

MITIGATING THE IMPACT OF THE ROAD SYSTEM ON CLIMATE CHANGE

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STRATEGIC THEME A

INTRODUCTORY REPORT

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1. INTRODUCTION

The use of road and other transport networks makes a significant contribution to Greenhouse Gas Emissions (GHGEs), usually expressed as carbon dioxide equivalent or CO₂e. Governments of many countries are setting both challenging and ambitious legislative targets for CO₂e reductions. National Road Administrations have a key role to play in meeting these targets and it seems essential that substantial moves are made *Towards a Carbon-Free Transport Future Now*.

Member countries of the Association were invited to submit a national report addressing the issues in relation to:

- **Legislative, regulatory and other targets**, and deadlines that have been set for carbon reduction;
- **Guidance and objectives that have been set for the transport sector**: to ensure that such targets are reached. While not all actions will fall to the Road Administration, actions such as the development of non-carbon vehicle fleet, changing power sources and associated infrastructure, developing vehicle technologies, and the costs of travel and associated fiscal drivers are all of relevance here;
- **Measures**, with indications of quantitative objectives, that are planned within the road transport sector to reduce the carbon footprint of the construction, maintenance and operation of the network. This might include inter alia:
 - Reducing the need for travel by engaging with planners to influence the interaction between land-use planning and transport,
 - Encouraging public transport use by facilitating modal shift and multi-modal travel,
 - Improving journey time efficiency and reducing congestion,
 - Ensuring freight inter-operability,
 - Changing specifications and procurement

Eight National reports were received from: Austria, Cuba, Japan, Norway, Portugal, the United Kingdom, the United States and Spain.

In this Strategic Direction Session, key aspects of the policies adopted by different countries will be presented and discussed. This introductory report provides an outline of the national reports received.

2. OUTLINE OF THE NATIONAL REPORTS SUBMITTED FOR STRATEGIC THEME A

2.1. Austria

“Since 1990, the emissions of the transport sector have shown significant growth in Austria, whereas a slightly decreasing trend has been observed since the year 2005.

The transport sector is responsible for about 26 % of the annual CO₂ emissions, the so-called “fuel tourism” (fuel sold in Austria but consumed abroad) for about 25 % of the overall CO₂ transport emissions in Austria. Out of a total of 22.6 million tonnes transport-related CO₂ emissions 5.6 million tons are to be attributed to “fuel tourism”. This is due to the fact that price differences in relation to most neighbouring countries have been growing since the mid-1990ies.”

The report states that despite the issue of “fuel tourism” the per capita production of CO₂ in Austria is on an average among western European countries, important routes for long-distance freight traffic cross Austria and the integration of eastern neighbour states into the European economic area has led to additional traffic demand, especially on transit routes.

Since the beginning of the 1990ies, Austria has adopted a number of policies and measures aiming and stabilizing and reversing the current trend of emissions:

- *the Immission Protection Act – Air* was passed in 2010 Austria, essentially in response to CAFE-RL, the Clean Air for Europe Directive 208/50/EG of the European Union;
- *the Environmental Impact Assessment Act* including an energy concept stating what is the relevant energy consumption for each project;
- *measures with regard to the reduction of CO₂ emissions from mobile sources* including:
 - increase of the mineral oil tax;
 - increase of the toll for heavy commercial vehicles in the primary road network;
 - promotion of EURO-6-PKW und environment friendly engines;
 - comprehensive promotion of mobility management
 - Monitoring goods transport on the road, etc.

Besides these measures targeting the automobile transport, the report lists a number of measures taken to promote cycling seen as having a considerable potential for replacing passenger car traffic above all in urban areas.

Within the framework of the “Overall River Construction Project” measures are taken to improve the Danube navigability in order to shift traffic from roads to the waterway.

The Ministry is promoting research and development in the areas of logistics and alternative fuels and has presented in 2010 a strategy and implementation plan for national electric mobility.

2.2. Cuba

The Cuban national report states that there is a desire to reduce greenhouse gases between 2008 and 2012 by 5 percent over 1990. Although the Kyoto Protocol did not require the reduction of emissions in developing countries, it was signed by Cuba and therefore an inventory system to record the carbon emissions was established.

The Ministry of Transportation has developed a series of measures to minimize negative environmental impacts, particularly the reduction of pollutant emissions in order to achieve sustainable transport, including:

- Development of non-motorized transportation alternatives, encouraging the use of bicycles, tricycles, animal-drawn vehicles and other facilities created for coexistence with motorized traffic.
- Increase of walking tours, facilities for pedestrians and traffic education.
- Development of multimodal transport, using rail for medium and long distances, as well as freight and cargo.
- Establishment of design standards for roads that involve the environmental aspect and in particular air pollution decision-making project.
- Traffic Ordinance and establishment of measures to reduce congestion on the basis of emissions of polluting gases.
- Creating good condition in Vehicles Technical and Environmental Inspection Centers in all provincial capitals.
- Introduction of alternative fuels such as Compressed Natural Gas, reducing emissions or air pollutants from transportation.
- Implementation of national technologies or leading to greater efficiency in the combustion and gas treatment in the current vehicle fleet, such as implementing electronic ignition and injection, the construction of catalytic converters, etc..
- Implantation of administrative regulations on the movement of vehicles in the city, taking into account age, fuel type, emission control standards.”

From the point of view of the project, the Construction Minister has established two national regulations that relate to the design of roads to the environment:

- "Procedures for environmental analysis of variants in the road design”, incorporating environmental issues into the design process and providing the methodology for the analysis of alternatives, taking into account the impact that each lead on the environmental factors.
- "Design of roads in environmentally sensitive areas", which establishes the planning strategy for this type of road and areas and the geometric design parameters on the basis of the ability of the host territory.”

2.3. Japan

The Japanese national report mentions when signing the Kyoto Protocol in 1995 “Japan set the goal of restricting CO₂ emissions originating from energy in the transportation sector to an increase of about 10–12 percent from the 1990 level during the same period. As for medium- and long-term CO₂ reduction targets, Japan set the goal of reducing greenhouse gases emissions by 25 percent from 1990 levels by 2020. That target, however, is being debated.” Japan considers balancing economic growth with reducing CO₂ emissions to be a vital issue.

Japan's total CO₂ emissions during FY 2008 were 1,214 million tons. Of this, the transportation sector emitted about 235 million tons, or 19.4 percent with a decrease since 2001.

Japan has undertaken a comprehensive approach in the transportation sector to reduce CO₂ emissions through fields such as automobile technologies, public transportation, road structure, and urban planning. Among these measures are:

- Improved traffic flow by removal of bottlenecks, use of ITS, construction of ring roads;
- Promotion of eco-driving;
- Improved fuel economy of individual through the development of technologies and next-generation automobiles in response to higher fuel economy standards;
- Encouragement of modal share by enhancing the convenience of public transportation and upgrading environments for cycling in order to promote the shift of passenger travel from automobiles to public transportation and bicycles;
- More efficient and greener freight transportation;
- Traffic demand management to transform automobile traffic by reducing congestion and the needs for travel in conjunction with urban planning.
- Improvement of data collection for the estimate of CO₂ emissions.

2.4. Norway

Norway has recently reassessed its policy and targets regarding emissions reductions in the transport sector and decided that “the emissions of CO₂es should be reduced by levels exceeding the levels Norway has committed to through the Kyoto Protocol with 10 percent. In total, Norwegian emissions are to be cut with 15 – 17 million tonnes of CO₂ equivalents by 2020, so that domestic emissions do not exceed 45-47 million tonnes CO₂ equivalents in 2020. Emissions from the transport sector are to be reduced with 2.5-4 million tonnes.”

The estimated costs of the measures considered are mainly less than NOK 1 500/tonne, but some are substantially higher.

In order to achieve the targets the report states that it will be “necessary to use taxes, invest in infrastructure, provide information about and introduce incentives to promote technical solutions and environmentally friendly transport. There appears to be considerable potential for the introduction of new vehicle technology such as electricity and possibly also hydrogen, and a higher share of renewable bio fuels. However, it takes a long time to develop new technology and to replace the Norwegian vehicle fleet, so technology based

on petrol and diesel will continue to account for the bulk of the vehicle fleet in 2020. There is a considerable potential for replacing the vehicle fleet and for zero-emission and low-emissions vehicles by 2030 and 2050.”

The measures with the highest potential for CO₂e emission reductions are discussed in the report and include:

- the use of bio fuels;
- doubling the share of bicycles by building an interconnected main network for bicycle traffic in towns and built-up areas with more than 5 000 inhabitants;
- increasing the efficiency of passenger cars;
- the use of car tyres with lower rolling resistance;
- electrification of the vehicle fleet. A scenario has been developed for the introduction of a recharging infrastructure which assumes that there are public recharging stations for 15 per cent of the plug-in cars that are sold up to 2020 and 2030 and a limited high-speed recharging network;
- increased efficiency in delivery vans and heavy vehicles;
- improved public transport in the six largest cities;
- ecological driving.

The following chapter of the report discusses some of the policy instruments which may be used to implement these measures:

- economic instruments
- regulatory instruments
- information, expertise and R&D (research and development)”

“The effects of the instruments will vary through the introduction phases of the measure and on into an operations phase, and will be influenced by market and technological developments, so that there may be a need to adjust the use of instruments along the way.”

2.5. Portugal

The Portuguese national report starts with a brief description of the road transport sector in Portugal, including the Portuguese national road network as well as the organization and management of the national road network. Then, the report goes on describing the tolling system put in place already in 1995, and its name is “Via Verde” implying that it is a “green road” system. Only the Portuguese motorways are tolled.

Portugal in the year 1990 still had a comparatively low motorization and was not as industrialized as other EU countries which meant it had the opportunity to increase their share of GHGE up to 1990 levels, according to the Kyoto Protocol. However, “In 1998, the year after the adoption of the Kyoto Protocol, the Portuguese GHGE were already 28.8% above the 1990’s level and according to the report that number had increased to 33.6% in 2010.

When it comes to the construction of new motorways and trunk roads in Portugal the report states that “Portugal had in the last two decades a specific development path which

somehow is different from other major European countries. The country had to make a very important effort to recover from its lower patterns of development and achieve levels similar to those of Europe. This implied the construction of hundreds kilometres' (started in the '90s and still not completed) of new high quality roads (motorways and trunk roads)". "The simultaneous development on road accessibilities together with the generalized improvement of the purchasing power of families that occurred in the '90s implied an explosion on private cars acquisition and consequently a huge increase in mobility patterns".

To deal with this issue "the Portuguese Environmental Agency (APA) has been preparing the ground and taking measures to mitigate and reduce the overall GHGE." The policy strategy is supported by three major policy tools.

"The first one is the National Climate Change Programme (PNAC). This programme is in continuity with the European Climate Change Programme and all the major mitigation measures taken in all the responsible sectors of activity. The second tool applies only to major fixed carbon sources (heavy industry and similar)". The third tool, according to the report, is the Portuguese Carbon Fund (FPC) which "began operating in 2006 and is a trading mechanism allowing the investment on national and external projects which represent reductions on GHGE". The report states that these reductions can be incorporated into the Portuguese overall balance equation of CO₂e.

"The report shows that it is very likely that Portugal can fully realize the Kyoto targets, using the Portuguese Carbon Fund". However, in the report it is assumed the there will be a post-Kyoto Protocol with more strict commitments until 2020 and "then Portugal must have an even more proficient attitude about the subject".

2.6. Spain

"In Spain, the GHG emissions from transport activities exceeded the equivalent of 108 million tons of CO₂ in 2006, which is 25.4 per cent of the total greenhouse gases emission. Although this is much less than industry which causes 50% of emissions, it far exceeds that of agriculture, the sector which produces the third highest amount of greenhouse gas emissions.

This figure represents an increase of 88 per cent with respect to the millions of tons of CO₂ produced in 1990. This increase is directly related to the notable growth in demand, which has translated into the weight of the sector in emissions passing from 21.4 per cent in 1990 to the previously mentioned 25.4 per cent in 2006. With respect to the modal share, road transport is the cause of 89.2 per cent of emissions."

The main actions of the Spanish Public Services organizations to reduce the greenhouse gas emissions are carried out by means of planning instruments: Strategic Plan of Infrastructures and Transports 2005-2010 and their Action Plans, and the Renewable Energies Plan 2005-2010."

The report presents the evolution of energy consumption and the emission of contaminants due to road transport since 1990.

The report considers GHG emissions can be reduced by measures taken in the following different areas:

- Planning of the infrastructures;

- Design of the infrastructures;
- Construction of the infrastructures;
- Use of the infrastructures;
- Vehicles and fuels;
- Management of traffic demand;
- Traffic information.

“The predictions for 2020 about the total number of cars in Spain indicates a gradual rejuvenation with a reduction of 30 per cent of light petrol vehicles and a growth of 80 per cent of the total diesel vehicles, which would make the percentage of the light petrol vehicles go from 61 to 100 in 3004 to 30 per cent in 2020. The possible sudden inrush of electric cars, which is foreseeable especially in urban settings, has not been taken into consideration.”

The optimization in the use of existing infrastructures is looked for by means of demand management measures, which with reference to the road are based on:

- The improvement of accesses and transports services of public transport to terminals of different means.
- Construction of roads reserved for public transport and busy roads.
- Provision of parking for unused vehicles in metropolitan stations.
- Limitation of vehicle speed in order to reduce the energy consumption.
- Modernization and renovation of fleets of vehicles.

In its last section, the report presents a few examples of innovations in materials and technologies for road construction which participate in the reduction of the impact on climate change and are being encouraged by the Traffic Department of the Ministry of Public Works:

- Use of powder from out-of-use tyres in binders and bituminous mixtures;
- Recycling of road surfaces;
- Tepid and warm bituminous mixtures;
- Cold micro-mixtures.

2.7. The United Kingdom

The UK national report compiles information from the four transport organizations existing in Wales, Northern Ireland, Scotland, and England with respect to mitigating the climate change impacts on the trunk road network during design, construction, operation and maintenance.

The devolved governments of the UK operate within a unifying legislative and policy agenda established by the UK Government. The Government has adopted a strategic framework for managing climate change impacts in the UK, which provides the foundation from which all four administrations must operate.

Relevant policy instruments include:

- Climate Change Act 2008*

This legally binding Act creates a new approach to managing and responding to climate change across the UK, by setting ambitious targets for an 80% reduction in the UK's greenhouse gas emissions below 1990 levels by”.

- Low Carbon Transport: A Greener Future – A Carbon Reduction Strategy for Transport Report shows how the UK intends “to meet the requirements of the carbon budgets set under the Climate Change Act, and sets actions that the DfT will take to deliver those emissions cuts. The strategy describes how 85 million tonnes of CO2 from domestic transport can be saved from 2018-22 by supporting a shift to new technologies and fuels, promoting lower carbon choices and using market mechanisms to encourage a shift to lower carbon transport.”

- Transport Carbon Reduction Delivery Plan

This plan aims to fulfil the commitments made in ‘Low Carbon Transport: A Greener Future’, by detailing who will deliver the carbon reduction policies and how. Alongside the accompanying ‘Climate Change Adaptation Plan for Transport 2010-12’, the document provides a detailed action plan to tackle climate change in the transport sector.”

Other important national legislation which impacts upon the agencies includes the Low Carbon Transition Plan – the national strategy for moving towards an energy efficient, low carbon economy and reducing carbon emissions by 34% by 2020 in all private and public sectors of the UK, compared with 1990 levels.

The 2008 Strategy for Sustainable Construction furthermore commits to a range of construction-related targets, including for 25% of construction materials to be “responsibly sourced” by 2012.

The report presents the main features of the approaches of the four administrations. Commonalities between the four approaches include:

- Identification of materials and waste as significant sources of embedded carbon, and the need to manage these areas of road design and construction;
- Identification of modal shift towards lower carbon travel options (walking, cycling, public transport) as a key method to reduce transport emissions, and the need to provide facilities to support this shift; and
- Identification of the potential for new technologies to achieve emissions reductions, via mechanisms including Intelligent Transport Systems, electric vehicles, and on-site renewable energy generation.

2.8. The United States

Under the Copenhagen Accord, the United States submitted to the United Nations Framework Convention on Climate Change its intention to reduce greenhouse gas (GHG) emissions 17% by the year 2020. For the US government the overall target has been set to a 28% reduction by 2020.

Individual US States have the legislative ability to set their own approaches on greenhouse gas mitigation and adaptation. By November 2009, 30 States had developed climate action plans and 24 of these had set greenhouse gas reduction targets. Another three had plans under development.

US transportation alone constitutes about five percent of global emissions and account for 29 percent of all US GHG emissions. Light duty vehicles, buses, motorcycles and freight trucks represent almost 79 percent of all transportation emissions. Road transport emissions are about 1,466 mmt CO₂e annually.

The report presents the different strategies for the US to reduce GHG emissions including:

- Improving the fuel efficiency of vehicles;
- Alternative and renewable fuels;
- Transportation planning and funding;
- System efficiency measures (such as reduction of congestion, eco-driving, real-time traveller information, higher limits for truck size and weight...);
- Demand management strategies (alternatives to driving alone, pricing/market measures);
- Construction through the use of less energy-intensive construction materials
- Research and development in particular in the areas of new fuels and propulsion systems.

The effectiveness of these strategies varies “with fuel efficiency and renewable appearing to be of higher effectiveness. Other measures such as system efficiencies and demand management may be more effective as new more comprehensive measures are tried and used in combination with one another”.