intermodal Transport

The development in intermodal road/rail transport is illustrated in figure 8.3. 2009 was the first year since 2001 where the total amount of combined transport declined compared to the year before. Total combined transport was reduced by 17% in 2009 to 5 million TEU, compared to 6 million in 2008. International combined transport declined slightly less (16%) than national combined transport (18%). The major part of the decline happened for unaccompanied transport with a reduction of 19% while accompanied combined transport was reduced by only 3% in 2009 compared to 2008. The average annual growth in combined transport from 1998 to 2009 was 3%, it is worth noting, that the decline in 2009 the average annual growth was 6%. Combined transport grew especially rapidly in the period 2002 to 2007 with an average annual growth rate of 11%. Preliminary information on volumes for 2010 reveal signs of a recovery and a double digit increase in combined transport compared to 2009.

Figure 8.3

Development of intermodal road/rail transport in Europe*, 1998-2008



Source: UIRR

* UIRR: International Union of Combined Road/Rail Transport Companies

** One consignment is equivalent to two (2) twenty-foot units (TEU)

Work on intermodal transport also includes measures to shift freight traffic, wherever possible, from roads to railways and inland waterways to free up road capacity, to tackle congestion and to arrive at a better carbon foot-print of land transport in general. However, for most transport operations, lorries are indispensable to ensure terminal hauls and the final distribution of goods, particularly in case of consumer products. Therefore, very often

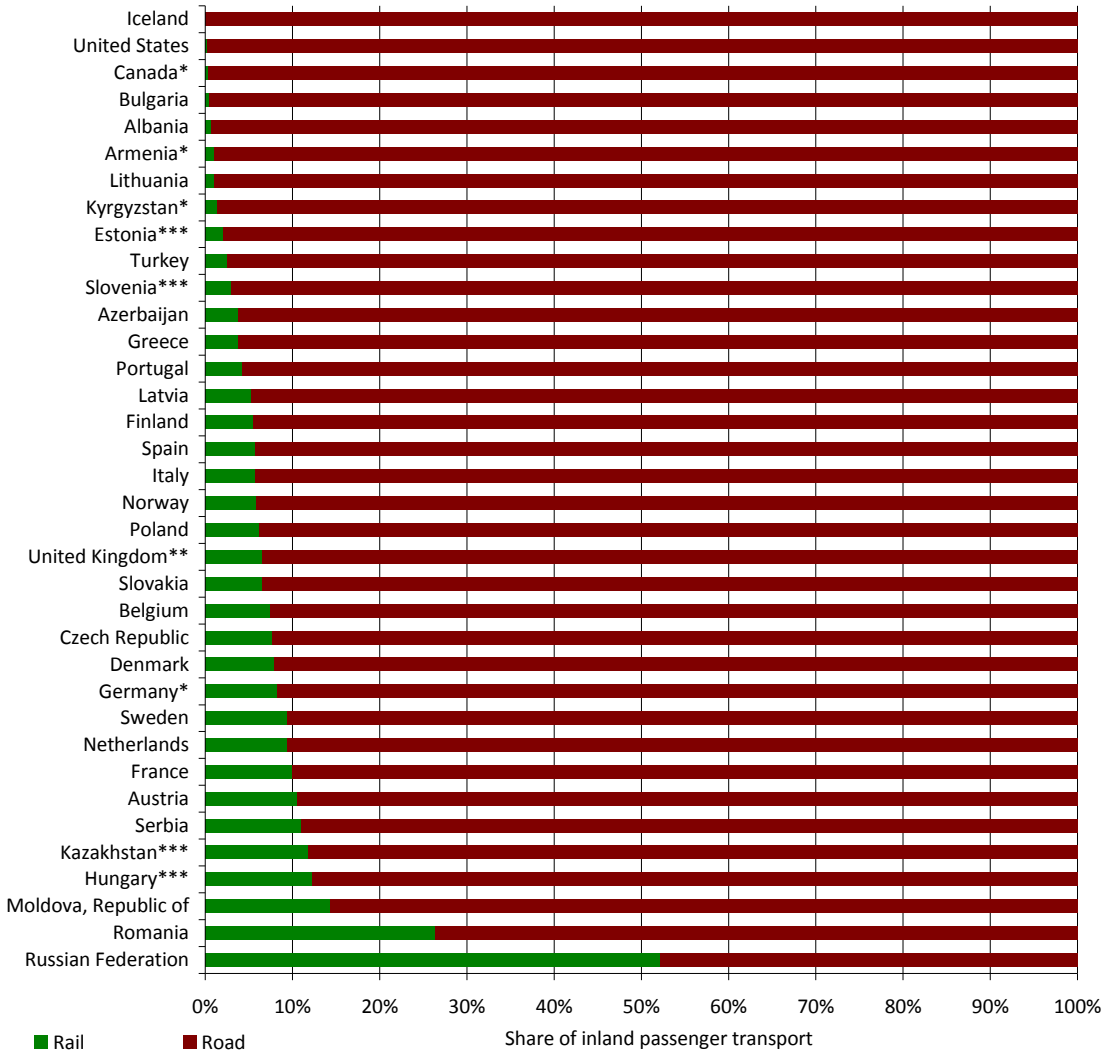
rail and inland waterway transport entails trans-shipment operations using containers and other intermodal transport units that can be shifted swiftly and safely from one mode to the other.

Modal split of inland passenger transport

Did you know? 83% of all inland passenger transport in the EU27 was carried out in private cars!

Private cars dominate the inland passenger transport. From 1999 to 2008 the modal split between private passenger cars, buses/coaches and railways have been very constant. Cars constitute for 93-94% of all inland passenger transport throughout the period. Rail transport constitute for 3.9% in 1994 and for 4.1% in 2008, while buses and coaches have remained within 2.4-2.6% throughout the period.

Figure 8.4
Modal split of inland passenger transport in 2008



*Source: UNECE and OECD/ITF, Note: Measured in passenger-km. *** Data is for 2009, ** Data is for 2006 and * Data is for 2007.*

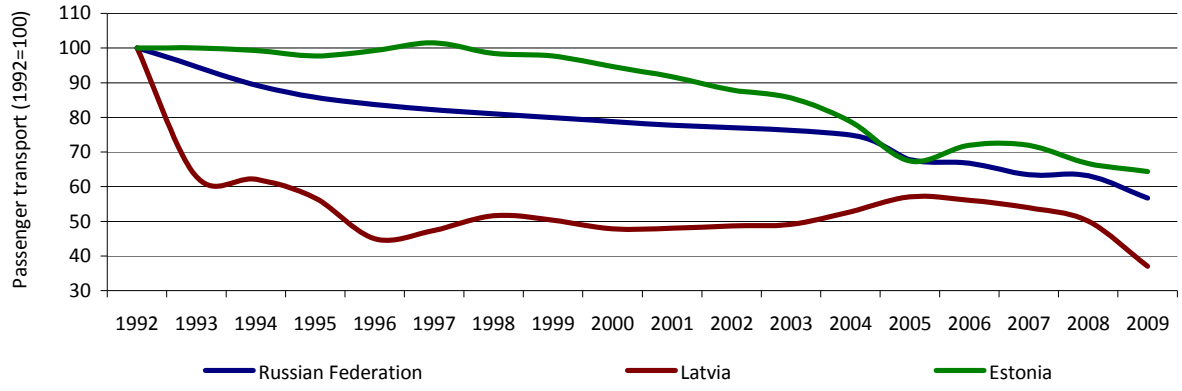
Figure 8.4 shows that the modal split of passenger transport is relatively homogeneous. In most countries private vehicles constitute for between 80 and 90% of all passenger transport. Rail transport is relatively important in Austria, France, Hungary and Switzerland; where it represents for respectively 10%, 10%, 12% and 29% of inland freight transport. While in countries such as Albania and Armenia the share of rail transport is less than 1%. Transport by bus or coach constitutes for between 0 and 15% in most European countries. It is interesting to note that while for freight transport Canada and the United States prefer railways, for passenger transport it is certainly roads. In the United States 94% of all inland passenger transport is carried out by private cars and 5% by buses and coaches on roads (in 2008).

The distinction between road and rail transport in figure 8.4 is made due to data availability. It would be even more interesting to evaluate the split between private and public transport, but unfortunately data availability of this modal split is very limited.

The role of public transport

Public transport has an important role to play in sustainable development. As discussed in the chapters three and four affordable and accessible public transport is important for social inclusion of marginalized groups in the society, especially low income households. Moreover, public transport is able to carry masses more environmentally efficient than private transport, especially in urban areas. While transport demand overall has been increasing over the last decades, the use of public transport has been declining as shown in figure 8.5. In Latvia the use of public transport declined by 60% from 1990 to 1993 and in 2009 the passenger transport in public transport in Latvia is less than one-quarter of the volume in 1990. In the Russian Federation the passenger transport with public modes is down with almost 50% in 2009 compared to 1992.

Figure 8.5
Volume of public transport in selected UNECE countries

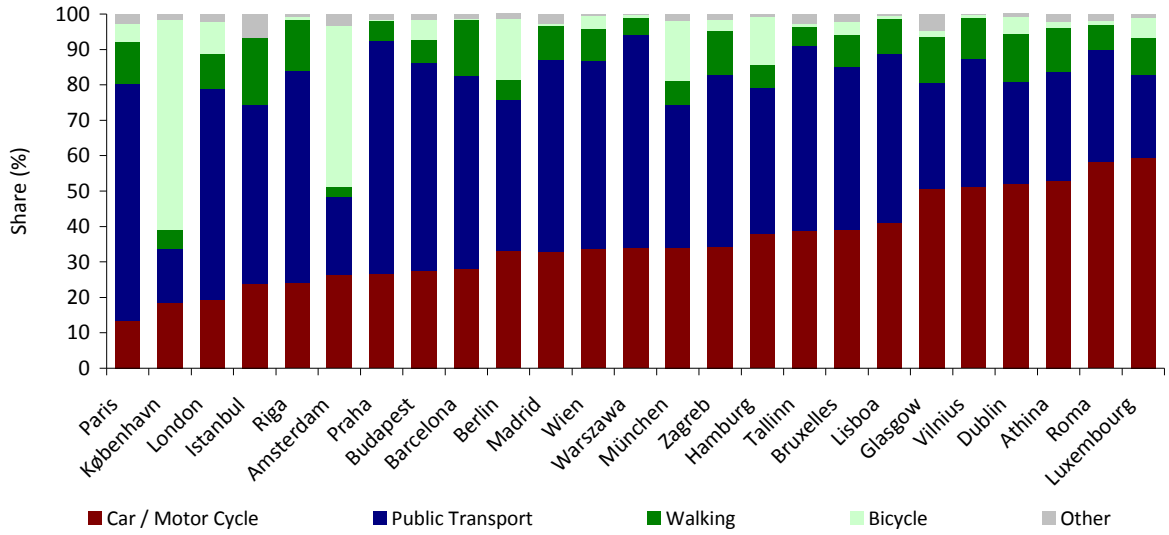


Sources: National Statistical offices

Figure 8.6 shows the modal split for transport to work/training in selected cities in the ECE region. In Paris 67% of all commuters use public transport which is the highest rate of public

transport for all included cities. When it comes to commuters by bike, Copenhagen is leading by far with 60%; Amsterdam is second with 46%.

Figure 8.6
Means of transport primarily used to go to work/training place in 2009



Sources: Eurostat

UNECE specific challenge – Integrated Transport Systems

Providing Public Transport in Urban Areas[76]

EuroTest has evaluated the quality of public transport in 23 European cities. 12 of the cities evaluated are assessed to have an acceptable or even public transport. Among these 12 cities are Paris, Brussels, Amsterdam, London and Oslo. The verdict is based on four criteria: 1) travel time, 2) transfer between modes, 3) information and 4) ticketing. London is for example doing well respect to the connectivity to Heathrow airport, with respect to communication in various languages and the ability to bring bikes on public transport. London is performing poorly with respect to ticketing when changing from tube to bus, contradicting signposts, lack of escalators and lifts and lack of parking facilities for bikes. Generally the conclusion is that missing information is an issue in most cities.

How to develop integrated transport

Freight transport

Intermodal transport in Austria[77]

Austria has experienced exceptional high growth rates in combined transport and intermodal transport plays a central role in Austrian transport policy. Initiatives include public funding for intermodal terminals and infrastructure, subsidies for transport across the

[76] According to: http://eurotestmobility.com
[77] www.unece.org/trans/wp24/wp24-official-docs/documents/ECE-TRANS-WP24-2007-05e.pdf

Alps and the possibility of reimbursement of vehicle taxes for road vehicles that are used in intermodal transport. Moreover Austria applies a ban on heavy vehicles for travelling on Saturday evenings and Sundays, however if these vehicles are part of an intermodal transport chain, they are exempt of that rule. A similar strategy for the promotion of intermodal transport is applied in other UNECE member states, for example Croatia[78].

Modal split: From road to rail[79]

Several UNECE member states – among others Croatia and Switzerland - have a goal of moving freight transport from roads to rail and inland navigation. Sweden has removed the targets for specific modal splits. There focus has been changed from having specific split targets to instead handling modal split as a means to improve the environmentally sustainability of transport. In such a setting a move from road to rail *can* be a solution.

Multi-modality in Seine-Nord Europe canal[80]

The Seine-Nord Europe Canal project implemented by Voies Navigables de France aims to remove one of the major missing links on the European inland waterways connecting the Seine basin with its high traffic capacity and the rest of the European network of inland waterways of international importance. The canal will also connect seven major ports in the North of Europe (Havre, Rouen, Dunkirk, Ghent, Zeebrugge, Antwerp and Rotterdam), raising their attractiveness and competitiveness in the context of growing maritime traffic. Finally, the canal will offer four multimodal platforms, whose loading/unloading, storing, transhipment capacities will effectively enable the integration of the rail and water traffic in the global logistic chain.

P*assenger transport*

Setting targets[81]

The Czech Republic has defined targets for the transport system in the Ministry of Transport's document "Transport Policy for the Czech republic 2005-2013". It includes specific targets for both freight and passenger transport. To mention a few: At least 50% of all municipalities should be included in an integrated transport system of passenger transport by 2013; maintaining the split between private and public passenger transport from 2005, increase the use of rail passenger transport in urban areas and allocation of 1% of GDP to compensatory payments to public transport services in 2013. Sweden aims at doubling the share of public transport in 2020 compared to 2006.

National cycling strategy[82]

Austria introduced a national cycling strategy in 2006 called "Masterplan Radfahren", which aims at doubling the share of cycling from 5 pct. to 10 pct. the plan involves investment in

[78] According to the information provided by Croatia in the questionnaire on Transport for Sustainable Development, December 2010.
[79] According to the information given in the questionnaire on Transport for Sustainable Development, December 2010. The answers are unfortunately very vague in some cases.
[80] www.seine-nord-europe.com/
[81] According to the information given by the Czech Republic in the questionnaire on Transport for Sustainable Development, December 2010 and www.mdcr.cz/en/Strategy/Transportation+Policy+for+2005+%E2%80%93+2013/default.htm
[82] According to: www.klimaaktiv.at/article/articleview/56370/1/15137

cycling infrastructure, free cycling consulting, bike2business awards for cycling friendly companies, fahrRad cyclist competition and introduction of cycling coordination in national agencies.

Employees travel habits[83]

In Belgium, large firms with more than 100 employees in total and at least 30 employees at the local site are obliged to carry out surveys every 3 years of the employees travel means to an from work and the measures taken to improve sustainable transport. This allows for the identification of issues and solutions of inappropriate travel habits.

Intelligent traffic management in the Russian Federation[84]

In the capital of the Russian Federation a traffic management system called START was introduced to increase the capacity of the road infrastructure in the city. A computer collects data from traffic detectors and optimizes traffic lights for the entire network. The system also includes manual observations through video cameras and dynamic traffic signs, allowing communication to drivers. The estimated impact of the system is an increase in the road capacity of about 10-12 percent.

Eco-Cities[85]

The city of Freiburg has been known as Germany's ecological capital since the 1970ies. The old town centre became car-free in 1973 and public transport is paid by a low-cost monthly fee. About one-third of the population has chosen to live without a car in Freiburg and following a cycle plan that was set up in 1970 there are now more than 500 km of bicycle path. Both emissions and energy consumption has been reduced in the city. The European Energy Award[86] imitative aims at giving communities incentives and tools for sustainable energy policies. Currently almost 1,000 inhabitants across Europe are involved in these projects and so far 331 communities have been given an award. Whether an award is given depends on the number of measures implemented and finalized. France recently launched a national eco-city project with financial support for 13 cities.

Taking responsibility – Railroads in the United States of America

The CSX Railroad network covers approximately 21,000 miles in the United States. The company operates in 23 states, the District of Columbia, the Canadian provinces of Ontario and Quebec and thereby covers about two-thirds of the Americans and three-quarter of the American consumption. The company is dedicated to reduce the environmental their footprint as well as the footprint of their customers. Initiatives include investments in new technology, an extended recycling policy, reduced use of hazardous chemicals and an online carbon calculator that allows users to estimate their CO_2 savings by specific shipments.

[83] According to: www.un.org/esa/dsd/dsd_aofw_ni/ni_pdfs/NationalReports/belgium/Transport.pdf
[84] According to: www.thepep.org/en/workplan/urban/documents/RussianFederation.pdf
[85] According to: www.c40cities.org/bestpractices/transport/freiburg_ecocity.jsp
[86] According to: www.european-energy-award.org/

Tram in Strasbourg[87]

The introduction of the Tram system in Strasbourg in 1994 was motivated by an objective to revitalize the city centre and improving urban well-being. The tram connects the city centre with the main train station. From 1994 to 2004 passengers in public transport increased by more than 100% to 65 million annual public transport passengers in 2004. Two new lines followed in 2000. A result of the tram is a reduced volume in car traffic through the city centre.

Jubilee Line extension in London with employment effects[88]

The extension of the Jubilee Line in London opened in 1999 to support the development of Canary Wharf and the following job increase in the Isle of the Dogs. According to a study this lead to employment benefits of 6 billion British pounds (2003 level) through agglomeration benefits. Furthermore property values increased for the Canary Wharf station area.

Metro tram in Volgograd[89]

In order to improve the environmental efficiency of the transport sector, the Russian Federation has introduced a number of environmentally friendly transport modes. To mention one example, the "Metro tram" in the city of Volgograd, is a high-speed tram that has proven to be a cost-effective way of providing a safe, comfortable, reliable and environmentally friendly mode of transport. Both the construction and operation costs of this system are regarded as relatively low by the Russian Transport Ministry.

Best practice – Integrated transport systems

The Marmaray project[90]

The European and Asian parts of Istanbul, Turkey, are getting connected by rail through the Marmaray Project. 75.000 passengers will be able to travel in each direction per hour thereby relieve the historical parts of Istanbul from motorized traffic. It will reduce the traffic density and lead to lower noise and air pollution levels and thereby increasing the liveability of the city centre. It is furthermore expected that through this project time and human lives can be saved, as travel time is shorter and safety higher than with road transport. The project also saves the UNESCO World Heritage historical areas of Istanbul.

Database of Best Practices

Transport Canada has created a database of policies implemented in Canadian communities to promote sustainable development in urban transport. More than 60 examples of best practices are included in the database, with description of project results, costs and policy contexts. The City of Mississauga did for example introduce an Idle-Free Zone to encourage

[87] According to: www.uitp.org/mos/focus/FPBenefits-en.pdf
[88] According to: www.uitp.org/mos/focus/FPBenefits-en.pdf
[89] According to the information given by the Russian Federation in the questionnaire on Transport for Sustainable Development, December 2010.
[90] According to the information provided by Turkey in the questionnaire on Transport for Sustainable Development, December 2010.

motorists to turn off their engines when parked. Another example is the use of intelligent transport systems to improve the quality of the bus transit system between Vancouver and Richmond B.C. The system allows for real-time passenger information, traffic signal controlling according to bus schedules and a transit management system. These initiatives lead to higher reliability and reduced travel time which resulted in a change in modal split towards lower car use and higher use of public transit. The database of best practices is available here: www.tc.gc.ca/eng/programs/environment-utsp-casestudylibrary-229.htm

UNECE works for integrated and sustainable transport systems

Intermodal transport and Logistics

At the pan-European level, UNECE is the only inter-governmental organization that contributes to internationally harmonized solutions in the field of intermodal transport infrastructures, technical minimum standards and service benchmarks. UNECE has negotiated a pan-European network of important road-rail-inland water transport lines and provides a forum for Government and industry experts to review the latest policy, legal and technical developments, to exchange best practices in intermodal transport and to prepare guidance on specific issues.

In order to ensure that intermodal transport solutions are applicable within total logistics and transport chains, Governments have the responsibility to establish the necessary framework conditions that set a level playing field among all actors and modes of transport involved. This would then allow the industry to establish and operate seamless intermodal transport operations that are economically viable and ecologically sustainable. In Europe, efficient intermodal transport operations are often only feasible beyond distances of 300-500 km. Thus international cooperation and harmonized transport policies are required as the total transport chain is only as good as its weakest link.

Standards for intermodal transport

The UNECE working party on Intermodal Transport and Logistics (WP 24) initiated the work for identifying a network of international intermodal transport that satisfies commonly accepted standards in 1987. This led to the adoption of the European Agreement on Important International Combined Transport Lines and Related Installations (AGTC) which entered into force in 1993. These standards are monitored by the working party, until 2006 by a Yellow-Book series, and since then through an online web-tool. In 1992 the Working Party started the work for defining minimum requirements for transport on European Inland Waterways and coastal routes. The adoption of a protocol on inland waterways to the AGTC in 1997 was a result of this work.

Promotion of sustainable development of the Euro-Asia transport links

In addition to the work carried out under the Euro-Asian Transport Linkages Project (EATL), TEM and TER, the UNECE working party on Intermodal Transport and Logistics (WP 24) has analyzed the land transport links between Europe and Asia in combination with the European Conference of Ministers of Transport since 1995. The work of the UNECE has

further led to recommendations on important elements for international activities for increasing the efficiency of intermodal transport from Europe to Asia: (1) A Unified Railway Law system, (2) A Pan-European Rail customs transit regime and (3) a new annex to the UNECE “Harmonization Convention” for efficient border crossing procedures on railways. As explained earlier, the TEM and TER Projects are the backbone of Pan-European Road Corridors in Central and East Europe and act as an important instrument of institutional inter-country cooperation and coordinated of actions of the countries in Central, East and South-East Europe.

Terminology on Combined Transport

The UNECE working on Intermodal Transport and Logistics (WP 24) has created a publication that lists the general terms used in intermodal transport: “Terminology on Combined Transport” which is available in four languages. The publication serves to makes terms unified and easily understandable and thereby supporting the work of politicians, technical personnel, operators and other interest groups who work with intermodal transport.

9. Transport for sustainable development: The current situation and the way forward

9.1 Verdict: The current situation

Transport is important for sustainable development. The past chapters have shown that transport can improve sustainability by ensuring social inclusion of marginalized groups and promote economic development. However the chapters have also shown that there are many remaining challenges that need to be addressed. The ECE region covers a huge variation in economic development, geographical and demographic characteristics. The following verdict is an attempt to give an overall judgment of the current situation. Due to the great differences there are exceptions for every aspect. But all countries should continue to work for improvement of all aspects. If countries are doing well it is important to share its good practices and ideas, if a country is performing poorly it is important to learn from other nations. Sustainable development is a global issue and intergovernmental cooperation is therefore crucial.

National accessibility

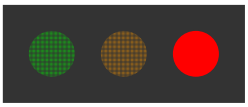
Increased urbanization has led to congestion issues in many cities throughout the ECE region. Moreover the share of elderly individuals is increasing in almost all ECE countries. These issues have to be addressed in order to ensure social and economic sustainability.

International accessibility

Missing international links combined with growing congestion at borders reduce the fluidity of international transport. International accessibility is important for economic sustainability.

Individual affordability

Many UNECE countries have experienced a collapse of public transport in and the recovery is only occurring slowly. More initiatives are needed to tackle this issue, because public transport is important for social and economic sustainability.



Social affordability

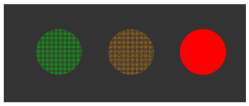
The lack of sound multi-year investment programs, backlogs in maintenance investments combined with lack of public funds create a challenging situation in many UNECE countries.

Transport safety

Five UNECE countries are among the world top ten in road safety[91]. However, there are still annually about 150,000 people killed on roads in the UNECE, mainly because of rule violations. For example in the United States drink driving kills more than 15,000 people every year.

Transport security

The ECE region constitutes for about 60% of global trade. While this is a good sign for economic development, it is also a risk factor for organized criminal activities. Moreover New York in 2001, Madrid in 2004, London in 2005 and most recently Moscow in 2010 has shown that that all transport modes are at risk of terror attacks.



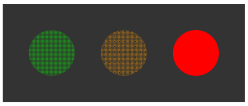
Environmental sustainability

Local pollutants

The emission of local pollutants has come under control through the work of the UNECE Working Party on Vehicle Regulations (WP. 29) and the EURO standards system.

Global effects

The emission of greenhouse gases from transport continues to rise and further attention to this issue is needed in order to get emissions under control.

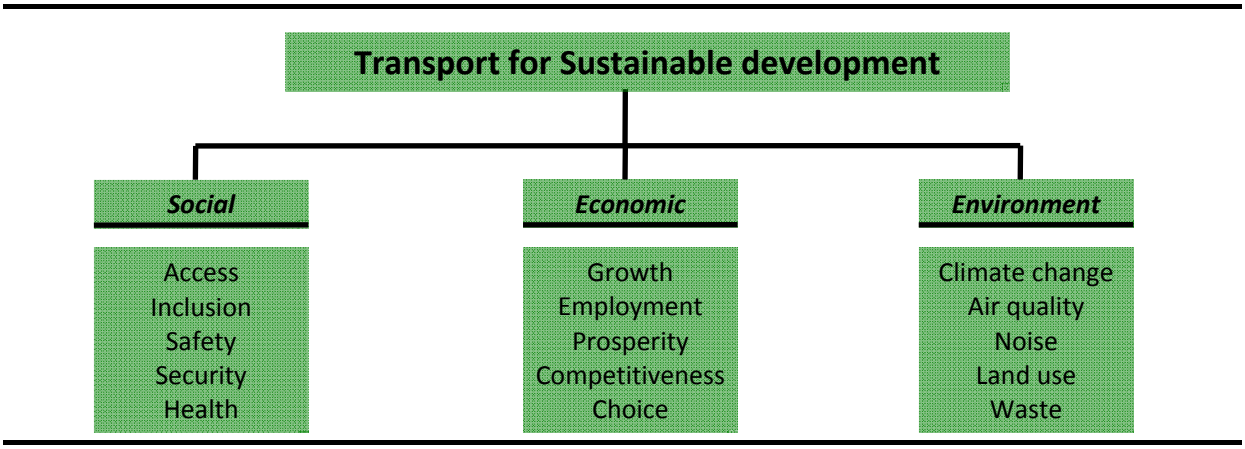


9.2 Policy implications

Message 1: Transport for sustainable development is about social, economic and environmental sustainability

Transport is important for social, economic and environmental sustainability. Working towards sustainable transport systems requires that all aspects of sustainable development are considered. With policies targeting only one aspect there is a risk, that other dimensions of sustainable development may be neglected or even negatively affected. Environmental concerns, for example, are important and have to be addressed, but by focusing only on the environmental impacts of transport, certain policies may have converse and even negative reduce impact on social and economic sustainability. It is therefore imperative to understand that sustainable transport is important for all dimensions of sustainability. Therefore, the full contribution of transport to sustainable development needs to be addressed in systemic way and consider through its linkages with social, economic and environmental policies.

Figure 9.1
Sustainable transport is not only about the environment



Message 2: A transport system can be sustainable only if all aspects of sustainable development are taken into account

Conflicting and supporting policy objectives

For each policy measure implemented for one aspect of sustainability one has to consider its possible impacts on all other aspects of sustainability. By setting high vehicle requirements with respect to safety and environmental efficiency for example, cars become more expensive and thus less affordable. A policy that would lead to low income households driving in unsafe and environmentally inefficient vehicles, would have negative consequences for social sustainability. A solution to this is to provide good alternatives through public transport, but this is not always possible and may be unaffordable for the authorities. There is therefore no single instrument to obtain sustainable development of

transport, instead a balanced and internationally cooperated approach is needed, to avoid conflicts of sustainability between nations or dimensions of sustainability.

Example policy conflict # 1: Taxation

In most UNECE countries the tax share of the fuel price is above fifty percent. If a country would want to improve its competitiveness and thereby economic sustainability, cutting these taxes would make it more attractive for firms that rely on transport of goods or passengers. The same holds for vehicle taxation or road usage tolls. However, taxation of private transportation is used to internalize the negative externalities such as pollution, emission of greenhouse gases, noise and reduction of natural habitat.

Example policy conflict # 2: Maintenance

Maintenance of private vehicles is important to keep safety levels high and ensure environmental efficiency. Many UNECE countries have already implemented a regular vehicle inspection scheme, ensuring that private and public vehicles are tested to fulfil safety and environmental requirements. For many owners reparation and testing of vehicles could be costly, and therefore vehicle inspections have to be made affordable so that their implementation does not result in reduced mobility, social exclusion and circulation of unsafe and polluting vehicles.

Example policy conflict # 3: Silent technology

Electrical vehicles are politically popular because of their environmental sustainability. Low emissions and low noise levels are appreciated especially in urban zones. However they may be dangerous for individuals with impaired vision, elderly as well as every other road user, who by habit rely on car noise to navigate in traffic.

Considering these conflicting goals, it is even more important to cooperate between countries and transport modes. UNECE as an international forum gives the opportunity to share ideas, best practices and experiences. It can help less developed countries to identify next steps in the path towards sustainable development by learning from the more developed countries. It also helps them to avoid making the mistakes made by first-movers.

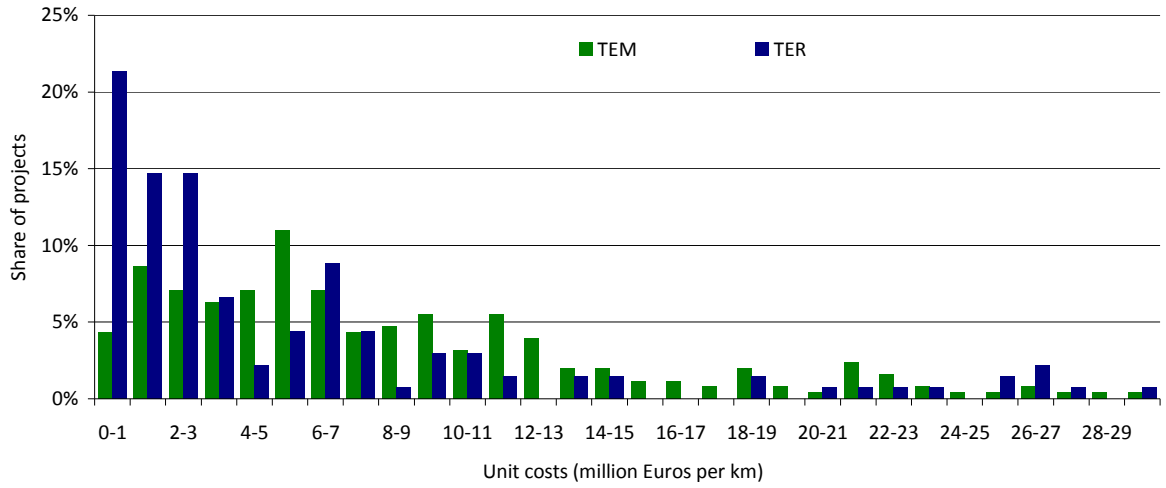
<u>Message 3: Sustainable transport policies can be financially beneficial, but require political commitment!</u>

It is all about the money[92]

While public funds never have been in excess, the financial crisis has definitely reduced the available public funds. The maintenance costs of the existing infrastructure are not decreasing and new investments are needed, especially in low and middle income countries. In addition, provision of public transport may require public subsidies in order to ensure a

competitive alternative to private transportation. Several UNECE countries including Czech Republic, Denmark, Latvia, Switzerland and Sweden mentioned that the main obstacle for development of transport is the lack of funds. The revenues from transport related taxes – for instance on fuels, road use and vehicles – are often earmarked to transport. The use of transport and especially purchase of new vehicles is often reduced in recession times, leading to lower public revenues from the transport sector and therefore less investment and maintenance funds.

Figure 9.2
Estimated unit cost of TEM and TER projects



Source: UNECE: TEM and TER Revised Master Plan 2011

The scarcity of public funds requires prioritization of infrastructure projects, and this may also lead to giving indirectly priority to certain transport modes. While the rail transport has higher environmental and safety benefits compared to road transport, it lacks in flexibility, quality of service and reliability. Figure 9.2 illustrates the unit costs of new roads and rails. It appears that while railway projects are more heterogeneous than road projects, the average unit cost is close to similar.

Several UNECE member countries face challenges with uneven distribution of transport infrastructure and network. In Croatia[93] for instance, the motorway network is above EU average, while local roads as well as inland waterways and railways are lagging behind in quality.

What is needed: Political commitment!

Money is not sufficient without political will. Political commitment to sustainable development of transport is needed at all levels of authorities and institutions. Prioritization of long term sustainable transport projects that are based on sound rate of return on investments and impact assessment is needed. Creative solutions, cross-border agreements, knowledge sharing and sometimes unpopular decisions are needed to ensure sustainable development of transport systems.

Many things have been done right in the course of the work towards creating a sustainable transport system, but there is still a long way to go. We have presented a number of best practices of policies that can be implemented in order to improve the situation. Policy makers are often worried about the costs of sustainable transport system. Policies however need not to be costly and, on the contrary, in the long run many investments in sustainable solutions have a positive net return.

Policies can be fun and simple. Obesity is a serious concern in Sweden, and a trial experiment at a Subway station in the capital Stockholm was set up to encourage people to take the stairs instead of the escalator. The stairs were designed as a piano and people could play a melody by walking up and down the stairs. This led to a 66% increase in the number of people who had chosen the stairs! This shows that policies can be fun, simple and cheap. The same approach can be applied to policies in some areas of transport.

Sustainable transport policies, can be financially beneficial

Investments in research and development of new energy sources and vehicle technologies can have important financial benefits for policy makers, as they could not only help us develop a more sustainable transport system, but may also lead to jobs creation and economic growth. New industries and jobs could help policy makers to address both short-run economic and long-run sustainability issues.

Message 4: Consequences of new technologies have to be thought through and tested before their full implementation

Sustainable development through innovation and research

Innovation and research in new technologies play an important role in fostering development of sustainable transport system. However the full impact, consequences and possible adverse effects of new technologies must be taken into account before their full implementation.

Example # 1: Bio-fuels

The increased use of bio-fuels raises the question about the impact of their increased use. For every newly developed and used energy source it is important to assess both its impact on intra and intergenerational sustainability. The use of first generation bio fuels may have especially had undesired impacts on intra-generational equity. These fuels are often made from seeds, grains or sunflower. These ingredients could also have been used as human or animal food. The usage of first-generation bio fuels may therefore lead to increased food prices and food shortages. It is therefore crucial to evaluate the consequences of subsidizing these fuels (or removing taxes on them). Second generation bio fuels are – in contrast – made of non-food ingredients, such as waste biomass. This type of bio fuel is together with the third (Algae) and fourth (bio-chemical) generation referred to as “advanced bio fuels” and may have a less undesirable impact on the current generation.

Example # 2: Electric Vehicles

Electric vehicles are commonly regarded as environmentally friendlier than conventional vehicles - they solve the problem of air pollution, greenhouse gas emission and noise, which are negative externalities of conventional cars. However this is only true if the electricity is generated in sustainable way. If the electricity used for electric cars is produced by combustion of non-renewable energy, emissions will also occur as well as energy loss compared to conventional vehicles because energy has to be transformed twice. As a result, an electric vehicle may consume more non-renewable energy and produce more (aggregated) emissions than conventional cars. Add to this that an electric car uses batteries which cannot be recycled but requires special procedures. There is thus an additional waste generation. Only if these issues are handled, electric vehicles could become a true sustainable solution.

The cases of bio fuels and electric vehicles emphasized the need for integration of all aspects of sustainability when designing policies and developing new technologies. This does not imply that policies that may have certain negative implications for other dimensions of sustainability should be excluded, but their negative consequences may be addressed by other policy instruments, so that overall impacts can be improved.

Message 5: There is no one size fits all

Transport is needed to ensure social and economic sustainability, but the negative impact on the environment must be minimized. However the problems in designing a sustainable transport policy differ from region to region within the UNECE. It does not only depend on the countries economic situation, but also on the geographical and demographic characteristics of the region.

Challenges in developed countries: capacity constraints![94]

Even well developed countries have faced problems with capacity constraints in their transport infrastructure. This may have had a negative impact on the economic development of these countries, as the growth potential has not been exploited fully. However, often the constraints are limited to certain transport modes and the limitations have typically led to a shift to less efficient transport modes. For instance in Sweden, a capacity problem on railroads has led to a shift to road transport. Switzerland is expecting capacity constraints on both rail and roads urban areas and for railroads on the trans-alpine routes.

Different policy solutions for different countries

In urban areas congestion is a challenge in almost all countries. Cities such as Moscow, London, Paris and Stockholm are facing issues with accessibility due to the huge number of vehicles going into the city in the morning and leaving the city in the evenings. While congestion charging is used as an effective instrument in some UNECE cities, others apply different methods because they have judged these to be more effective or appropriate. For

instance, Finland recently decided not to apply a congestion charging scheme. Solutions are diverse and include congestion charging and using ITS for optimal capacity utilization.

Message 5: Act now!

Storms and extreme precipitations are becoming increasingly frequent and believed to be associated with the climate change. The heavy snowfalls in large parts of the UNECE region in December 2010 let to the closure of several airports and reduced inland mobility. Poland experienced a severe flooding in May 2010 which led to severe damages on infrastructure and buildings and the loss of human lives. The resulting damages on roads amounted to approximately one billion euros, while the damages on railroads amounted to 80 million euros. Transport policies have to incorporate the possibility of severe weather conditions, as a result of climate change. Adaptation and mitigation is a key to ensure transport system that can sustain climate impacts.

9.3. The role of UNECE

As in the previous chapters we could see in details UNECE has been addressing sustainability of transport through the different legal instruments, through its analytical work and technical assistance activities, as well as through its main governing structures, i.e. through the traditional work of the Working Parties. Table 9.1 gives a summary of how sustainability and its key areas (access, affordability, safety, security, and environmental protection) are incorporated into the UNECE work programme. Assessing the role of UNECE in promoting sustainable development of transport we can make the following observations:

- UNECE by its mandate and traditional approach is primarily focusing on international transport, while sustainability measures require a system-approach, i.e. considering local, regional, national and international transport;
- UNECE is playing a key role in some areas of sustainability, like international access, road traffic safety, Environmentally Friendly Vehicles, inter-modal transport. At the same time having a marginal or no role in other important areas. In light of the resource constraints, this selectivity will likely to continue also in the future.

Table 9.1

Main activities of the UNECE in relation to sustainable development and transport

	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 their hinterland connection	ITC/ Transport Trends and Economics (WP.5) ITC/ Customs and Transport (WP.30) CEFACT WP Trade Committee
Affordability		Socio-economic analysis of transport investments Common criteria on identification of bottlenecks, missing links, 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 Forum (WP.1) ITC/ Working Party on the Transport of Dangerous Goods ITC/ Working Party on Railway Transport (SC.2) ITC/ Inland Waterway Transport (SC.3 and WP.3) ITC/ World Forum for Harmonization of Vehicle Regulations (WP. 29)
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 Int. Carriage of Dangerous Goods by Road (ADR), Inland Waterways (ADN) and Rail (RID*)	ForFITS: Facilitating climate change adaptation in transport through addressing the energy-environment linkage. 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 Transport, Health and Environment Pan-European Program ITC/ Inland Waterway Transport (SC.3 and WP.3)

Notes and Definitions

Member States of the United Nations Economic Commission for Europe

AL	Albania
AD	Andorra
AM	Armenia
AT	Austria
AZ	Azerbaijan
BY	Belarus
BE	Belgium
BA	Bosnia and Herzegovina
BG	Bulgaria
CA	Canada
HR	Croatia
CY	Cyprus
CZ	Czech Republic
DK	Denmark
EE	Estonia
FI	Finland
FR	France
GE	Georgia
DE	Germany
GR	Greece
HU	Hungary
IS	Iceland
IE	Ireland
IL	Israel
IT	Italy
KZ	Kazakhstan
KG	Kyrgyzstan
LV	Latvia
LI	Liechtenstein
LT	Lithuania
LU	Luxembourg
MT	Malta
MC	Monaco
ME	Montenegro
NL	Netherlands
NO	Norway
PL	Poland
PT	Portugal
MD	Republic of Moldova
RO	Romania
RU	Russian Federation
SM	San Marino
CS	Serbia
SK	Slovakia
SI	Slovenia
ES	Spain
SE	Sweden
CH	Switzerland
TJ	Tajikistan
MK	The former Yugoslav Republic of Macedonia
TR	Turkey
TM	Turkmenistan
UA	Ukraine
GB	United Kingdom
US	United States of America
UZ	Uzbekistan

Notes to chapter 2

Figure 2.2

Data on inland freight transport is obtained OECD/ITF and standardised to the 2000 level based on data in million tonne-km. GDP data is taken from the UNECE statistical database. All UNECE countries except Andorra, Cyprus, Iceland, Israel, Kazakhstan, Kyrgyzstan, Malta, Monaco, Montenegro, San Marino, Tajikistan and Turkmenistan are included.

Figure 2.3

Data is taken from the UNECE statistical database. The UNECE average is estimated by a weighted average of country fatality rates. The weights are based on the population size, obtained from the World Bank. In none of the years is data for all countries available and since there are signs of a negative correlation between fatality rate and data availability, the UNECE average may be underestimated.

Figure 2.4
Data is taken from the UNECE statistical database.

Figure 2.5
CO_2 emissions from fuel combustion in transport are measured in million tonnes and are taken from the International Energy Agency. This covers all transport modes except international marine bunkers and international aviation. Data is from 2008 for all countries, but is missing for Andorra, Liechtenstein, Monaco, Montenegro and San Marino.

Figure 2.6
GDP data is from the UNECE statistical database. Energy use from transport is measured in tonnes of oil equivalent and is taken from the International Energy Agency.

Table 2.1
Data on GDP per capita, GDP growth, the unemployment rate and the road fatality rate are from the UNECE statistical database. Data on passenger cars is also taken from the UNECE statistical database, except for Armenia, Tajikistan, Turkmenistan and Uzbekistan, where data is from IRF. Data on passenger cars in Greece is from the national statistical office of Greece. Data on passenger cars in Portugal is from EEA. Data on road length is from IRF, except for Albania where data is from the UNECE survey on transport for sustainable development, Luxembourg where data is from the national statistical office. Data on energy emissions and energy consumption is obtained from the international energy agency. Data on population size is from the World Bank and data on area size is from the UNECE statistical database. All data for Turkey is from the Turkish National Statistics Institute, except energy consumption which is from the Turkish Ministry of Energy and National Resources and the inflation rate, which is taken from the UNECE Statistical Database.

Notes to chapter 3
Figure 3.1
See notes to table 2.1 on road density.

Figure 3.2
The source for the population is the World Bank. The rail length is taken from the World Bank and the UNECE Statistical database. The length is measured in kilometres and covers all rail lines. Data for Romania is from 2009; data for Austria, Azerbaijan, Croatia, France, Iceland, Kazakhstan, Russian Federation and the Former Yugoslav Republic of Macedonia is from 2007. Data for Albania is from 2004. Data for all the remaining countries is from 2008, except Andorra, Cyprus, Iceland, Malta, Monaco, Montenegro and San Marino for which data is either unavailable or not relevant.

Figure 3.3
The rural access indicator is calculated by the World Bank. The values are taken from the publication: http://www.worldbank.org/transport/transportresults/headline/rural-access/tp-10-final.pdf. Data for Tajikistan is from 1999, data for Uzbekistan is from 2000, for Belarus, Russian Federation, Romania, Latvia and Bulgaria data is from 2001, for Albania and Azerbaijan in 2002, for Turkey, Armenia, Croatia, Estonia, Georgia, Czech Republic and Lithuania in 2003.

Figure 3.4
Values are from the World Bank and IRF. For Greece and Netherlands data is from 2000, Kyrgyzstan, Turkmenistan and Uzbekistan data is from 2001; data for Albania is from 2002, data for Germany, Spain and Italy is from 2003; data for Canada, Czech Republic, Luxembourg, Portugal and Romania is from 2004; data for Belarus, Bosnia and Herzegovina and Bulgaria is from 2005; data for Azerbaijan, and Slovakia is from 2006. Data for Denmark, Georgia, Monaco, Norway and the Russian Federation is from 2007. For the remaining countries data is from 2009, except Andorra, Montenegro, San Marino, Tajikistan and Turkey, for which data is unavailable.

Figure 3.5
The data source for the Human Development Index is UNDP and values are for 2007. Data sources and definitions for road density are as for table 3.1. Data on road density for Turkey is from the Turkish Statistics Institute.

Figure 3.6
Data is taken from the UNECE statistical database. Data is unavailable for Belgium, Malta, Tajikistan, FYR Macedonia and Turkmenistan.

Figure 3.7
Data is taken from Eurostat.

Figure 3.8
Imports and exports measured in current prices and exchange rates (USD) are from the UNECE statistical database. GDP is also in current prices and USD and is taken from the World Bank. Note that to express the importance of foreign trade we have shown the size of imports plus exports relative to GDP, which should not be confused with the trade balance (exports minus imports). Data is from 2009 for all countries, except for Austria, Cyprus, Kyrgyzstan, Montenegro, Serbia, Switzerland and The Former Yugoslav Republic of Macedonia for which data is from 2008. Data for Uzbekistan is from 2007. There is no data for Andorra, Liechtenstein, Malta, Monaco, San Marino and Turkmenistan.

Figure 3.9
Data is from Eurostat. Freight transport is measured in tonne-km. Data is from 2009 except for Italy, Russian Federation and Serbia for which data is from 2008. Data is unavailable for all countries not included in the graph.

Figure 3.10
The source is Eurostat's trade statistics and is measured in value.

Figure 3.11
The World Bank's Logistics Performance Index is used as a source and all values are from 2009.

Notes to chapter 4

Figure 4.1
The Gini coefficient is taken from the World Bank. Data is from 2000 for the following countries Austria, Belgium, Canada, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Norway, Spain, Sweden, Switzerland and United States of America. Data for Israel is from 2001, for Bulgaria and Uzbekistan data is from 2003; values for Estonia, Hungary, Lithuania, Slovenia and Tajikistan is from 2004. Data is from 2005 for Albania, Azerbaijan, Croatia, Georgia and Poland; data for The Former Yugoslav Republic of Macedonia and Turkey is from 2006; data for Armenia, Belarus, Bosnia and Herzegovina, Kazakhstan, Kyrgyz Republic, Latvia, Montenegro, Republic of Moldova, Romania and Russian Federation is from 2007. For Serbia and Ukraine data is from 2008.

Figure 4.2
Data is from Eurostat's household survey from 2005 and covers EU27 countries.

Figure 4.3
Data is from Eurostat's household survey from 2005.

Figure 4.4
Data for EU is from Eurostat's household survey from 2005 and covers EU27 countries. Data for Russian Federation is from the Russian Federation Federal State Statistics Service and is from the year 2008. Data for the Republic of Moldova is the National Bureau of Statistics of the Republic of Moldova and is from the year 2008. Data for Turkey is from 2009 and is taken from the Turkish Statistical Institute. Data for the United States of America is from 2009 and is taken from the United States Department of Labor, Bureau of Labor Statistics. Note that the definitions for the United States of America vary from the others. Transport Services for the United States of America is only Public Transport, all other transport services are included under Operation of Vehicles.

Figure 4.7
Investment in infrastructure is from ITF. Data on GDP is obtained from UNECE. Data is for 2008 except for the following cases: 2007 for Austria, Georgia, Italy, Lithuania, Norway and Portugal; 2005 for Malta; 2004 for Switzerland and 2003 for the United States of America. There is no data on investment in railway infrastructure for Canada.

Figure 4.8
See notes to figure 4.7. For countries where data is only unavailable for 2008, the value of 2007 has been used for 2008. Countries where more observations are missing have been excluded.

Figure 4.9
Both GDP and Private Investments in Transport are taken from the World Bank, and should according to the source include *all* private investments in transport.

Notes to chapter 5
Figure 5.1 and 5.2
For detailed information about international agreements see
http://www.unece.org/trans/conventn/intro.html

Figure 5.5
Study results are taken from they survey: *Review and Analysis of Posted Speed Limits and Speed Limit Setting Practices in British Columbia*.

Figure 5.6
Data on alcohol involvement in road fatalities is from the UNECE Statistical Database. Sources for road fatality statistics are the UNECE Statistical Database, Eurostat, The International Transport Forum and OECD. Data for Andorra is from 2000, for Tajikistan is from 2001, for Italy 2002, for Azerbaijan, Georgia, Germany, Luxembourg, Netherlands, Republic of Moldova and Romania from 2003. For Albania from 2005, Croatia, The Former Yugoslav Republic of Macedonia and Turkey from 2007, Cyprus, Czech Republic, Slovakia and Switzerland for 2008. For all remaining countries data is from 2004, except Andorra, Belgium, Bosnia and Herzegovina, Canada, France, Ireland, Israel, Liechtenstein, Malta, Monaco and Montenegro, Norway, Portugal, San Marino, Serbia, Spain, Turkmenistan and Uzbekistan for which data is missing.

Figure 5.7
Data is from WHO and is from 2007. In case an interval is given by the raw data, the middle value of the interval is represented (i.e. if 1-5 is given, 3 is shown). Data is missing for Albania, Andorra, Armenia, Azerbaijan, Belarus, Croatia, Denmark, Georgia, Germany, Israel, Kazakhstan, Kyrgyzstan, Liechtenstein, Lithuania, Monaco, Montenegro, Moldova, San Marino, Serbia, Slovakia, Tajikistan, Macedonia, Turkey, Turkmenistan, Ukraine and Uzbekistan.

Figure 5.8
Data on motor cycles' involvement in road fatalities is from the UNECE Statistical Database and IRF. Sources for road fatality statistics are the UNECE Statistical Database, Eurostat, The International Transport Forum and OECD. Data is unavailable for Andorra, Armenia, Bosnia and Herzegovina, Georgia, Liechtenstein, Monaco, Montenegro, San Marino, Serbia, Tajikistan and Uzbekistan. Data is from 2003 for Albania, Republic of Moldova and Turkmenistan; from 2004 for Belarus, Kyrgyzstan, Malta, Romania, Russian Federation and Ukraine; from 2005 for Bulgaria, Finland and Latvia; from 2007 for Azerbaijan, Croatia, The former Yugoslav Republic of Macedonia and Turkey; from 2008 for Belgium, Canada, Denmark and Israel. For the remaining countries data is from 2009.

Figure 5.9
Information is obtained from www.cobx.org.

Notes to chapter 6
Figure 6.1 Data is from Eurostat

Notes to chapter 7
Figure 7.1
Energy use from transport is measured on tonnes of oil equivalent and is taken from the International Environmental Agency. This covers all transport modes. Population data is from the World Bank. Data for Turkey is from the Turkish Ministry of Energy and National Resources.

Figure 7.2
Energy use from transport is measured on tonnes of oil equivalent and is taken from the International Environmental Agency.

Figure 7.3
Energy use from transport is measured on tonnes of oil equivalent and is taken from the International Environmental Agency. Data is unavailable for Andorra, Liechtenstein, Monaco, Montenegro and San Marino.

Figure 7.4
CO_2 emissions from fuel combustion in transport are measured in million tonnes and are taken from the International Environmental Agency. Population data is from the World Bank.

Figure 7.5
Data is from European Environmental Agency.

Figure 7.6
Data on noise is from a survey by the European Commission.

Figure 7.7
Data on fuel price and tax is from the International Environmental Agency.

Figure 7.9
Data is from the European Environmental Agency http://www.eea.europa.eu/data-and-maps/indicators/proportion-of-vehicle-fleet-meeting/proportion-of-vehicle-fleet-meeting-1 and covers EU, Norway, Switzerland and Turkey.

Figure 7.10
Data is from the UNECE.

Notes to chapter 8

Figure 8.2
Data on freight transport is from UNECE OECD/ITF; for all transport modes the performance is measured in tonne-kilometres.

Figure 8.3
The data source for combined transport is the International Union of Combined Road/Rail Transport Companies (UIRR). The values include only the rail part of the Combined Transport Road-Rail (terminal to terminal) and cover Austria, Belgium, Switzerland, Serbia, Czech Republic, Germany, Spain, France, Greece, Hungary, Italy, Netherlands, Norway, Poland, Slovenia, Croatia, Slovakia, Turkey, Denmark, Romania, Russian Federation, Sweden, Finland, Luxembourg, France and The Former Yugoslav Republic of Macedonia.

Figure 8.4
Passenger transport is measured in passenger-kilometres. The sources used are UNECE and OECD/ITF.

Figure 8.5
Sources used: Statistics Estonia, Russia in Figures 2010 (Statistics of Russia) and Central Statistics Bureau of Latvia. Note: Public transport includes: Rail, Bus, Tram, Trolley-Bus and Subways, except for Estonia where only data on Trams and Trolley-buses is available. Data is standardized based on passenger-km values.

Figure 8.6:
Data is taken from the Eurostat Urban Audit.