OECD Guidelines towards Environmentally Sustainable Transport

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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Pursuant to Article 1 of the Convention signed in Paris on 14th December 1960, and which came into force on 30th September 1961, the Organisation for Economic Co-operation and Development (OECD) shall promote policies designed:

- to achieve the highest sustainable economic growth and employment and a rising standard of living in member countries, while maintaining financial stability, and thus to contribute to the development of the world economy;
- to contribute to sound economic expansion in Member as well as non-member countries in the process of economic development; and
- to contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations.

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Foreword

Conventional approaches to mitigating transport's environmental impacts have taken observed and projected transport trends as givens and have sought to assess the environmental impact of these developments ex-post. This approach has led to important efficiency gains and has helped to reduce certain environmental and health risks stemming from the transport sector. It has not – and likely will not – , however, lead us towards meeting long-term environmental objectives.

A new policy approach is needed which places environmental criteria up front along with other policy goals. Recognising this need, the OECD Environmental Policy Committee's Task Force on Transport initiated in 1994 the project on E*nvironmentally Sustainable Transport* (EST) to give some precision to the concept through the use of criteria which can be quantified and have environmental significance. The overall objectives of the project are to provide an understanding of EST, its implications and requirements, and to develop methods and policy guidelines towards its realisation. The core of the EST approach is to develop long-term scenarios and identify instruments and strategies capable of achieving Environmentally Sustainable Transport as part of overall efforts to achieve sustainable development. Unlike conventional approaches to transport system development, the EST project is a *backcasting exercise*. One or more desirable futures are described and policy development is guided by an assessment of what is required to achieve these visions.

At the 1998 Environmental Ministerial meeting, a set of Shared Goals for Action were adopted as an expression of OECD Environment Ministers' commitment to implement sustainable development. This is part of a larger OECD initiative on sustainable development. In the pursuit of the Shared Goals, Ministers agreed to strengthen international co-operation in meeting global and regional environmental commitments by "*giving particular focus to key cross-sectoral issues and the strategic directions for environmentally sustainable transport developed at the* OECD *Vancouver Conference and the* UNECE *Conference on Transport and the Environment in Vienna*". Ministers called for the OECD to "*further develop work on environmentally sustainable transport* (EST), *including guidelines for implementing* EST *principles, and paying particular attention to the recommendations of the Vienna Declaration on Transport and the Environment*".

This co-operation has resulted in a forward looking and encouraging project, whose findings can assist other countries in their progress towards sustainable transport. A set of guidelines for moving towards EST has also been developed to give some practical and detailed suggestions on how to move towards EST. The EST Guidelines have been endorsed by OECD Environment Ministers at their Ministerial Meeting in May 2001. The results of the project will continue to stimulate and frame efforts within the OECD to develop innovative policy approaches for sustainable transport activity.

This report has been prepared an approved by the OECD's Environmental Policy Committee's Working Group on Transport. It is published on the responsibility of the Secretary-General to the OECD.

Acknowledgements

The work has been carried out by six teams of experts from nine countries, each with a separate geographical focus. The case studies include Sweden, the Netherlands, Germany, the Quebec-Windsor corridor in Canada, the greater Oslo region in Norway and the Alpine region comprising parts of Austria, France, Italy and Switzerland. Related studies have been undertaken by Japan and jointly by UNEP, the OECD and Austria, under the Central European Initiative (CEI) for fourteen Central and Eastern European economies in transition.

The OECD would like to acknowledge the contribution and support from numerous government officials and experts from member countries and international organisations involved in this project. In particular, the wealth of information and experience gathered throughout this project would not have been possible without the productive co-operation and commitment of the project teams in the participating countries and from the following individuals.

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Executive Summary

Transport at the turn of the century displays several unsustainable trends. Continued growth in the number of motorised vehicles and their use places major burdens on the availability of natural resources, notably oil. Emissions from the burning of motor vehicle fuel contribute to global and local damage to ecosystems and human health. Other concerns related to the use of motorised transport include traffic accidents, high noise levels that harm human health, and land use patterns that interfere with habitat, migration patterns, and ecosystem integrity.

The OECD's project on Environmentally Sustainable Transport (EST) was undertaken to help respond to these trends and make transport sustainable. Nine countries contributed to six case studies. EST was defined, envisioned, and then quantified in terms of internationally agreed standards for ecosystem and human health. Six EST criteria-for noise, land use, and emissions of carbon dioxide, nitrogen oxides, volatile organic compounds, and particulate matter – were set for the year 2030 in relation to conditions in 1990. The teams developed EST scenarios consistent with the criteria and also "business-as-usual" (BAU) projections for 2030.

Both the BAU and EST scenarios were characterised by high levels of access to people, goods and services in comparison to 1990. In the case of the EST scenario, however, providing for this high level of access was accomplished with less overall travel volume, especially in regards to freight transport. The EST scenarios involved more use of public transport and new mobility services and less travel by cars and aircraft for passenger transport. For freight transport, the EST scenarios indicate improved supply chain management and more movement of freight by rail than by road. The EST scenarios were assessed in relation to the BAU projections to determine how the most stringent EST criterion – an 80-per-cent reduction in total carbon dioxide emissions from transport – was to be achieved. The assessment suggested that about half of the reduction would result from improvements in technology and half would result from changes in transport activity.

Working back from the EST criteria (backcasting), the project teams developed packages of policy instruments considered capable of securing the attainment of EST. The instrument packages differed greatly among the teams,

suggesting that there are many potential routes to EST. Work was also undertaken to identify some of the economic and social implications of moving towards EST rather than continuing with "business as usual". The overall impacts of moving towards EST would appear to be positive: economies would remain robust, society's costs would be lower, and there could be social advantages.

EST is an appealing, achievable objective that will require a broad-based and concerted commitment. Reaching EST will ensure that the transport sector plays its role in the quest for sustainable development. The most important challenges for the attainment of EST concern well-tuned phasing of implementation strategies and their component policies and instruments as well as the involvement of stakeholders from government, industry, non-governmental organisations and the public. Another important challenge for achieving EST concerns tailoring the project findings to various, regional situations and focusing on high growth sectors, such as freight, aviation and leisure traffic. Finally, an objectives-based approach, as for the EST project, serves as a promising model for other sectors.

The EST Concept and Approach

1. A New Policy Approach is Required

Policy development can be shaped in the light of present circumstances or future goals. In the former case, forecasts based on current trends provide the basis for determining what may be required to accommodate or counteract those trends. In the latter case, goals are set and there is a working backwards (backcasting) from the goals to determine what must be done to reach them. The former kind of policy development results in doing what is possible to avoid an unwanted future. The latter kind results in doing what is necessary to achieve a wanted future.

Policy development often involves both approaches, although usually with more emphasis on present circumstances than on goals for the future. An emphasis on present circumstances is especially true of transport policy-making. Conventional approaches to transport's environmental impacts have taken observed and projected trends in transport activity as givens and have sought to assess and mitigate the environmental impacts of these developments. This approach has led to important efficiency gains and has helped to reduce certain environmental and health risks stemming from the transport sector. It has not led – and likely will not lead – towards attainment of long-term environmental objectives.

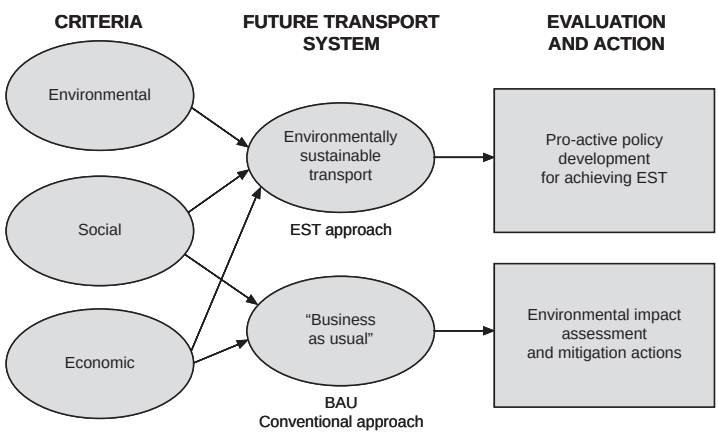
The conventional approaches are appealing because transport presents so many challenges for policy-makers. Effective motorised transport has become a central feature of life in OECD countries, associated for the most part with progress, efficiency, and great convenience. Attempts to change what appears so desirable are accordingly met with strong resistance. Conventional approaches offer the promise of mitigation of growing costs while providing little restraint on growth in transport activity, thereby softening some of the resistance to action. The problem with such approaches is that the resulting mitigation is usually insufficient to offset the increased costs resulting from continuation of trends in transport activity.

It is time for a new approach to transport policy-making, which can be called the environmentally sustainable transport (EST) approach. It involves three important steps. The first is to set out scenes or scenarios of what transport will be

like when it is environmentally sustainable. The second is to characterise EST in terms of quantifiable targets for transport activity and the environmental impacts of each unit of activity. The third is to engage in backcasting exercise that involves working back from these targets to present conditions to determine what actions are required to ensure that the targets are met. This kind of goal-directed approach characterises much business activity and has been used with success to address environmental considerations in other sectors, notably electricity generation.

There are three key differences between the EST approach and conventional approaches. The first is that the goals of the EST approach are consistent with specific requirements of sustainable development. Other approaches may do little more than acknowledge the desirability of moving towards sustainable development. The second difference is that the EST approach attempts to address the totality of transport's environmental impacts. Other approaches tend to focus only on reducing the impacts per unit of transport activity, leaving unconsidered the growth in impacts resulting from growth in activity. The third difference follows from the second. It is that the selection of measures or instruments required to secure attainment of EST of necessity includes consideration of the need to restrain growth in the most environmentally damaging forms of transport activity. Other approaches often seem based on the assumption that sufficient mitigation of impacts can be secured by a focus on such measures as emissions control, use of better fuels, and improvements in engine efficiency. Some of the differences between the two approaches are summarised in Figure 1.

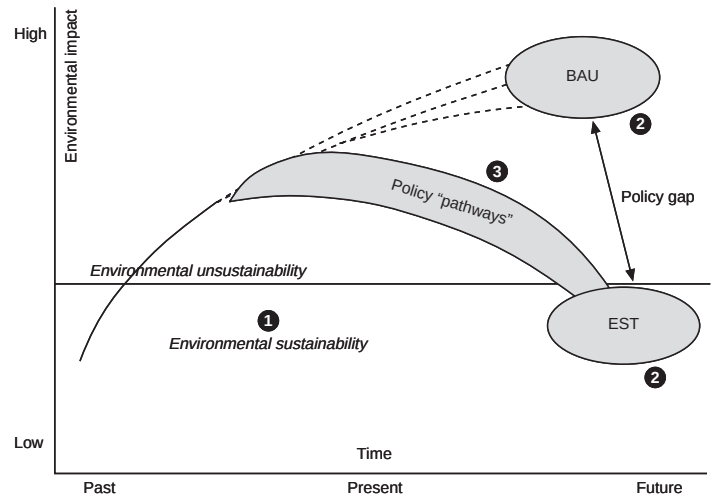
Figure 1. **Comparison of the EST approach and the conventional approach to transport policy-making**



Source: OECD (1996), OECD (1998).

The EST approach, based on backcasting from a desirable future, may be capable of generating the fresh policy directions needed if transport is to become environmentally sustainable. Moreover, because such methods highlight discrepancies between current trends and desirable futures, they may be capable of generating the motivation needed to impement fresh policy directions, and to overcome the "policy gap" illustratled in Figure 2.

Figure 2. **Bridging the policy gap**



Source: OECD (1998), OECD (2002).

In the long-term, the potential to influence development in desired directions is relatively large. Major obstacles to important changes are often perceptions of what is possible or reasonable to achieve based on current situations. The EST scenarios of a backcasting exercise are not limited by the constraints of current policies. They can therefore broaden the scope of solution-finding.

2. The OECD's EST Project

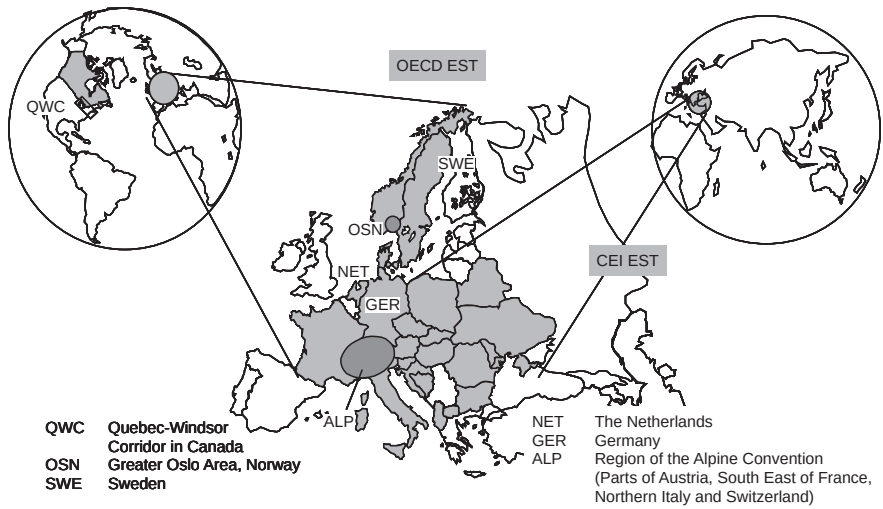
2.1. *Purposes and overview of the* EST *project*

A new policy approach is needed that places environmental considerations in the forefront with other policy goals. Recognising this need, the OECD Environmental Policy Committee's Working Group on Transport initiated the project on

Environmentally Sustainable Transport (EST) in 1994 with two broad purposes in mind. The first was to give some precision to the concept of EST through the use of criteria that have environmental significance and can be quantified. The second was to develop guidelines for the attainment of EST that could be of use to governments in OECD countries and others.

Teams from nine countries undertook six case studies to determine how EST might be achieved. They concerned respectively the whole countries of Sweden, The Netherlands, and Germany, as well as the Quebec-Windsor corridor in Canada, the greater Oslo region, and the Alpine region comprising parts of Austria, France, Italy, and Switzerland. The study areas are shown in the map in Figure 3.

Figure 3. **Map of EST study areas**



Source: OECD (1998), OECD (2002).

The EST project comprised several phases:

Phase 1, completed during 1996, involved a review of relevant activities of member countries, and establishment of a definition of and criteria for EST. [1]

Phase 2, completed during 1998, involved the development by the teams of a "business-as-usual" (BAU) scenario and three scenarios consistent with the EST criteria, all for 2030. For EST1, transport activity was set at the BAU level and the criteria were met through improvements in technology. For EST2, technology was

set at the BAU level and the criteria were met through reductions in transport activity. For EST3, the criteria were achieved through each member country team's preferred combination of improvements in technology and reductions in transport activity.[2] How the three EST scenarios related to the BAU scenario is illustrated in Figure 4.

Figure 4. **Definition of the three EST scenarios used in the EST project**

	EST1	EST2	EST3
Technology development	>> BAU	= BAU	> BAU
Transport activity	= BAU	<< BAU	> BAU

Source: OECD (1998).

Phase 3, completed in early 2000, had two main elements: 1) to work out how the EST3 scenario might be reached, *i.e.*, which instruments could be deployed by governments to reach EST3; and 2) to examine in a preliminary way the social and economic implications of the BAU and EST3 scenarios and of deploying the instruments used in their attainment.[3]

Phase 4, completed in 2000, involved development of draft guidelines that could be used by governments in OECD countries and others for moving their transport systems towards EST. It also involved reconsideration of the criteria for EST and the characterisations of EST that flow from the criteria.

A project taking the same approach has been completed for Central and Eastern European countries through a joint Austrian, United Nations Environment Programme, and OECD effort.[4] It examined current and projected transport trends and the challenges involved in moving towards EST within an economic setting that differed from those of OECD countries. Several promising options and strategies for the attainment of EST in these countries were identified.

2.2. *Characterising Environmentally Sustainable Transport*

The term *sustainable development* was introduced in 1980, popularised in the 1987 report of the World Commission on Environment and Development (the Brundtland Commission), and given the status of a global mission by the United Nations Conference on Environment and Development (UNCED) that met in Rio de Janeiro in 1992.[5] The global mission involves achieving sustainability in all sectors of human activity, including transport.

The Brundtland Commission defined *sustainable development* as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".[6] The definition implies that the movement of people and goods should occur in ways that are environmentally, socially, and economically sustainable. The present work has focused on the need for ensuring that transport is environmentally sustainable. The requirements for social and economic sustainability have not been neglected, but their full exposition requires further work.

Environmentally sustainable transport (EST) is above all transport that functions within the limits set by nature. At an early stage, participants in the EST project defined an environmentally sustainable transport system as one where:

> *Transport does not endanger public health or ecosystems and meets needs for access consistent with* a) *use of renewable resources below their rates of regeneration, and* b) *use of non-renewable resources below the rates of development of renewable substitutes.*[7]

More specifically, a sustainable transport system is one that throughout its full life-cycle operation:

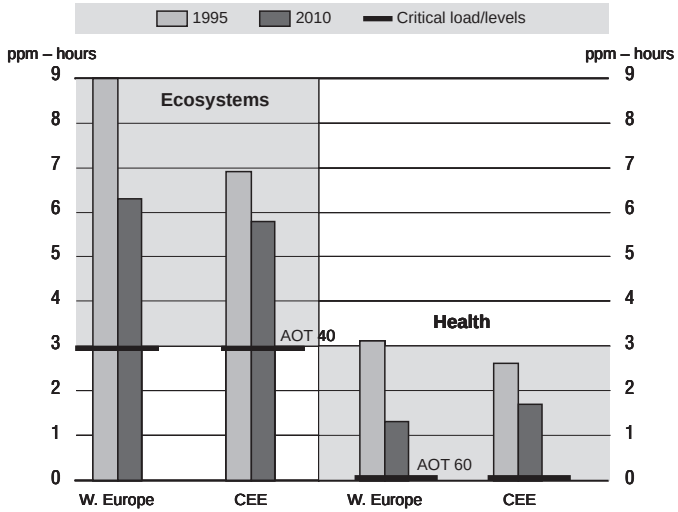
- allows generally accepted objectives for health and environmental quality to be met, for example, those concerning air pollutants and noise proposed by the World Health Organization (WHO);
- is consistent with ecosystem integrity, for example, it does not contribute to exceedence of critical loads and levels as defined by WHO for acidification, eutrophication and ground-level ozone; and
- does not result in worsening of adverse global phenomena such as climate change and stratospheric ozone depletion.

Internationally agreed goals, guidelines, and standards were used to operationalise this definition and to set EST criteria and thus reduction targets. They included those proposed by WHO and adopted in the Convention on Long-Range Transboundary Air Pollution (United Nations Economic Commission for Europe, UN ECE) and the UN Framework Convention on Climate Change.

Examples of the considerations involved in the setting of EST criteria are provided in Figure 5 (ozone) and Figure 6 (acidification and eutrophication).[8] In both boxes it can be seen that although reductions in pollution are expected they will be insufficient to bring levels below the respective critical loads.

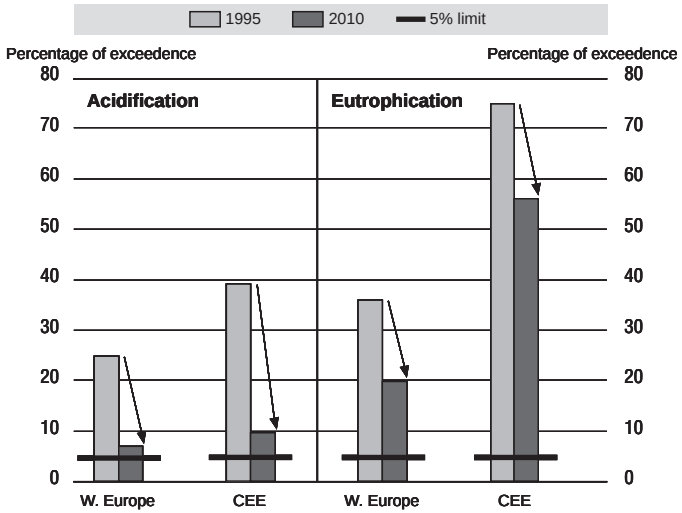
Six criteria were identified during the first phase of the EST project as being the minimum number required to address the wide range of health and environmental impacts from transport. The criteria were selected so that local, regional, and global concerns would be addressed, specifically noise, air quality, acidification and eutrophication, ground-level ozone, climate change, and land use.

Figure 5. **Exceedences of critical loads for sensitive ecosystems: assessment of ground-level ozone for ecosystems and human health, Europe, 1995 and 2010**



Source: EEA (1999), IIASA (1998).

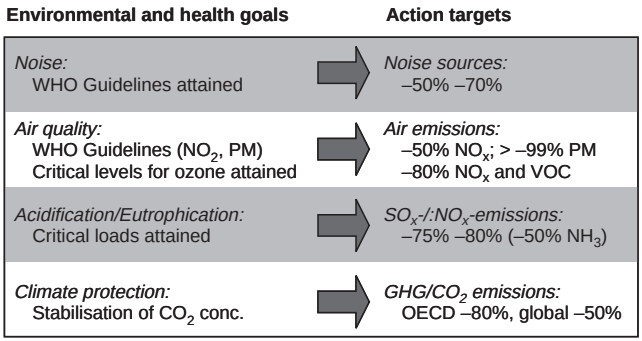
Figure 6. **Exceedences of critical loads for sensitive ecosystems: assessment of degrees of acidification and eutrophication, Europe, 1995 and 2010**



Source: EEA (1999), IIASA (1998).

The EST criteria (targets) were expressed relative to respective 1990 values. Good data were available for 1990 for all the study areas. Criteria were expressed relative to 1990 values to allow their ready application across jurisdictions. Common criteria were set with respect to four of the six areas selected; individual project teams developed their own criteria for noise and land use. The development of the criteria is illustrated in Figure 7, and the specific criteria are set out in Figure 8.

Figure 7. **Operationalising EST criteria**



Source: OECD (1996), OECD (1998).

The year 2030 was chosen as the target date for attainment of EST. The date was a compromise between avoidance of as much as possible of the cumulative adverse effects of transport (which spoke to an earlier date) and allowing enough time for effective action (which spoke to a later date). Because of the distance of the target date from the present, the establishment of intermediate targets (milestones) was considered essential.

There was some arbitrariness in the selection of the base year, in the use of relative criteria, and in the target date. These matters were determined in order to proceed with the project. Review during the course of the project left them essentially unchanged.

2.3. *Visions of transport in* 2030

The first task of the project teams was to develop "business-as-usual" scenarios for the respective study areas. The emissions aspects of these scenarios are shown in Figure 9.[9] The box shows that in each study area local and regional emissions (nitrogen oxides, volatile organic compounds, and fine particles) are expected to decline, but not enough to meet the respective criteria. Emissions of carbon dioxide are expected to increase, *i.e.*, their trend is in the opposite direction from the CO_2 criterion.

Figure 8. **Quantification of EST criteria**

CO_2
Climate change is prevented by reducing carbon dioxide emissions so that atmospheric concentrations of CO_2 are stabilised at or below their 1990 levels. Accordingly, total emissions of CO_2 from transport should not exceed 20% to 50% of such emissions in 1990 depending on specific national conditions.[1]

NO_X
Damage from ambient NO_2 and ozone levels and nitrogen deposition is greatly reduced by meeting WHO Air Quality Guidelines for human health and eco-toxicity. This implies that total emissions of NOx from transport should not exceed 10% of such emissions in 1990.[2]

VOC_s
Damage from carcinogenic VOCs and ozone is greatly reduced by meeting WHO Air Quality Guidelines for human health and ecosystem protection. Total emissions of transport-related VOCs should not exceed 10% of such emissions in 1990 (less for extremely toxic VOCs).[2]

Particulates
Harmful ambient air levels are avoided by reducing emissions of fine particulates (especially those less than 10 microns in diameter). Depending on local and regional conditions, this may entail a reduction of 55% to 99% of fine particulate (PM_{10}) emissions from transport, compared with 1990 levels.[3]

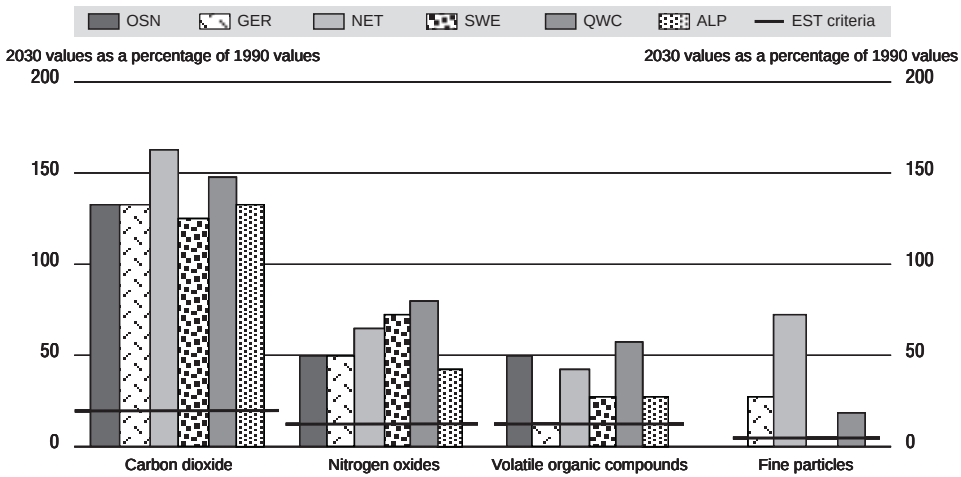
Noise
Noise from transport no longer results in outdoor noise levels that present a health concern or serious nuisance. Depending on local and regional conditions, this may entail a reduction of transport noise to no more than a maximum of 55 dB(A) during the day and 45 dB(A) at night and outdoors.[4]

Land use/Land take
Land use and infrastructure for the movement, maintenance, and storage of transport vehicles is developed in such a way that local and regional objectives for air, water and eco-system and biodiversity protection are met. Compared to 1990 levels, transport activity will likely entail a smaller proportion of land devoted to transport infrastructure. Compared to 1990 levels, this will likely entail the restoration and expansion of green spaces in built-up areas.[5]

1. The Second Assessment Report of the Intergovernmental Panel on Climate Change (1996) maintains that, in order to stabilise atmospheric CO_2 concentrations at near current levels, world-wide CO_2 emissions would need to be reduced by 50% to 70% with further reductions thereafter (IPCC, Second Assessment Report, page xi, Intergovernmental Panel on Climate Change, 1996). In order to allow for increases in emissions in developing countries, OECD countries should reduce their emissions by 80% or more so that a global reduction of 50% may be attained (OECD, Environmental Criteria for Sustainable Transport, OECD Environment Directorate, Paris, France, 1996). A reduction target of 50% might be more appropriate for certain countries that benefit from a favourable (*e.g.* a more environmentally friendly modal split) as was suggested by the EST pilot study for the countries of the Central and Eastern European region.
2. These criteria are set in line with the WHO guidelines for human health regarding NOx, VOC's and Ozone (WHO, 1996) and the UNECE protocols under the Convention on Long-Range Transboundary Air Pollution for ecosystem protection regarding critical loads for nitrogen deposition and critical levels of ozone (UNECE, LRTAP Convention, 1999).
3. The WHO advises that no safe threshold level can be set for fine particulate matter (smaller than PM_{10}) and ultrafine particles (smaller than $PM_{2.5}$) below which health effects (including cancer) do not occur.. However, countries should set targets based on dose-effect considerations. The targets set here are preliminary due to the ongoing research on the health effects from ultrafine particulate matter (WHO, Air Quality Guidelines, World Health Organization Regional Office for Europe, Copenhagen, Denmark, , Geneva, 1998).
4. This criterion is based on the former WHO recommendation on noise that has been recently updated in the WHO Guidelines for Community Noise (WHO, Guidelines for Community Noise, World Health Organization, Geneva, 1999).
5. The quantification of the land use criterion will require further research

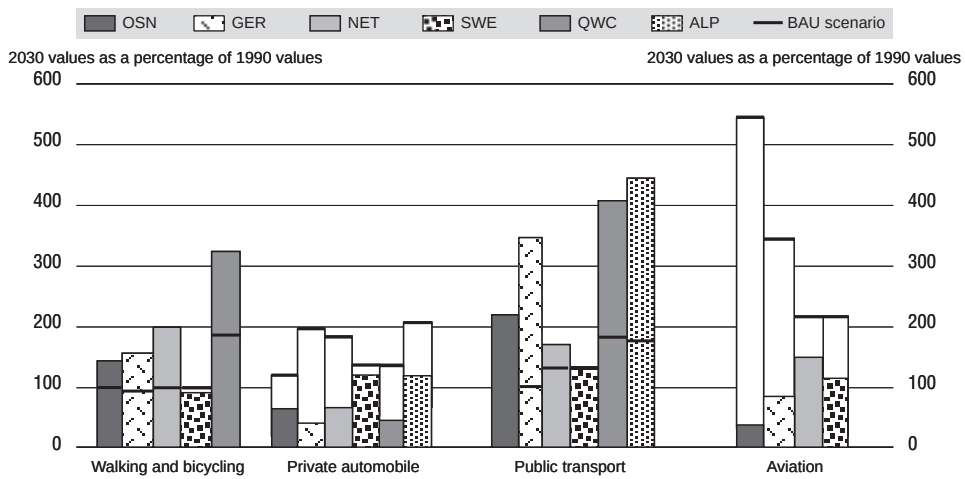
Source: OECD (1996), OECD (1998).

Figure 9. **"Business-as-usual" projections (BAU) of transport emissions in the six EST project study areas**



Source: OECD (1998).

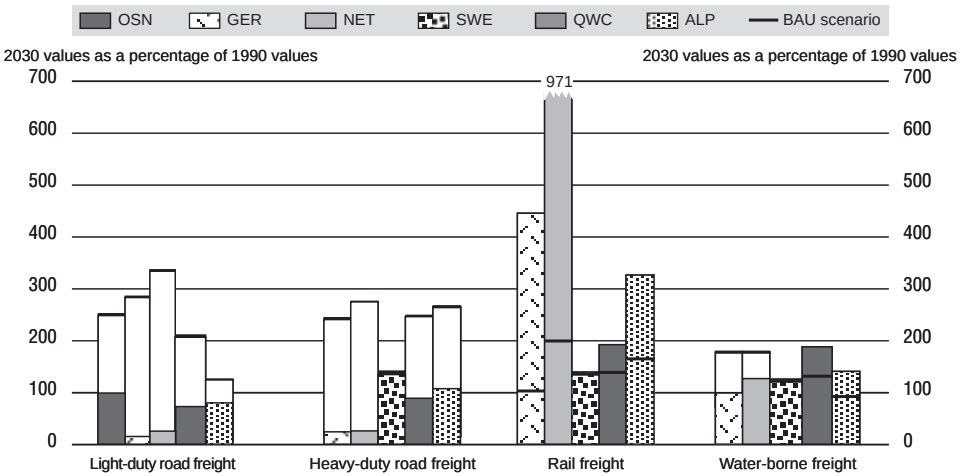
Figure 10. **Passenger transport activity by mode in 2030 for the EST3 scenarios, as compared with expected trends (BAU scenarios)**



Source: OECD (1998).

Environmentally sustainable transport in 2030 will, by definition, meet the six EST criteria. In developing a vision of such a system, two alternate scenarios were explored: the first focused on reaching the EST criteria solely through technological means; the second relied on restraining transport activity. Working EST scenarios-known in the project as the EST3 scenarios – were constructed by the project teams by combining some of the most promising, available, and tested features of the technology-only scenarios with the more politically acceptable features of the demand-side management-only scenario. Transport activity in the EST3 scenarios is shown in Figure 10 (passenger transport) and in Figure 11 (freight transport).

Figure 11. **Freight transport activity by mode in 2030 for the EST3 scenarios, as compared with expected trends (BAU scenarios)**



Source: OECD (1998).

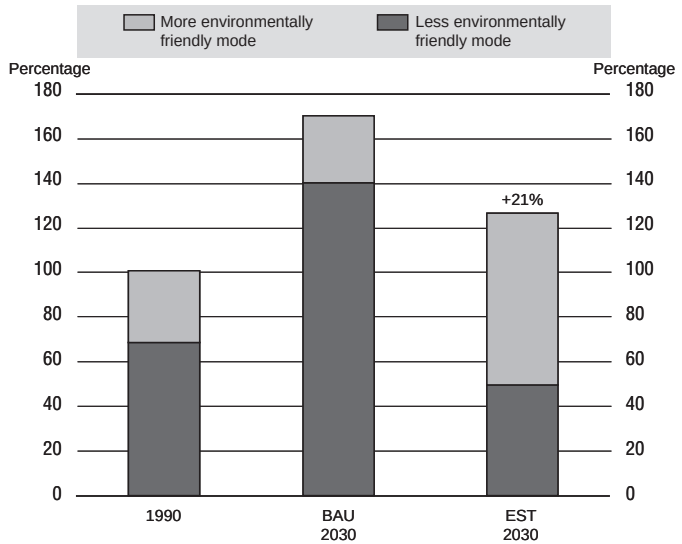
In general, the following features characterised the EST3 scenarios for 2030 (although not all features appeared in each team's scenario):

- There will be a significant decrease in car ownership and use with many cars running on hybrid-electric or all-electric engines, the latter often powered by fuel cells.
- For passenger travel, there will be a focus on reducing the number of long-distance trips and on much greater use of non-motorised means for short-distance trips, with a large increase in the provision of supporting infrastructure for non-motorised travel.

- The amount of long-distance freight traffic will be significantly reduced by improved logistics (resulting in higher load factors), and by greater use of rail-based modes; hydrogen will be widely used as a fuel for freight transport both directly and in fuel cells.
- There will be much greater availability and use of well-integrated public transport – including new forms of mobility such as "public cars"-displacing individual ownership and use of personal motorised vehicles and thereby substantially reducing the health and environmental impacts of passenger travel.
- Rail will be all-electric, with increases in the availability of high-speed rail and in the efficiency and capacity of all rail modes, replacing much use of less environmentally friendly modes, especially for the movement of freight.
- More efficient and less polluting inland and coastal shipping vessels will be used, perhaps using hydrogen as a fuel.
- Long-distance air travel will be substantially reduced. Aircraft in use will be more efficient, conventional types. Rigid airships may be used for specific purposes.

Figure 12 provides an overall comparison of transport activity (except aviation) in the EST3 and BAU scenarios. Compared with 1990 levels, transport activity increases in both scenarios, although less for the EST3 scenario. A significant

Figure 12. **Overall comparisons of 1990 activity and that projected for the BAU and EST3 scenarios**



Source: OECD (1998).

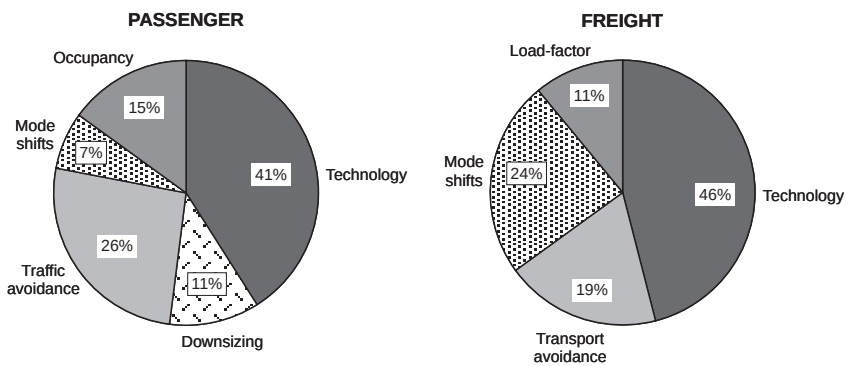
difference between the two scenarios concerns the balance of use of more rather than less environmentally friendly modes, the latter chiefly comprising passenger cars and lorries (trucks). Overall, EST3 achieves a 21-per-cent higher level of transport activity in 2030, compared with 1990, while substantially reducing the use of less environmentally friendly modes.

Figure 13 provides a more detailed analysis of the differences between the BAU and EST3 scenarios. It shows how the reductions in carbon dioxide emissions were achieved for passenger and freight transport, whether by technological improvements resulting in less emission of CO_2 per vehicle-kilometre, on the one hand, or by a variety of other measures, on the other hand. These other measures included reduced transport activity, modes shifts, and higher occupancy (loading). As well as technological improvements to vehicles, fuels, and infrastructure, an estimate was made of the contribution of vehicle downsizing to passenger transport, *i.e.*, the use of smaller, lower-powered vehicles to perform the same tasks.

A significant conclusion from this "balance-of-effort" analysis was that overall the teams constructed their EST3 scenarios so that technological improvements would provide no more than half of the effort required to achieve EST. This seems a likely balance of effort for any realistic approach to attainment of EST.

The teams noted that policies and measures concerning other sectors will support and accompany the shift towards more environmentally sustainable

Figure 13. **Contributions of technological improvements and other measures to the construction of the EST3 scenarios**



Source: OECD (1998).

transport, while not necessarily decreasing economic and social welfare. These measures include among others the following:

- Electric power for transport will be generated with much greater efficiency than at present, using a high proportion of renewable fuels.
- Relatively small changes in the form of settlements will be implemented in order to reduce the need for movement of people and freight.
- Greater use of telecommunications will be made, obviating some passenger travel and movement of goods.
- Regionalisation of production will occur, thereby reducing long-distance freight movement; the overall volume of freight transport will be reduced and there will be a greater focus on service provision.
- Continuing public education campaigns will be implemented to help support lower levels of travel and more environmentally sustainable levels of consumption.

2.4. *Policy instruments and strategies to achieve* EST

Having developed and characterised their EST3 scenarios in Phase 2 of the EST project, the teams then, in Phase 3, worked out how these EST3 scenarios might be reached, *i.e.*, which instruments could be deployed in order to reach EST3. The teams concluded that the EST3 scenarios were sufficiently distant in time and different from present activity to require that the identification of implementation strategies be mostly exercises in informed imagination rather than application of sophisticated modelling techniques.

The basic technique chosen by the project teams was named *structured brainstorming*. It involved iterative identification and assessment of potential instruments and packages of instruments by groups of experts using a consistent methodology.[10] A large number of policy instruments was considered. The proposed packages of instruments included regulations (*e.g.*, concerning emissions of CO_2 and local pollutants), fiscal instruments (*e.g.*, fuel taxes and road pricing, other disincentives and also incentives), and hybrid regulatory-fiscal instruments such as tradable entitlements to emit CO_2 from vehicles. They included policies concerning infrastructure investment and land use planning. Most importantly, they included instruments to raise public awareness about the problems, need for action, and possible solutions.[11]

For the most part the teams concluded that if the CO_2 target were met the other emissions targets would also be met. Thus, there was a strong focus on CO_2 reduction in the selection of instruments. Noise and land-use targets were not necessarily met when the CO_2 target was met – indeed, noise could be worsened- and so separate focuses were needed on these concerns.

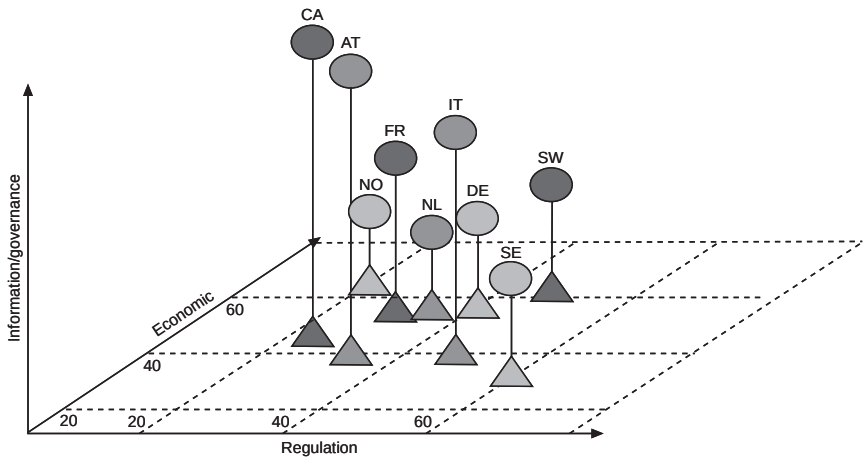
In some cases, instruments applied in isolation were anticipated to have a perverse effect. For example, requirements for vehicle fuel efficiency can cause increases in transport activity and even increases in fuel use because of the resulting reduced costs of transport. Complementary measures – in this case, higher fuel taxes – were applied where appropriate.

Figure 14 provides an overview of the relative emphases placed on regulatory, economic (fiscal), and informational instruments in the instrument packages developed by the six project teams. Each team's package placed some emphasis on each type of instrument, but there were considerable differences among the teams as to how much emphasis was placed on each type of instrument.

The most important aspect of the instrument packages was their phasing. The general strategy adopted by the teams involved late introduction of the more stringent instruments. There was much emphasis early in the implementation periods on deployment of instruments that made later use of more stringent instruments acceptable, chiefly through education but also through judicious use of less stringent instruments.

The teams differed in the extent to which reliance was placed on one or a limited number of instruments. At one extreme was the strategy of The Netherlands

Figure 14. **Broad characterisations of the instrument packages for attainment of EST developed by each of the EST project teams**



Note: The triangle indicates the percentage of regulatory versus economic (financial and fiscal) instruments, and the circle above marks the percentage of educational/governance instruments proposed by the country in the EST case studies; the latter is double enhanced for the display.

Source: OECD (2002).

team, which focused on the eventual use of tradable entitlements to emit CO_2 from transport activities. The team's logic was that only such a flexible method of rationing could be sufficiently effective, and yet sufficiently appealing, to ensure attainment of the CO_2 target. The early part of the implementation period was devoted to paving the way for and making possible the introduction of the tradable permit scheme. The strategy of the Canadian team was at the other extreme. It involved deployment of relatively large numbers of instruments, with further use of those considered to be the most effective. The Canadian team was impressed by the uncertainty of knowledge about how to achieve large changes in transport systems and activity, and emphasised the need for an eclectic approach with a strong evaluation component.

In general, although with many specific exceptions, the instruments included in the teams" packages were: *i*) directed at the movement of people rather than freight, *ii*) regulatory rather than fiscal in nature, *iii*) directed towards achieving mode shifts and favouring non-motorised alternatives rather than towards numerous other objectives, and *iv*) designated as being the responsibility of national or sub-national governments and agencies rather than the responsibility of international agencies, on the one hand, or local or regional governments or agencies, on the other hand. It was recognised that some key instruments nevertheless require co-ordinated international action.

Participants in the EST project also considered barriers to the implementation of EST and gaps in knowledge that need to be bridged. They noted that present transport practices have a formidable momentum that has deep psychological, social, and technological characteristics. Lack of relevant knowledge is itself a major barrier to attainment of EST. There is lack of technical knowledge that could enable needed improvements in vehicles, fuels, and infrastructure. Even more, there is lack of knowledge about human behaviour and societal organisation that could help policy-makers secure needed changes.

The participants concluded that three things are required. One is a better understanding of how to make potential future distress relevant to present circumstances. Another is a more appealing vision of sustainable transportation. The third, following from the first two, is greater interest among the public generally, and transport industries in particular, in moving towards sustainable transportation.

2.5. T*he economic and social implications of* BAU *and* EST

The OECD's EST project focused on how to move towards transport systems that are *environmentally* sustainable. During Phase 3 of the project, consideration was also given to social and economic factors to provide a preliminary assessment of the broader implications of EST and, more specifically, to help with the identification of instruments. In respect of the latter point, instruments were chosen

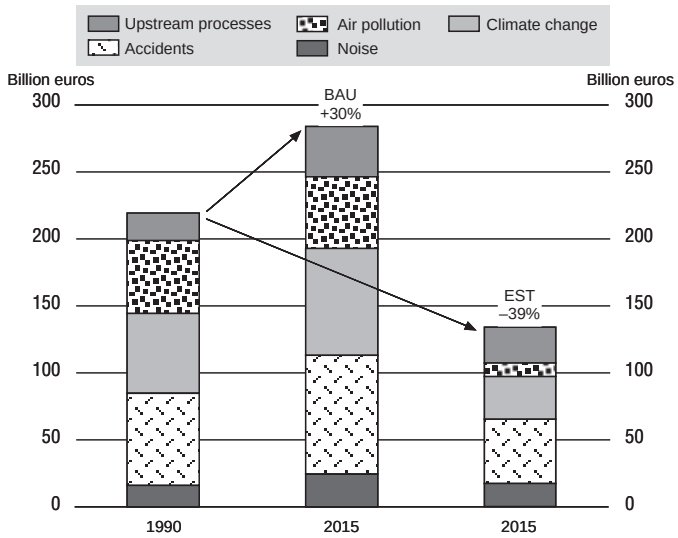
where possible to be consistent with broader societal objectives such as maintenance of employment levels and enhancement of equity.

Preliminary assessments of the economic and social implications of attainment of EST were conducted. The reference point in each case was the BAU scenario for 2015, rather than the actual circumstances of 1990. These assessments were extremely preliminary in nature, in part because of available resources but chiefly because of the inherent hesitation of experts to project about such matters so far into the future.

Each case study assessed the economic implications of their EST3 scenarios and of the application of their instrument packages using a variety of approaches. The general conclusion from this work was that on average the overall economic effects on the national economies from proceeding towards EST rather than BAU would be slight – in terms of changes in significant indicators such as Gross Domestic Product and employment rates – although there was some variation in the results obtained.

As well, the external (*i.e.*, unpaid) costs of transport were estimated for the study areas, for 1990, for BAU in 2015, and for EST3 in 2015 making use of methods employed in a recent major assessment of external costs in Europe.[12] The results of this analysis are summarised in Figure 15 where estimates of five kinds of exter-

Figure 15. **Estimated overall external costs of transport, based on the scenarios of the nine EST case studies**



Source: OECD (2002).

nal cost of transport are presented: noise, accidents, climate change, air pollution, and upstream processes (*e.g.*, production and distribution of vehicles, fuels, and infrastructure).[13] These costs were estimated to be much increased with BAU, compared with 1990, and much reduced with the EST3 scenarios.

Social implications were assessed for each study area through evaluation of the appropriateness of several statements about BAU and EST based on perceived social trends. The project teams concluded that social conditions could be more benign with EST3 compared with BAU, and perhaps more than now. Continuation of BAU could result in loss of independent mobility among the elderly and particularly children. With movement towards EST3, on the other hand, life could become more healthful, safe, convivial, and child-friendly, at least in comparison with BAU. Some individuals would experience negative effects from reduced opportunity for mobility.

This preliminary work on the economic and social implications of EST compared with BAU suggests that the overall effect will be positive: economies will remain robust, society's costs will be lower, and there could be social advantages. However, some people, businesses, and institutions will be negatively affected as societies change the nature of such a fundamental matter as their transport systems, and care must always be taken to mitigate adverse economic and social impacts.

Implementing EST will require a broad range of instruments assembled as a coherent package of measures combining regulations and standards, fiscal instruments, changes in governance arrangements, and instruments involving education, the provision of information, awareness raising, and attitude change. Most of the instruments proposed in the cases studies are already used or are being discussed; only about one third would be new.

An overall conclusion from this work is that a broad range of instruments will be needed that have to be deployed in a consistent manner and their focus maintained over time.

3. Conclusions from the EST Project

The EST project concluded that EST is attainable, although only with a broad-based and concerted commitment. member country teams working on how this can be done developed a broad variety of policy instruments and strategies capable for achieving EST. The instruments addressed technological breakthroughs, mobility maganement, and awareness raising and education. In most cases, the proposed packages of instruments included regulations (*e.g.*, emissions standards and limit values), economic instruments (*e.g.*, fuel and road pricing and fiscal incentives), changes in infrastructure investment policies, and land-use planning.

Information and education to raise public awareness about the problems and possible solutions and alternatives played a key role in the proposed strategies.

The most important challenges lie in the acceptability of the goals, targets, and strategies and their component instruments. Issues of acceptability are best addressed by careful phasing of the application of instruments across the whole implementation period until 2030. Issues of effectiveness are best addressed by careful monitoring of the effects of instruments and appropriate adjustment of the vigour of their implementation.

The project concluded with the development of Guidelines for moving towards environmentally sustainable transport, designed to assist government at all levels in the development and implementation of approrpiate strategies towards EST. Their effective implementation requires strategies that accommodate the particular geographic and socio-economic conditions of countries and regions and the involvement of all affected parties.

There are overwhelming environmental advantages to be gained from taking steps towards sustainability. The responsibility of those concerned about transport is to facilitate moving towards environmentally sustainable transport which is one of the principal policy challenges facing OECD and other countries at the outset of the 21st century. International co-operation within the OECD framework will assist member countries in the development of innovative methods and policy approaches towards sustainable transport that will be environmentally responsible, socially acceptable, and economically viable.

Notes

1. The project documentation is available at the OECD's Internet site *www.oecd.org/env/transport*. Phase 1 of the EST project is reported in OECD (1996).
2. Phase 2 of the EST project is reported in OECD (1998).
3. Phase 3 of the EST project is reported in OECD (2002).
4. The EST project concerning Central and Eastern Europe has been reported in UNEP/OECD/Austria (1999).
5. See Page 1 of Kågeson, P. (1994).
6. See Page 43 of WCED (1987).
7. Of particular note in this definition is the reference to meeting needs for access rather than for "mobility" or "transport". Accessibility loosely means "ease of reaching a destination", whereas mobility can more precisely be equated with "person-kilometres travelled" or "vehicle-kilometres travelled". According to William Ross (2000), accessibility and mobility are inversely related, *i.e.*, where mobility is high, accessibility is low, and *vice versa* .
8. The data and projections represented in Figure 5 and Figure 6 come from Figure 3.4.2 and 3.4.13 of EEA (1999) and from IIASA (1998). "AOT" in Figure 5 indicates "Accumulated exposure Over the Threshold", defined as the sum of all excess concentrations over a specified threshold occurring within a particular period.
9. Figure 9 is taken from OECD (1998), (which is also the source of Figure 10 and Figure 11).
10. Structured brainstorming and the exercise of identification of implementation strategies in the EST project is described in OECD (2002).
11. See OECD (2002) for details of the instrument packages developed by the teams.
12. Cost factors and projections used as developed by INFRAS/IWW (2000) and adjusted for changes in the BAU and EST scenarios.
13. Figure 15 is based on an analysis internal to the EST project [see OECD (2002)].

Guidelines for Moving towards Environmentally Sustainable Transport

1. Scope and Purpose

Ensuring progress towards sustainable development is a priority of the OECD's work. Transport is a particularly challenging sector. It is indispensable to modern life, but has many adverse effects on health and environment. Most transport trends are unsustainable.

In 1998, Environment Ministers of OECD member countries called on the OECD to develop guidelines for moving towards environmental sustainable transport (EST). The OECD's Working Group on Transport developed the EST guidelines based on the results and conclusions of the EST project. This OECD project – involving many OECD and non-OECD countries – provides a solution to making transport policy more sustainable and enhancing quality of life.

The EST G*uidelines* have been developed to enable economic development and individual welfare without causing undue health and environmental impacts and depletion of finite resources. These guidelines represent a desirable and feasible approach for the transport sector that may also be of value in the sustainable development of other sectors.

The Working Group on Transport has submitted the EST Guidelines for discussion and endorsement at the OECD Conference on Environmentally Sustainable Transport – Futures, Strategies, and Best Practice held in Vienna in October 2000.

The OECD acknowledges the contributions by and assistance of participating countries, in particular those that provided case studies: Austria, Canada, France, Germany, Italy, Japan, The Netherlands, Norway, Sweden, Switzerland, and the CEI region.

2. Transport Challenges Sustainability: OECD Takes Action

Numerous initiatives have been undertaken or proposed to reduce the negative environmental and health impacts of current transport systems. There have been significant gains with respect to specific pollutants, notably carbon monoxide

and lead, from the application of regulations controlling vehicle emissions and fuel quality.

However, many measures lack effective implementation, in particular those targeting structural changes in transport activity and reductions in carbon dioxide emissions and noise. Continuing growth in transport activity offsets the gains achieved through technology. Overall, insufficient progress has been made towards achieving environmental sustainability for the transport sector (see Annex I).

A new target-oriented approach is needed that places environment and health at the top of the policy agenda for transport and related sectors, at international, national, and local levels.

To this end, the Environment Ministers of OECD member countries agreed on *Shared Goals for Action* (OECD Environmental Ministerial, April 1998). They requested that the OECD undertake further work on environmentally sustainable transport (EST), including the development of guidelines for implementing EST principles. In response to the Ministers" request, the OECD' Working Group on Transport elaborated the EST *Guidelines* based on the results and conclusions of its EST initiative.

The EST *Guidelines* operationalise the *Principles towards Sustainable Transportation* and the *Strategic Directions* endorsed by the OECD Conference on Sustainable Transport held in Vancouver in 1996.

Furthermore, the EST Guidelines are part of the OECD's commitment to contribute to the implementation of major international conventions and other commitments, in particular:

- the UN Framework Convention on Climate Change, and its Protocols (1994/97);
- the Vienna Declaration of the UN ECE on Transport and Environment (1997);
- the WHO Charter on Transport, Environment and Health (1999).

The EST *Guidelines* recognise the global responsibility of each sector to contribute to the achievement of sustainable development, as stated in the 1992 Rio de Janeiro *Declaration on Environment and Development* and adopted in *Agenda* 21. They are fully in the spirit of *sustainable development*, formulated in 1987 by the World Commission on Environment and Development to stress the need for inter-generation equity and the integration of social, economic, and environmental objectives in all policy developments.

The EST project characterised EST by starting from the broad definition of sustainable development and constructing a qualitative definition for environmentally sustainable transport (see Annex II). Health and environmental quality goals for a number of criteria were set based on internationally agreed guidelines, standards, and goals. Six EST criteria were identified as the minimum number

required to reflect the wide-ranging health and environmental impacts of transport. They concern noise levels, emissions of major air pollutants and greenhouse gases, and land use (see Annex III).

The EST project used a new goal-oriented approach by constructing long-term visions of EST consistent with the EST criteria, and then proposing strategies for reaching the goals by applying a backcasting methodology. At the core of the strategies were well-phased packages of policy instruments considered capable of achieving EST.

Extreme solutions were rejected. Reaching EST entirely through technological advances would be costly, and also risky because necessary improvements may be beyond reach. Reaching EST entirely through changes in transport activity would entail unrealistic changes in mobility patterns, numerous restrictions, and the loss of too many of the economic and social benefits provided by transport.

The EST G*uidelines* are proposed as a basis for developing a feasible and viable strategy towards sustainable development and for future-oriented policymaking and practice in the transport sector.

3. Towards a New Transport Vision: EST!

EST is a new transport vision and approach. It provides an appealing and plausible alternative to unsustainable "business-as-usual". This new transport approach comprises: *i*) a portrayal of a sustainable transport future, *ii*) the development of environmental and health quality objectives and criteria, and derived quantified targets with dates and milestones, and *iii*) the specification and implementation of packages of measures required to achieve a sustainable transport future.

The key conclusions drawn from the OECD'sEST project are:

- **EST offers an appealing and realistic vision** of a long-term sustainable transport future that provides for enhanced quality of life for present and future generations while retaining the numerous benefits of today's transport.
- **"Business-as-usual" in transport policy and practice is no longer a viable option**. Growth in transport would continue, with the highest rates in road freight and aviation; modal split will become more unbalanced; and fuel use would steadily increase, as would noise and the use of land for transport. Some air pollutants could be reduced due to tight emission controls. These transport trends call for a reorientation of transport policies and practices to ensure sustainability and to maintain the benefits of the transport sector.
- **EST can be defined**. This requires deriving targets based on environmental and health quality objectives and criteria using internationally agreed standards, goals, and guidelines. These must fulfil local, regional and global requirements.

- **EST is attainable**. It requires a consistent and balanced package of measures focusing on the technology of vehicles, fuels, and infrastructure, on the one hand, and changes in transport activity and management, on the other hand. The latter involves favouring a higher share and use of environmentally sound and health-beneficial modes, increasing the loading and occupancy of vehicles, reducing the need for motorised transport, changing mobility patterns and driver behaviour, and providing information and education about the efficient use of transport. EST calls for a much greater emphasis on transport demand management policies than in the past.
- **EST will induce structural changes and provide for new opportunities.** EST induces significant changes in technology, transport activity and mobility, and land use patterns that will require adaptations by the transport sector. It will at the same time provide opportunities for transport industry, operators and new mobility services as well as better and more balanced access to people, places, goods, and services.
- **EST must be co-ordinated across sectors.** It requires prioritising and implementing appropriate actions within the transport sector and other key sectors. Investment policies and financing practices as well as pricing and fiscal policies need to contribute to – not counteract – sustainable development of transport.
- **EST can be reached through several paths**, varying according to national, regional, and local circumstances. Overall, the key to success will be a well designed, co-ordinated, and broadly supported implementation strategy
- **EST provides for numerous social advantages.** There would be increased accessibility through a wider choice of transport modes and thus more individual and collective opportunities.
- **EST provides the opportunity for economic enhancement** through the establishment of viable long-term infrastructure, the expansion of sustainable transport modes, and the avoidance of the costs of ill health, accidents, environmental degradation, and resource depletion.
- **EST policies are evolutionary rather than revolutionary**. Many of the elements required for it are already known or even in place, however their implementation must be strengthened and more effective. With a few new and innovative measures, and the proper implementation of currently available instruments, EST can be achieved within the time frame of a generation (30-40 years).

Policies for EST should adopt a goal-oriented approach akin to modern business practice. Specific environmental and health, economic and social objectives are set and detailed; quantified targets, dates, and milestones are established. Policies are formulated precisely in terms of their ability to ensure that targets are

met. This approach has been used with success in managing some of transport's environmental impacts. It should be extended to all transport activity.

EST should build on the active participation of citizens, businesses, governments, and non-government organisations. Special emphasis should be given to promoting sustainable mobility behaviour and consumption patterns through information dissemination and public awareness building, in particular through the education of younger generations.

4. Towards Sustainable Transport: the EST Guidelines

The EST G*uidelines* have been elaborated to assist governments at all levels in the development and implementation of strategies towards EST. Effective implementation of the EST G*uidelines* requires strategies that accommodate the particular geographic and socio-economic conditions of countries or regions. The EST G*uidelines* should be used in a dynamic fashion that takes into account the latest scientific results. When starting an EST implementation process, concerned parties – transport, environment, health and other sectors, government, industry, academia, and NGO's, as well as the public-at-large – should be involved to ensure widespread awareness, understanding, commitment, and acceptance.

OECD member countries are called upon to use and apply these EST G*uidelines* and to initiate an implementation process towards achieving environmentally sustainable transport at international, national, regional, and local levels. This approach is also recommended for other countries, as well as for other sectors of the economy.

The EST Guidelines

Guideline 1. D*evelop a long-term vision* of a desirable transport future that is sustainable for environment and health and provides the benefits of mobility and access.

Guideline 2. A*ssess long-term transport trends*, considering all aspects of transport, their health and environmental impacts, and the economic and social implications of continuing with "business as usual".

Guideline 3. D*efine health and environmental quality objectives* based on health and environmental criteria, standards, and sustainability requirements.

Guideline 4. S*et quantified, sector-specific targets* derived from the environmental and health quality objectives, and set target dates and milestones.

Guideline 5. I*dentify strategies to achieve* EST *and combinations* of measures to ensure technological enhancement and changes in transport activity.

The EST Guidelines (*suite*)

Guideline 6. E*nsure that the vision of – and strategies to achieve –* EST *are socially acceptable and economically viable* by assessing their social and economic implications Assess the social and economic implications of the vision, and ensure that they are consistent with social and economic sustainability.

Guideline 7. C*onstruct packages of measures and instruments* for reaching the milestones and targets of EST. Highlight "win-win" strategies incorporating, in particular, technology policy, infrastructure investment, pricing, transport demand and traffic management, improvement of public transport, and encouragement of walking and cycling; capture synergies (*e.g.*, those contributing to improved road safety) and avoid counteracting effects among instruments.

Guideline 8. D*evelop an implementation strategy* that involves the well-phased application of packages of instruments capable of achieving EST taking into account local, regional, and national circumstances. Set a clear timetable and assign responsibilities for implementation. Assess whether proposed policies, plans, and programmes contribute to or counteract EST in transport and associated sectors using tools such as Strategic Environmental Assessment (SEA).

Guideline 9. S*et provisions for monitoring implementation and for public reporting on the* EST *strategy*; use consistent, well-defined sustainable transport indicators to communicate the results; ensure follow-up action to adapt the strategy according to inputs received and new scientific evidence.

Guideline 10. B*uild broad support and co-operation for implementing* EST; involve concerned parties, ensure their active support and commitment, and enable broad public participation; raise public awareness and provide education programmes. Ensure that all actions are consistent with global responsibility for sustainable development.

References

OECD (1996),
Environmental Criteria for Sustainable Transport, Organisation for Economic Co-operation and Development, Paris.

OECD (1998),
Scenarios for Environmentally Sustainable Transport (report on Phase 2 of the EST project). Organisation for Economic Co-operation and Development, Paris, France.

OECD (2002),
Policy Instruments for Achieving Environmentally Sustainable Transport (report on Phase 3 of the EST project). Organisation for Economic Co-operation and Development, Paris, France.

UNEP/OECD/Austria (1999),
Towards Sustainable Transport in the CEI *Countries* (Ministerial Declaration and Joint Pilot Study on Environmentally Sustainable Transport in the CEI Countries in Transition). United nations Environment Programme, Organisation for Economic Co-operation and Development, Federal Ministry of Environment, Youth and Family, Vienna Austria.

Ross W. (2000),
Mobility and accessibility: the yin and yang of planning, *World Transport Policy and Practice*, 6(2), 13-19.

World Commission on Environment and Development (1987),
Our Common Future, Oxford University Press, UK.

Kågeson P. (1994),
The Concept of Sustainable Transport, European Federation for Transport and the Environment, Brussels, Belgium, March.

EEA (1999),
Environment in the European Union at the Turn of the Century. European Environment Agency, Copenhagen, Denmark (available at <binary.eea.eu.int>).

IIASA (1998),
Emission reduction scenarios to control acidification and eutrophication and ground-level ozone in Europe, International Institute for Applied System Analysis (IIASA), Laxenburg, Austria.

INFRAS/IWW (2000),
External Costs of Transport: Accident, Environmental and Congestion Costs in Western Europe (report for the International Union of Railways, Paris). INFRAS, Zurich; IWW, University of Karlsruhe, Germany.

Annexes I-IV

The purpose of these annexes is to describe and illustrate features of the guidelines in order to facilitate their use and application when developing and implementing EST strategies. They serve to share the lessons learned during the course of the OECD EST initiative. Care should be taken therefore, to ensure that particular national, regional or local considerations are addressed when using these.

Annex I highlights certain unsustainable trends in relation to local, regional and global scales.

Annex II recalls the qualitative definition of Environmentally Sustainable Transport developed for the EST project that has been derived from the broad definition of sustainable development.

Annex III presents the minimum number of criteria required to encompass the wide range of health and environmental impacts from transport, identifies health and environmental quality objectives and derives quantitative targets.

Annex IV provides hints and explanations as to the application of the guidelines.

Annex I

Key Signs of Unsustainable Transport Trends

This brief assessment focuses on the EST criteria considered to be the minimum number to characterise the wide-ranging health and environmental impacts from transport.

Climate protection: the CO_2 criterion

Transport represents a growing source of climate-impacting emissions. Furthermore, as shares of these emissions are decreasing in other sectors, transport'sshare of climate-impacting emissions continues to grow. Under the assumption that no drastic interventions will occur, global CO_2 emissions from motor vehicles are projected to increase by more than 300 per cent by 2030 compared to 1990 levels. This increase is primarily due to growth in road and air traffic. In OECD countries the overall increase will be "only" 56 per cent. Altogether, these emission increases will contribute to dangerously high concentrations of atmospheric CO_2 that are more than double the present levels.

Regional air quality: the NOx and VOC criteria

Transport'sshare of responsibility for causing acidification, eutrophication, and dangerous levels of tropospheric ozone continues to grow as emissions from stationary sources decline. Stringent emissions standards and targets for motor vehicle emissions have been established up to the year 2005 and beyond for all the three OECD regions in order to meet long-term air quality objectives. With the adopted standards, NO_x and VOC emissions are expected to decline by 40 to 70 percent between now and 2030, and possibly stabilise thereafter. However, *air quality* will not improve at the same rate due to complex transformation processes of emissions into ambient air levels, notably those concerning the production of ground-level ozone. Thus, air quality standards will be exceeded for many years to come, in terms of short-term episodic peaks as well as long-term ambient levels. Furthermore, a similar trend in emission reductions is not expected for other parts of the world, where high growth rates together with lenient controls will result in increased total emissions from transport, in particular from motor vehicles, resulting in further degradation of already-bad air quality.

Local air quality: the particulate matter (PM) criterion

The growing vehicle fleet and increasing distance travelled by road freight diesel vehicles will continue to contribute to exceedence of ambient air quality standards for PM. In the three OECD regions, stringent emission controls and use of filter technology will reduce emissions substantially over the long term. By 2030, emission levels will be much lower than today. However, air quality standards for fine particulate matter will still be exceeded for

many years and a large proportion of the population will be exposed to harmful concentrations. New research on health effects suggests that exposure to ultrafine particulate matter (less than 2.5 mm) emitted from both gasoline and diesel vehicles will cause increasing public health concerns.

Quietness: the noise criterion

Transport noise, particularly from road vehicles, is the major source of external acoustic nuisance in urban areas. Engine noise has been reduced through stringent standards, but tyre and road noise levels have remained largely unchanged and have even increased. Aircraft noise is also increasing, affecting larger numbers of people. About 10 per cent of the European population is affected by aircraft noise above 55 dB(A), 30 per cent is exposed to road traffic noise above the nuisance level of 55 dB(A). The proportion of European region'spopulation exposed to high noise levels (equivalent to 65 dB(A)) increased from 15% to 26% between 1980 and 1990 (WHO Charter for Transport, Environment and Health, Annex I, London 1999). Despite technological progress to reduce noise at the source, the prospects are less promising for the future; noise nuisances will increase near roads, airports, and railway lines due to projected increases in vehicle traffic and expansion of road infrastructure and airports.

Land use/take criterion

Land use for transport is a key issue in that it is both a factor generating transport activity (infrastructure-induced mobility) and a contributor to environmental stress (*e.g.*, increasing pressure on biodiversity due to habitat separation, fragmentation, and destruction). Transport infrastructure, mainly roads, occupies 25-30 percent of land in urban areas and less than 10 per cent in rural areas in the OECD. Land use for transport infrastructure (roads and parking, rail corridors, airports, and harbours) is likely to increase by 2030 due to the expected strong growth in transport activity. Furthermore the expansion of road infrastructure, in particular motorways, will add barriers to the migration of many species, reducing their viability and disrupting local ecosystems.

Annex II

Definition of Environmentally Sustainable Transport

In the spirit of the well-accepted broad definition of sustainable development, four broad ecological principles can be derived:

- public health and the environmental quality should be preserved;
- non-renewable and renewable resources should be used sustainably;
- critical limit values for health and ecosystems should be respected; and,
- global irreversible effects should be avoided.

A sustainable transport system should provide *access* to people, places, goods, and services in an environmentally responsible, socially acceptable, and economically viable manner. Mobility for communication and for enabling social contacts, as well as movement of people and goods, is to be considered as a *means* rather than as and *end* in itself.

Important prerequisites for realising an EST system in the long term are these: protect human health, ensure ecosystem integrity, respect health and ecological limits (critical levels and loads), prevent and minimise pollution, ensure sustainable use of non-renewable and renewable resources and avoid human-induced changes in global environmental systems such as the atmosphere and the oceans.

A sustainable transport system is therefore one that *i*) provides for safe, economically viable, and socially acceptable access to people, places, goods and services; *ii*) meets generally accepted objectives for health and environmental quality, *e.g.*, those set forward by the World Health Organization for air pollutants and noise; *iii*) protects ecosystems by avoiding exceedence of critical loads and levels for ecosystem integrity, *e.g.*, those defined by the UN ECE for acidification, eutrophication, and ground-level ozone; and *iv*) does not aggravate adverse global phenomena, including climate change, stratospheric ozone depletion, and the spread of persistent organic pollutants.

Accordingly, the EST project developed the following brief definition of an environmentally sustainable transport system as one where,

> T*ransportation does not endanger public health or ecosystems and meets needs for access consistent with* a) *use of renewable resources below their rates of regeneration, and* b) *use of non-renewable resources below the rates of development of renewable substitutes.*

This qualitative definition has been elaborated by expanding some of the generic statements and developing quantified criteria and targets based on international environmental and health criteria and objectives.

Annex III
Health and Environmental Criteria for EST

This annex describes how the broad EST definition (see Annex II) can be operationalised by setting quantified targets based on health and environmental objectives for a minimum number of criteria that describe transport's wide-ranging impacts.

Health and environmental quality objectives have been adopted in almost all OECD countries (and in many non-OECD countries) based on national and internationally agreed goals and standards. Long-term targets – typically for a time period of 30 to 40 years – can be derived from these quality objectives. Intermediate targets for shorter periods of time (*e.g.* 10 years) could be set to supplement the long-term targets and focus policies and strategies. These specific targets should be set in accordance with economy-wide sustainable development goals and will have to take into account efforts made in other sectors towards these broader objectives. Reaching these broader objectives will imply that cost-effective and realistic solutions are applied in each sector. Also, targets should be set so as to be consistent with countries" commitments and obligations outlined in various international treaties (*e.g.* UNECE Long-Range Transboundary Air Pollution Convention and its protocols, EU Directives, United Nations Framework Convention on Climate Change and Convention and its protocols, etc…). Criteria selected for the transport sector should reflect local, regional, and global environmental quality goals. The specific target levels chosen will depend on countries' specific environmental and health conditions. The environmental quality objectives, however, are valid for all countries since they represent the desired health and environmental outcome.

The targets developed in the context of the OECD's EST initiative (see box on following page) can be achieved within the time frame of a generation (30-40 years). However, in the course of the project, it became evident that some countries thought it necessary to extend the deadlines for meeting some targets (*e.g.* the CO_2 emission reduction target). In those cases, the level of the target remained the same while the time period was extended.

Six criteria for the transport sector have been developed for the EST initiative as being the minimum number required to encompass the wide range of health and environmental impacts from transport. These criteria have been selected so that local, regional, and global concerns are addressed, notably noise, air quality, acidification and noise, air quality, acidification and eutrophication, tropospheric ozone, climate change, and land use. Specifically, the criteria concern emissions of carbon dioxide, nitrogen oxides, volatile organic compounds, carcinogenic particulate matter, noise, and land use below). Criteria for other important impact vectors such as ultra-fine particulate emissions, waste generation, water and soil pollution, biodiversity and habitat fragmentation, and releases of persistent organic pollutants could not be quantified at present, therefore more analysis of these is required. Each criterion described on the following page is accompanied by a footnote providing the manner in which it was quantified.

These criteria and targets were developed in the context of the OECD's EST initiative as being the minimum number required to describe EST and were selected so that local, regional and global concerns are addressed. They provide an illustration of how criteria and targets can be linked to significant environmental and health quality objectives. These targets are long-term – specific intermediate targets and milestones should be set to focus action. The quantitative target levels below are not prescriptive and could be adapted according to national, regional or local circumstances. What is essential for the EST approach, is that the target levels are set to achieve environmental and health quality objiectives.

Long-term and Health Quality Objectives, Criteria and Derived Targets for EST

CO_2
Climate change is prevented by reducing carbon dioxide emissions so that atmospheric concentrations of CO_2 are stabilised at or below their 1990 levels. Accordingly, total emissions of CO_2 from transport should not exceed 20% to 50% of such emissions in 1990 depending on specific national conditions.[1]

VOC_s
Damage from carcinogenic VOCs and ozone is greatly reduced by meeting WHO Air Quality Guidelines for human health and ecosystem protection. Total emissions of transport-related VOCs should not exceed 10% of such emissions in 1990 (less for extremely toxic VOCs).[2]

Noise
Noise from transport no longer results in outdoor noise levels that present a health concern or serious nuisance. Depending on local and regional conditions, this may entail a reduction of transport noise to no more than a maximum of 55 dB(A) during the day and 45 dB(A) at night and outdoors.[4]

NO_X
Damage from ambient NO_2 and ozone levels and nitrogen deposition is greatly reduced by meeting WHO Air Quality Guidelines for human health and eco-toxicity. This implies that total emissions of NOx from transport should not exceed 10% of such emissions in 1990.[2]

Particulates
Harmful ambient air levels are avoided by reducing emissions of fine particulates (especially those less than 10 microns in diameter). Depending on local and regional conditions, this may entail a reduction of 55% to 99% of fine particulate (PM_{10}) emissions from transport, compared with 1990 levels.[3]

Land use/Land take
Land use and infrastructure for the movement, maintenance, and storage of transport vehicles is developed in such a way that local and regional objectives for air, water and eco-system and biodiversity protection are met. Compared to 1990 levels, transport activity will likely entail a smaller proportion of land devoted to transport infrastructure. Compared to 1990 levels, this will likely entail the restoration and expansion of green spaces in built-up areas.[5]

1. The Second Assessment Report of the Intergovernmental Panel on Climate Change (1996) maintains that, in order to stabilise atmospheric CO_2 concentrations at near current levels, world-wide CO_2 emissions would need to be reduced by 50% to 70% with further reductions thereafter (IPCC, Second Assessment Report, page xi, Intergovernmental Panel on Climate Change, 1996). In order to allow for increases in emissions in developing countries, OECD countries should reduce their emissions by 80% or more so that a global reduction of 50% may be attained (OECD, Environmental Criteria for Sustainable Transport, OECD Environment Directorate, Paris, France, 1996). A reduction target of 50% might be more appropriate for certain countries that benefit from a favourable (*e.g.* a more environmentally friendly modal split) as was suggested by the EST pilot study for the countries of the Central and Eastern European region.
2. These criteria are set in line with the WHO guidelines for human health regarding NOx, VOC's and Ozone (WHO, 1996) and the UNECE protocols under the Convention on Long-Range Transboundary Air Pollution for ecosystem protection regarding critical loads for nitrogen deposition and critical levels of ozone (UNECE, LRTAP Convention, 1999).
3. The WHO advises that no safe threshold level can be set for fine particulate matter (smaller than PM_{10}) and ultrafine particles (smaller than $PM_{2.5}$) below which health effects (including cancer) do not occur.. However, countries should set targets based on dose-effect considerations. The targets set here are preliminary due to the ongoing research on the health effects from ultrafine particulate matter (WHO, Air Quality Guidelines, World Health Organization Regional Office for Europe, Copenhagen, Denmark, Geneva, 1998).
4. This criterion is based on the former WHO recommendation on noise that has been recently updated in the WHO Guidelines for Community Noise (WHO, Guidelines for Community Noise, World Health Organization, Geneva, 1999).
5. The quantification of the land use criterion will require further research.

Source: OECD.

Annex IV

The EST Guidelines Checklist

Guideline 1. **D*evelop a long-term vision* of a desirable transport future that is sustainable for environment and health and provides the benefits of mobility and access**.

- T*he vision should guide policy*. Policy-making can be framed by the negative ("avoid making things worse") or by the positive ("work towards a better situation"). On the assumption that the positive is better than the negative, society should look principally to where it wants to go, not to what it wishes to avoid. A vision for environmentally sustainable transport should answer this need.
- T*he vision should be long-term*. Adapting any sector to the requirements of sustainable development will not occur overnight. The vision should be sufficiently far removed from the present to allow for major changes yet set not so far into the future to make it unrealistic. A horizon of 30 to 40 years is appropriate.
- T*he vision should inspire action*. It should present an alternative transport scenario that delivers real social, environmental, and economic benefits. These benefits need to be described in both a quantitative and qualitative manner.
- T*he vision should be positive*. The negative rarely inspires people. A vision that repeats looming threats *in crescendo* will likely turn away many more people than it will attract. The vision should be couched in terms of what is to be *gained* from EST and what might be lost through inaction.
- T*he vision should be ambitious, sound and realistic*. It should be supported by detailed scientific and quantitative analysis supplemented by more qualitative descriptions. A realistic vision can be ambitious, but not all ambitious visions are realistic.
- T*he vision should be built from the ground up*. Like a house, the vision should have a strong foundation. Such a foundation builds on the collected aspirations of different key stakeholders in society. A vision that does not address and incorporate these aspirations will not compel and will ultimately fail.
- T*he vision should be tailored to a broad range of actors*. Concrete descriptions of daily life and of the operating environments of different types of households, firms, and industries should be portrayed in order to translate the vision into practical terms.

Guideline 2. ***Assess long-term transport trends*, considering all aspects of transport, their health and environmental impacts, and the economic and social implications of continuing with "business as usual".**

- A*n essential step in moving towards* EST *is determining whether society is on the right path*. Developing an understanding of where "business-as-usual" will lead provides policy-makers with insight as to the scope and scale of the changes needed to achieve EST.
- T*he* BAU *forecast should be realistic*. Determining "business-as-usual" involves some uncertainty as changes will occur that cannot be accurately foreseen. At a minimum, a BAU forecast should account for all present, planned, and reasonable foreseeable policies and technological, economic, and social changes.
- T*he* BAU *forecast should reflect a number of viewpoints*. Depending on your viewpoint, BAU can look good or bad. In developing the BAU forecast, great care should be taken to involve a wide range of parties and interests so that they can not only provide their own view on the future but also have their views balance the optimism and pessimism of others.
- T*he* BAU *forecast should cover the same time frame as the* EST *vision*. Too short a time period could favour BAU on account of predictable short-term improvements (*e.g.*, in air quality); while too long a period could render the forecast useless because of the inherent uncertainty associated with long-term projections.

Guideline 3. ***Define health and environmental quality objectives* based on health and environmental criteria, standards, and sustainability requirements.**

Environmental and health criteria	Derived targets
Noise: WHO Guidelines attained	*Noise sources:* –50% –70%
Air quality: WHO Guidelines (NO_2, PM) Critical levels for ozone attained	*Air emissions:* –50% NO_x; > –99% PM –80% NO_x and VOC
Acidification/Eutrophication: Critical Loads attained	*SO_x-/:NO_x-emissions:* –75% –80% (–50% NH_3)
Climate protection: Stabilisation of CO_2 conc.	*GHG/CO_2 emissions:* OECD –80%, global –50%

- B*asic health and environment quality objectives should form an integral part of all policies related to transport activity*. Commonly, transport policy is couched in economic and social terms. These concerns are integrated "upstream" in order to formulate specific policy responses within and outside the transport sector. Health and environmental impacts are typically assessed *ex-post* and this understanding is

used "downstream" to develop mitigation strategies. EST calls for health and environmental quality objectives (*e.g.*, clean air, avoiding morbidity and mortality, ecosystem protection, avoiding anthropogenic climate change, etc.) to be integrated from the outset.

- EST *health and environmental objectives should reflect the best available understanding of impacts on human health and the environment.* A wide range of recognised and agreed-upon criteria, standards, guidelines, and other sustainability requirements exist. These should form the basis for characterising EST (see the Figure below).
- H*ealth and environmental quality objectives are valid for all countries* – the criteria and targets that are derived from these depend on specific national, regional and/or local conditions.
- T*he characterisation of* EST *should be dynamic*. Our understanding of the health and environmental impacts from transport is continually evolving. As this understanding evolves, so should the health and environmental objectives.
- T*he objectives should reflect the broadest views on the health and environment impacts of transport.* Existing international criteria, standards, guidelines, and other sustainability requirements should be taken into consideration when no corresponding national guidance exists. Where international criteria, standards and guidelines are more stringent than national requirements, care should be taken to demonstrate the necessity for weaker standards in light of health and environmental objectives. Regional exceptions should be fully justified.
- C*riteria, standards, guidelines, and other sustainability requirements that can be quantified, should be quantified*. Those that cannot be quantified should be developed in such a way as to include a broad range of viewpoints (*e.g.*, industry, trade unions, governments, academia, NGO's, as well as groups of population at higher risk such as children, handicapped people, the elderly, etc.).

Guideline 4. **S*et quantified, sector-specific targets* derived from the environmental and health quality objectives, and set target dates and milestones**.

- EST *targets for pollutants, greenhouse gas emissions, noise, land-take, etc. should be based on the health and environmental quality objectives outlined in* G*uideline* 3. Targets for the reduction of environmental health impacts from transport can be relative (*e.g.*, incremental improvements from the present state) or absolute (measured against a defined end-state). Moving towards EST should be based on absolute rather than relative targets to ensure fulfilment of health and environmental objectives.
- T*argets should be set taking into account the specific conditions at the national, regional or local level.* Target levels will be dependent on actual baseline levels for different criteria.
- EST *targets should be set in reference to a baseline date*. The choice of a baseline date is important as it can mask or accentuate the changes necessary to reach the EST targets. To avoid confusion, all targets

should share the same baseline date (given data availability). The selection of the date should be made openly and should involve descriptions of the relevant underlying trends in transport-related phenomena.

- EST *targets should be set in reference to a deadline.* Setting an end-date for achieving EST targets ensures that the process of moving towards EST is verifiable. Intermediate targets and milestones should be established to allow progress to be tracked and policies to be adjusted.
- As *for the criteria, standards, guidelines, and other sustainability requirements outlined in Guideline* 3, targets that can be quantified, should be quantified. Those that cannot be quantified should be developed in a qualitative way and as concrete as possible taking into account the best scientific knowledge.
- T*argets and deadlines for* EST *should evolve as new information becomes available*. As scientific understanding of the environmental and health impacts progresses, so should the EST targets and deadlines. However, changes to these targets and deadlines should be made openly and with the involvement of a wide range of societal interests.

Guideline 5. Identify strategies to achieve EST and combinations of measures to ensure technological enhancement and changes in transport activity.

- T*he initial direction for the* EST *strategies should be set by the already-developed long-term vision of a desirable transport future.* This will imply a "balance of effort" for attainment of EST in terms of technological improvements, on the one hand, and changes in transport activity such as mode shifts, more efficient occupancy or loading of vehicles, and overall reductions in travel and freight movement, on the other hand. All EST strategies will likely comprise a mix of the two types of approach, perhaps in more-or-less equal amounts.
- A *quantified balance-of-efforts analysis should be performed* in order to determine the contribution of technology (unit emission improvements, efficiency improvements, vehicle downsizing) for the various passenger and freight modes and the contribution from activity changes (traffic avoidance), modal shifts, and increasing load/occupancy factors.

Guideline 6. Assess the social and economic implications of the vision, and ensure that they are consistent with social and economic sustainability.

- T*he economic and social implications of* EST *should be contrasted to the social and economic assessment of the* BAU *case*, not only in reference to the base case.
- E*xternal costs – those costs not currently incorporated into the price structure for transport related-activities and services (e.g., environmental and health costs stemming from accidents, air pollution, noise levels, and climate change) – must be accounted for when assessing the economic viability and implications of* EST.

Past economic assessments of transport policy have mostly confined themselves to what is readily measurable at the micro, meso, and macro scales. Recent assessments, however, have sought to account for costs that are not reflected in the price structure of transport markets. This trend should be continued and strengthened in the assessment of EST visions and strategies by openly incorporating the best current assessment of the scope and scale of such costs.

- *The validity and durability of external benefits – those benefits not currently incorporated into the price structure for transport-related activities and services (e.g., "time savings" leading to economic efficiency gains, "congestion reduction", etc.) – should be carefully examined when assessing the economic viability and implications of* EST. Many past transport policy decisions have been underpinned by the expectation that general welfare benefits can accrue to the public through new infrastructure construction. These expectations have rarely been met in the long term. Assessments of BAU and EST should carefully and openly check the validity of these benefits.
- *When examining the social acceptability and implications of* EST, *care should be taken to incorporate a wide range of societal needs (e.g. industry, trade unions, governments, academia,* NGO's *as well as groups of population at higher risk such as children, handicapped people, the elderly, etc.*). Social benefits and disbenefits accrue in varying proportions to different sectors of society. Assessments of the social outcomes of BAU and EST should identify potential winners and losers in order to better inform policy-making.

Guideline 7. ***Construct packages of measures and instruments* for reaching the milestones and targets of EST. Highlight "win-win" strategies incorporating, in particular, technology policy, infrastructure investment, pricing, transport demand and traffic management, improvement of public transport, and encouragement of walking and cycling; capture synergies (*e.g.*, those contributing to improved road safety) and avoid counteracting effects among instruments.**

- *The first step is to identify potential instruments (measures) that could contribute towards the improvements in technology and changes in transport activity needed to meet the* EST *targets*. Some or all of these instruments will comprise the critical elements of the EST implementation strategy.
- *Then, instruments should be selected for inclusion in the strategy that are together capable of ensuring that the* EST *targets are met*, in a manner that is consistent with the long-term EST vision and provides for positive rather than negative social and economic effects.
- *The selected instruments will likely address numerous aspects of transportation*. On the one hand, they will include instruments that can secure the improvements in technology and changes in infrastructure needed for the attainment of EST. On the other hand, they will include instruments that secure the needed changes in transport activity through demand management, which could include incentives to reduce the need for travel and provide alternatives to individual

ownership and use of vehicles. These instruments should also help facilitate a shift towards more environmentally friendly modes such as public transport, walking and bicycling. Finally these instruments should address improved driver training, education and awareness-raising for sustainable mobility, land-use, production and consumption.

- T*he selected instruments will likely include fiscal measures, regulatory measures, and measures to educate and change attitudes about transport.* Incentives should be considered as much as price increases and penalties. Incentives to reduce specific forms of transport activity should be considered only in conjunction with the provision of environmentally more benign alternatives.
- A*s far as possible, the selected instruments should be synergistic or complementary rather than antagonistic or perverse in their effects.* For example, fuel efficiency measures applied in isolation can initially reduce fuel use and emissions, but if transport costs are thereby reduced such measures can increase transport activity, thus offsetting much of the reductions in fuel use. Therefore fuel efficiency measures should be used in conjunction with measures to manage transport demand. Some EST instruments can bring benefits beyond those of attaining EST, for example improvements in safety and in access by elderly persons and children. Use of such instruments should be emphasised in the development of an implementation strategy.
- T*hus, the implementation strategy should be thought of in terms of well-co-ordinated packages of instruments, rather than as an assemblage of individual instruments operating in isolation.*

Guideline 8. **D*evelop an implementation* plan that involves the well-phased application of packages of instruments capable of achieving EST taking into account local, regional and national circumstances. Set a clear timetable and assign responsibilities for implementation. Assess whether proposed policies, plans, and programmes contribute to or counteract EST in transport and associated sectors using tools such as Strategic Environmental Assessment (SEA).**

- T*he implementation strategy should comprise a schedule of deployment of numerous packages of instruments over the whole of the target period, carefully phased in relation to the milestones.* Development of the strategy may well require several iterations.
- T*he instrument packages should be carefully orchestrated into a gradual progression that initially focuses on securing acceptance of the use of the more effective instruments and subsequently deploys these instruments.* Thus, initial instruments should include much in the way of education, building on the outreach processes employed during the development of the plan. They might also include instruments that "pave the way" for unfamiliar or unpopular instruments to be applied in a later phase.
- T*he implementation strategy should include a clear timetable for the deployment of instruments and their assessment.* The timetable should be organised according to the milestones that have been determined. It should

be flexible and amenable to adjustment in the light of circumstances and assessed progress towards sustainable transportation.

- *Responsibilities for implementation should be assigned*. The complexity of modern societies requires that many governments and agencies play a role in securing EST, at many levels of organisation from neighbourhood to international. Assignment of responsibilities for action and their co-ordination are critical components of any implementation strategy.
- *Strategic Environmental Assessment has been defined as* "The formalised systematic and comprehensive process of evaluating the environmental impacts of a policy, plan or program and its alternatives, the preparation of a written report on the findings, and the use of the findings in publicly-accountable decision-making." The implementation strategy and its significant components should be subjected to this kind of assessment.
- *Ensure that the environmental and health impacts of transport are included within the scope of performance assessments* such as ISO 14001 and Eco-Management and Audit Schemes (EMAS).
- *An important feature of an implementation plan should be provision of the means to sustain the changes that have been achieved*. When EST is attained, attainment will continue only to the extent that appropriate instruments continue to be applied. Evidence to date suggests that without constraints transport activity and emissions will increase.

Guideline 9. ***Set provisions for monitoring implementation, and for public reporting on the* EST *strategy*; use consistent, well-defined sustainable transport indicators to communicate the results; ensure follow-up action to adapt the strategy according to inputs received and new scientific evidence**.

- *The monitoring system should not be an afterthought but rather an integral part of the strategy that is provided for at an early stage of its development*.
- *Several kinds of monitoring will be required*. The most important monitoring will be in relation to the targets that are used to characterise EST. This may require good data collection with respect to emissions and atmospheric concentrations of nitrogen oxides or noise exposure and land take, for example. Transport activity of all kinds will need to be carefully monitored as well as the key drivers of transport activity such as levels of vehicle ownership. This monitoring should also look at key parameters such as changes in modal split. Good indicators of transport's impacts, therefore, will be needed. Monitoring of public attitudes towards the deployed instruments and the changes in transport activity would also be useful.
- *Monitoring and assessment have value only to the extent that they can result in meaningful changes as to which instruments are used and how they are used*. Effective reporting is required. The implementation strategy must thus be of a kind that permits appropriate changes to be made in order to secure more certain attainment of EST.

Guideline 10. **B*uild broad support and co-operation for implementing* EST; involve concerned parties, ensure their active support and commitment, and enable broad public participation; raise public awareness and provide education programmes. Ensure that all actions are consistent with global responsibility for sustainable development.**

- P*eople that will benefit or suffer from transport policy decisions should have a voice in shaping the transport system*. This requirement calls for the early integration and balancing of many viewpoints in society, including those that have usually been under-represented in transport policy-making like women, handicapped people, children and the elderly.
- T*he role of education in the implementation of* EST *is paramount*. Consideration of EST itself is an educational tool. Much of the resistance to change in transport results from the lack of appealing, properly formulated alternatives.
- E*ducation and information about* EST *should be integrated with general concerns about the fate of future generations*. Transport should not be considered in isolation from other sectors of human activity. Current concerns should be considered in the light of their likely effects on grandchildren and their grandchildren. Individual and family concerns need to be balanced with those of society and humanity as a whole.
- I*mplementing* EST *will require a structured plan of action and close co-operation among a broad range of stakeholders* from many sectors including transport, environment, health, finance, industry, academia and civil society including NGO's.

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