

Introducing the Concept of Sustainable Transportation to the U.S. DOT through the Reauthorization of TEA-21

By

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ABSTRACT

Transportation is linked to all aspects of human life. Our natural environment, economic prosperity, and social well being all depend on transportation systems that are safe, clean, efficient, and equitable. However, current predictions suggest that transportation growth is unsustainable. It threatens our environmental, economic, and social future. Altering and managing trends in transportation presents a significant challenge and will require the cooperation of all stakeholders at local, regional, national and international levels.

This research identifies the core issues of the sustainable transportation debate and presents a review of major publications on the topic. Of particular interest is the relationship between the sustainability of the transportation sector *itself* and sustainable development in a global context. The results show that there is growing international agreement on the concept of sustainable transportation and that progress can and is being made towards a more sustainable transportation sector in the U.S.. The paper concludes with a series of recommendations that are designed to enhance the performance of the U.S. transportation planning and programming process, including recommended alterations to TEA-21 that will move the act towards a more sustainable agenda.

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ABBREVIATIONS

ADD	Area Development District
BTS	Bureau of Transportation Statistics
CAAA	The Clean Air Act Amendments of 1990
CfIT	Commission for Integrated Transport (UK)
CMAQ	Congestion Mitigation and Air Quality Improvement Program
COG	Council of Governments
CSD	Commission for Sustainable Development (UK)
CST	The Centre for Sustainable Transportation (Canada)
DAD	Decide, Announce & Defend
DOT	Department of Transportation
EC	European Community
ECMT	European Conference of Ministers of Transportation
EESD	Energy, Environment & Sustainable Development (EC)
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
HTF	Highway Trust Fund
IM	Interstate Maintenance
ISTEA	Intermodal Surface Transportation Efficiency Act
ITS	Intelligent Transportation Systems
KYTC	Kentucky Transportation Cabinet
LCI	Livable Communities Initiative
LRTP	Long-Range Transportation Plan
LTP	Local Transport Plans (UK)
MAGLEV	Magnetic Levitation
MARAD	Maritime Administration
MPO	Metropolitan Planning Organization
NAAQS	National Ambient Air Quality Standards
NAPA	National Academy of Public Administration
NEPA	National Environmental Policy Act
NHS	National Highway System
NHTSA	National Highway Traffic Safety Administration
OECD	Organisation for Economic Cooperation and Development

OST	Office of the Secretary of Transportation
PennDOT	Pennsylvania Department of Transportation
POP	Publicly Owned Project
PROSPECTS	Procedures for Recommending Optimal Sustainable Planning of European City Transport Systems
ROO	Regional Operating Organization
RPO	Rural Planning Organization
RSPA	Research & Special Program Administration
RT	Round Table
RTS	Regional Transport Strategies (UK)
SCDOT	South Carolina Department of Transportation
SIP	State Implementation Plan
SLRTP	Statewide Long-Range Transportation Plan
STIP	State Transportation Improvement Program
STP	Surface Transportation Program
TE	Transportation Enhancement (TE) Program
TEA-21	Transportation Equity Act for the 21 st Century
TC	Transport Canada
TCSP	The Transportation & Community & System Preservation Pilot Program
TIP	Transportation Improvement Program
UN	United Nations
UNCHD	United Nations Centre for Human Development
UNCHS	United Nations Centre for Human Settlements
UNDESA	United Nations Department of Economic & Social Affairs
UNSD	United Nations Division for Sustainable Development
UNESC	United Nations Economic & Social Council
U.S.C.	United States Code
USCG	United State Coast Guard
VTPI	Victoria Transportation Policy Institute
WBCSD	World Business Council for Sustainable Development
WCED	World Commission on Environmental Development

1 INTRODUCTION

The concept of sustainable development first began to gather momentum following the publication of the *Our Common Future* (1987), by the World Commission on Environment and Development. This report, commonly known as the Brundtland Report after Gro Harlem Brundtland, the Commission's Chairman, has since formed the foundation for almost all discussions about the concept of sustainable development.

During the early nineties the notion of sustainable development was first applied to the transportation sector in developed countries. In 1995 the Organization for Economic Co-operative Development (OECD) Group on Urban Affairs and the European Conference of Ministers of Transport (ECMT), presented the *Urban Travel and Sustainable Development* report that recommended a three-strand approach to achieving sustainable transportation based on (1) the principles of best practice in land-use and transportation planning, (2) innovations in land-use planning and traffic management, and (3) pricing measures. This was followed in 1996, by a report from the World Bank entitled *Sustainable Transport: Priorities for Policy Reform*, which expanded the discussion to include recommendations for developing countries. These two reports played a key role in the early rounds of the sustainable transportation debate, a debate which is still ongoing and far from being resolved.

At the OECD ministerial council meeting in May 2001, it was recognized that the majority of the developed countries have faced difficulty in implementing the measures put forward in the *Urban Travel and Sustainable Development* report (Weiner, 2000). It was this fact that prompted the author's initial research, undertaken during an internship with the U.S. Department of Transportation's (DOT's) Office of the Secretary of Transportation (OST) during the summer of 2001. The project reviewed and summarized many of the definitions, principles, and challenges of sustainable transportation; documented the strategies behind the U.S. and U.K. transportation legislation; highlighted best practice regarding transportation planning and programming within three states in the U.S. (Pennsylvania, Kentucky, and South Carolina); and reviewed several research projects from the U.S. and Europe that were seen as being of direct relevance to sustainable transportation in the United States.

The project was concluded by a series of recommendations that were presented to the U.S. DOT's Office of Transportation Policy Development, on how the surface Transportation Equity Act for the 21st Century (TEA-21) could be enhanced towards a more sustainable agenda for reauthorization in 2003. This initial research paper proved to be a useful source of information. However, the scope for additional work was identified, to expand the discussion on the meaning of sustainable transportation and to develop more robust recommendations on how the US transportation planning and programming process could be altered to make it both more effective and more sustainable.

1.1 RESEARCH OBJECTIVES

The reauthorization of TEA-21 in 2003 provides the U.S. DOT with a unique opportunity to readdress the issue of how to achieve a sustainable transportation system.

This thesis has two main objectives. The first is to review and summarize existing research on sustainable transportation and to apply the knowledge and insights gained from this process, in order to address how transportation planning and programming activities in the U.S. can be enhanced. The second will be to develop a series of recommendations that can be used by government officials to formulate key transportation decisions in the context of the reauthorization of TEA-21.

This report can be separated into two major parts. The first part (Part A) focuses on identifying the objectives of sustainable transportation. A major work in this section is the review of existing *definitions, principles, challenges and recommendations for change* that have been developed around the concept of sustainable transportation. The reports identified for the review were published between 1995 and 2001 (refer to Appendix A1 for a listing of these reports). Before 1995, the majority of major works undertaken by national/international research institutions and governments addressed the issue of sustainable development – of which transportation was a part. Since 1995, the concept of sustainable transportation has taken a more prominent role and the volume of relevant literature available reflects this.

Given the limited time for this research, it was decided that its scope would not be extended to include concepts such as the role transportation plays in globalization and the impacts transportation has on national and international trade. Nevertheless, these issues are of considerable importance and it is hoped that this research will be extended at a later date to consider the impact of mobility on globalization, trade and the environment¹.

The objective of Part A of this research is to develop a framework to structure decision making towards sustainable transportation, with the intention of creating a comprehensive definition for sustainable transportation that is supported by a series of principles.

The second part (Part B) of the research looks specifically at the U.S. transportation planning and programming process. In the U.S., the Clean Air Act Amendments 1990 (CAAA) and TEA-21 have enabled a policy framework to be established that supports the pursuit of balanced national, regional, and local goals for land-use, transportation, health and the environment. While these Acts have revolutionized the decision-making process, there is still much to be done to achieve a truly sustainable transportation sector. The challenge is

¹ Professor Nicholas A. Ashford, Massachusetts Institute of Technology, is a leading figure in the field of Sustainability, Trade and the Environment and much of the discussion in this research paper is based on knowledge gained from his classes and their focus on the concepts of sustainability, trade, environment, law, technology, and public policy. <http://web.mit.edu/ctpid/www/people/Ashford.html> (11/14/01).

how to ensure that the U.S. moves towards a fully integrated and intermodal transportation system, which can sustain economic growth while minimizing harm to social well-being and the natural environment.

The objective of Part B is to apply the concept of sustainable transportation to a real case scenario. This section will build upon the recommendations made in the initial research project at the U.S. DOT (2001). Particular attention will be paid to identifying strategies that will improve the transportation programming and planning environment within the CAAA and TEA-21 framework and the forthcoming reauthorization of TEA-21.

In summary, the objectives of this research are to:

Part A:

- Understand the meaning and definition of sustainable transportation;
- Identify the principles that support the definition of sustainable transportation;
- Highlight the challenges faced when trying to achieve sustainable transportation; and
- Document potential recommendations and policy options that could be applied to the U.S. transportation sector to make it more sustainable.

Part B:

- Evaluate the U.S. DOT's legislative authorities and identify whether it has the ability to take action to move the transportation sector towards a sustainable agenda;
- Assess whether the U.S. DOT's Strategic Plan 2002 – 2005, supports the goals of sustainable transportation;
- Review the transportation planning and programming framework created under TEA-21 and the CAAA, to identify areas where sustainable transportation principles have been adopted and where other sustainable concepts/ideas can be incorporated;
- Highlight best practice, with respect to sustainable transportation, occurring within those States that are seen to be practicing high-quality transportation planning and programming;
- Identify U.S. research projects designed to enhance TEA-21 and which support the principles of sustainable transportation;
- Highlight lessons that can be learned from the UK transportation planning process; and
- Develop a set of recommendations that are designed to improve the effectiveness of the transportation planning and programming process under TEA-21 and the CAAA.

PART A

2 THE MEANING OF SUSTAINABLE TRANSPORTATION

2.1 IS THE TRANSPORTATION SECTOR UNSUSTAINABLE?

Today the transport sector accounts for about 25 percent of the total commercial energy consumed worldwide and approximately one half of the total oil produced (UNDESA, 2001). Between now and 2020, the energy demand for transport will grow by approximately 1.5 per cent per year in industrialized countries and by 3.6 per cent per year in developing countries. The rapid urbanization and suburbanization across much of the world means that an increasing number of people will be living and working in cities. A consequence of this is that more goods will be making more trips in urban areas, often over longer distances (UNCHD, 2001). The methods by which cities meet the increased demand for urban transport will have dramatic implications for the global environment and the economic productivity of human settlements. As economic growth occurs in developing countries, incomes rise, increasing the demand for travel and the level of automobile ownership, and the trend toward urbanization will continue. As urbanization gradually increases, the process of globalization will move forward, resulting in expected increases in world trade and personal travel.

The utilization of non-renewable energy supplies to cope with this growth in transportation demand is not only unsustainable, since the resource is finite, but is also harmful to public health and the environment at the local/regional/global level, through emissions of particulate matter, Carbon Monoxide, NO_x, VOCs and greenhouse gases. While technology plays a significant role in reducing the levels of pollution at the source, the benefits that technological improvements can offer are likely to be over shadowed by the predicted worldwide growth in transportation (WBCSD, 2001). In addition, the increasing noise and land use impacts of transportation combined with growing levels of accidents and congestion represents a significant burden on society and thus adversely affects sustainable development.

Conclusions of this type, prompted the 1992 Rio de Janeiro Declaration on sustainable development, and subsequently Agenda 21, to call for global responsibility by *each sector* (such as transportation, power, and water supply and sanitation) to contribute to the achievement of sustainable development.

However, one matter that is not explicitly raised in these reports is the relative level of sustainability that each *sector* is to achieve. For example, if transportation is vital for

societal interaction and economic growth, a case could be made for the transportation sector to use a larger proportion of the available resources than the other, perhaps less important, sectors. This topic is discussed in the concluding section of this research.

2.2 THE LINK BETWEEN SUSTAINABLE DEVELOPMENT & SUSTAINABLE TRANSPORTATION

Transportation is vital for development. Without transportation people would not be able to physically access jobs, health resources, education and other important necessities and amenities; consequently their quality of life would be negatively affected. In addition, without access to resources and markets, growth is limited and poverty reduction cannot be accomplished. Hence, one simple definition of sustainable transportation might be that it *enables humans to enhance their quality of life through mobility and economic activity*. While this definition is simple and concise, it does not include a consideration of environmental protection. In addition, one could argue that it has been created to suit the ‘developed nation model’, meaning it was developed to encourage activities that typically describe and suit an industrialized nation – those of seeking freedom of mobility and wealth creation.

The growing desire of developing nations to reach the industrialized status of the North is creating a worrying trend of resource utilization. Durning, (1994) provides a valuable discussion of the issues surrounding the predicted increase in levels of consumption by industrialized and more importantly industrializing nations. Specific attention is given to the impact of the ‘consumer class’ and how the soaring consumption rates that track the rise of the consumer society are, from another perspective, indicators of surging environmental harm. Durning’s description of the consumer class [below] also highlights the severe divide between the levels of consumption in developed and developing countries.

‘The consumer class – the 1.1 billion members of the global consumer society – includes all households whose income per family member is above \$7,500. Though that threshold puts the lowest ranks of the consumer at scarcely above the U.S. poverty line, they – rather, we – still enjoy a life-style unknown in earlier ages. ... We travel in private automobiles and airplanes, and surround ourselves with a profusion of short-lived, throwaway goods. The consumer class takes home 64 percent of world income – 32 times as much as the poor’. (Durning, 1994, p42)

The notion that high consumption rates translate to huge environmental impacts has been highlighted by Meadows (1972; 1992). A major conclusion of Meadows’ *Limits to Growth* report published in 1972, was that if the present trends in world population, industrialization, pollution, food production, and resource depletion continue, the limits to growth on our planet will be reached sometime within the next 100 years. As can be imagined, this statement was interpreted as a prediction of doom, which detracted from the true message of the work. The message Meadows et al were making was that although current trends are unsustainable, it is possible to establish a condition of ecological and

economic stability that is sustainable and provides each person with an equal opportunity to realize his or her individual human potential.

‘The ideas of limits, sustainability, sufficiency, equity, and efficiency are not barriers, not obstacles, not threats. They are guides to a new world. Sustainability, not better weapons or struggles for power or material accumulation, is the ultimate challenge to the energy and creativity of the human race We see “easing down” from unsustainability not as a sacrifice, but as an opportunity to stop battering against the earth’s limits and to start transcending self-imposed and unnecessary limits in human institutions, mindsets, beliefs, and ethics.’ (Meadows, 1992, page xvii).

While initial predictions from this first report have not materialized, the underlying message is still valid; increasing consumption rates [under current consumption patterns] will lead to severe environmental problems.

Meadows published a second report in 1992, entitled *Beyond the Limits to Growth*. This work addressed the concept of overshoot – i.e. to go beyond limits inadvertently – and modeled a series of future growth scenarios on a new version of ‘World3’, the model developed 20 years earlier². A crucial element in this work was that the important limits to growth were not physical limits, e.g. limits to population growth or the number of automobiles on the road. They were limits to *throughput*, i.e. limits to the flows of energy and materials required to keep people alive or to build more automobiles for example. Hence, the limits to growth are not only limits to the ability of the earth to provide the *resource streams* of energy and materials necessary to meet predicted consumption levels, but also limits to the ability of the earth to absorb the *pollution and waste streams* in natural *sinks* such as forests and oceans.

The above discussion provides an indication of the major issues that surround growth and development and how they incorporate all aspects of human activity. Therefore, it is clear that when considering the concept of sustainable transportation our attention must not only focus on assessing the impact of the modes of transportation, but also on the implications that enhanced mobility brings. The following discussion highlights how several disciplines view sustainability and how these views might influence a definition of sustainable transportation.

² The most common criticism of the first World3 model (1972) was that it underestimated the influence of technology and did not represent adequately the adaptive nature of the free market. Note; this earlier version still showed that limits to growth would eventually be reached even if the most effective technology and greatest economic resilience were included in the model. The later version (1992) was designed to ensure that the model did not rely solely on technology or solely on the market, but instead on a smooth interaction between the two.

2.2.1 Perspectives of Sustainable Development

Without refinement, the task of defining sustainable transportation is difficult since it is based upon the definitions of sustainable development, for which there are numerous descriptions which have many meanings and implications (Holdren, 1995). An important point to understand when discussing this subject is that ‘reality’, to a considerable extent, is the perceived product of subjective perspectives and personal value-judgments (Leisinger, 1998), i.e. observers regard as real what they are able to see from their specific viewpoint. Highlighting how an *economist*, a *technologist* and someone who has a more *holistic* viewpoint, addresses the topic of sustainable development can illustrate this point.

Two interesting concepts from an **economist’s perspective** are those of *substitutability* (Solow, 1991) and the *steady state economy* (Daly, 1991). Solow’s view is that natural and man-made capital are in some sense fungible and therefore we should assess them as if they were savings and investments, i.e. we have a choice between current consumption and providing for the future through the investment of non-renewable resource rents³. Whereas Daly believes that we should strive for an economy that functions within its ecological steady state limits, i.e. cycles of production and consumption should take into account the surrounding ecosystem and try to achieve a state of equilibrium with it. Both viewpoints are quite different and represent contrasting views of sustainable development.

A **technologist’s** optimistic perspective, as outlined by Krier and Gillette (1985), is that human ability for technological advancement will, in effect, remove the barriers to sustainable development, such as the growing level of environmental pollution. At the heart of the technology debate is the belief that technological advancement is a product of intellect, and intellect is regarded as a resource without limits. While Krier and Gillette do not fully support technological optimism, their perspective is of value to this discussion. It can be argued that Solow’s concept of substitutability can only be achieved in practice through technological advancement. Therefore, Solow could be described as being a technological optimist of sorts.

A more **holistic perspective** to sustainable development, which combines both the economy and technology with ecology, is *Ecological Economics* (Costanza, 1991). This is a relatively new interdisciplinary field that studies the relationships between ecosystems and economic systems, encompassing both biological and cultural change. Hence, the human economy is seen as being part of a larger whole. Its domain is the entire web of interactions between economic and ecological sectors. Ecological economics defines sustainability in terms of natural capital – the ability of natural systems to provide goods and services, including clean air and water, and climatic stability. The ecological economist will argue

³ Resource rents are described as the investment of the pure return on a non-renewable resource. For example, in using up a natural resource such as oil in the North Sea oil field, the revenues that are intrinsic to the oil itself should be invested into new technologies that will eventually replace oil. Hence, investing the ‘rent’ from the non-renewable resource is seen as being an effective way to continue the current levels of consumption while providing for future generations.

that consumption should not deplete natural capital at a faster rate than it can be replaced by human capital⁴.

What is clear from these three perspectives of sustainability is that if a person from each standpoint were asked to recommend how the transportation sector should be made more sustainable, their answers are likely to differ significantly. For example, Solow might argue that we should utilize all non-renewable energy and material resources and invest the rents from these resources to find transportation solutions for future generations which are based on renewable resources. This would mean that the current transportation system could continue to develop with the knowledge that future systems, at least for the medium term, will be powered by non-renewable energy sources. Costanza might argue that a more balanced approach is needed and that future transportation systems should be designed to minimize environmental impact in the short, medium and long-term. This would mean that technology would play an important role sooner rather than later.

The above discussion provides an indication of the complexity and diversity of issues that surround sustainable development and these issues flow directly into the sustainable transportation debate. The result of this complexity is that there is no universally accepted definition of sustainable transportation. It is difficult to frame transportation into a specific category since the transportation sector crosses, and is an integral part of, all aspects of sustainable development. It affects the economy, social well-being and the environment and therefore providing one clear and concise definition, without losing crucial elements of the full range of sustainable development concerns, is a significant challenge. However, this should not be an excuse for inaction.

The lack of consensus about a single definition is also due in part to the limited international cooperation on a vision for sustainable transportation, although evidence presented in this research suggests that organizations such as the United Nations, World Bank, the Organization for Economic Co-operation and Development (OECD), the World Business Council for Sustainable Development (WBCSD), and the European Commission (EC) are beginning to converge on the same set of core topics and issues.

⁴ Until recently only human-made stocks were considered as capital since natural capital was abundant throughout the world. The scale of human activities was too small relative to natural processes to interfere with the free provision of natural goods and services. However, we are now entering an era in which natural capital is becoming the limiting factor. Human economic activities can significantly reduce the capacity of natural capital to yield the flow of ecosystem goods and services upon which the very productivity of human-made capital depends. For a more extensive discussion refer to Costanza, R.. (1994) *Three general policies to achieve sustainability*. Pp. 392-407, In: A.M. Jansson, M. Hammer, and R. Costanza (eds) *Investing in Natural Capital: the Ecological Economics Approach to Sustainability*. Island Press, Washington, DC.

2.2.2 Conceptual Framework for Discussions about Sustainable Transportation

Before reviewing the information presented in this research, it is important to understand the conceptual framework from which discussions about sustainable transportation are constructed. Four main areas have been identified.

First is the *transportation planning and decision-making process*, which has a significant impact on the physical layout of a transportation network. For example, decisions such as whether a city, state or nation should invest in additional road capacity, a new bus or rail transit system, expand their air infrastructure, re-develop urban centers, or initiate planning boundaries to limit expansion, will shape the future of land use and the transportation system. Without redesigning the transportation planning process, the automobile, for example, is likely to remain the dominant transport mode in many OECD countries, leading to increased congestion, pollution and accident rates. Although transportation planning and transport modes are intimately linked, it is useful to recognize the planning process separately since its macro approach can have significant benefits when forming transportation policy.

Second is the *operation of the existing transportation system*. The *supply* of an effective transportation service can be improved dramatically by enhancing the operation of the existing transportation modes and infrastructure. For example, Intelligent Transportation Systems (ITS) present significant potential to improve the efficiency and safety of transportation networks and reduce both congestion and harm to the environment.

Third, and most easily identified, are the *transportation modes*. The physical mediums by which transportation can occur (e.g. a bike, car, bus, train, airplane, etc.) have a dramatic impact on the environment, not only because of the resources used to construct the medium, but also in the by-products that result from its use (e.g. emissions) and eventual disposal (e.g. physical waste such as heavy metals, synthetic materials, etc.). The pollution caused as a result of emissions from transportation vehicles or power plants supplying electricity to transportation modes can be reduced through the introduction of new *greener technology*. Examples of such technology might be the use of fuel cells in automobiles, hybrid cars or solar powered vehicles. In addition to this, by altering the materials from which a transportation medium is constructed, employing renewable and reusable sources, significant improvements can be made towards sustainability. Both of these approaches, aimed at enhancing the sustainable characteristics of transportation modes, lend themselves to the work of McDonough (1998), who frames sustainable development principles under what is becoming known as the *Next Industrial Revolution*.

‘One might say that the infrastructure created by the Industrial Revolution of the nineteenth century resembles ... a steamship. It is powered by fossil fuels, nuclear reactors, and chemicals. It is pouring waste into the water and smoke into the sky. It is attempting to work by its own rules, contrary to those of the natural world. And although it may seem invincible, its fundamental design flaws presage

disaster. Yet many people still believe that with a few minor alterations, this infrastructure can take us safely and prosperously into the future'. (McDonough 1998, p1)

McDonough believes that if people are to prosper within the natural world, all the products and materials manufactured by industry must after each useful life provide nourishment for something new. At the heart of his strategy for change lies the notion of technical and biological metabolisms operating within separate closed-loops. For example, products composed of materials that do not biodegrade should be designed as technical nutrients that continually circulate within closed-loop industrial cycles – the technical metabolism. Whereas biological nutrients should be designed to return to the organic cycle and be consumed by microorganisms and other creatures in the soil. In order for these two metabolisms to remain healthy, great care must be taken to avoid cross-contamination. For this strategy to succeed, producers/manufactures must be made responsible for the disposal of their products, which in turn will forced them to re-think current practices.

The fourth, and slightly more abstract concept is the *use of the transportation system* by customers. This can cover a wide range of issues such as accessing work or recreational activities, the transport of freight and consumer goods, the transport of hazardous waste, etc.. The concept of managing the use of the system is controversial, but nevertheless will play an important role in reaching the end goal of sustainable development. For example, the Basel convention⁵ prevents the shipment of hazardous chemicals from developed nations to developing nations, unless the receiving nation is fully informed of what is being transported and agrees to accept the substance. One of the core objectives of the convention is to reduce the movement of hazardous waste. Following this it would seem that an ‘unsustainable’ transportation system is one that directly facilitates harm to the environment, both in the short- and long-term, as a result of its use. Under this premise, a case could be made to severely limit or ban the transport of hazardous waste, if the waste is not being disposed of in the appropriate manner at its final destination. While it is unlikely that such a concept will be supported, there are other strategies that are not so controversial. For example, the use of technology and financial incentives to reduce the need and desire to travel will be influential in solving the sustainable transportation debate. The literature review undertaken for this research presents a useful set of recommendations that highlight numerous examples of how technology and financial mechanisms can be employed.

Figure 1 provides a visual representation of how the four areas of the conceptual framework interact.

⁵ The Basel convention came into force in 1992 and was designed to prevent the uncontrolled movement and dumping of hazardous wastes, including incidents of illegal dumping in developing nations by companies from developed countries. The key objectives of the convention are to minimize the generation of hazardous wastes in terms of quantity and degree of hazardousness; to dispose of them as close to the source of generation as possible; and to reduce the movement of hazardous wastes. For additional information please refer to: <http://www.basel.int/about.html> (11/18/01).

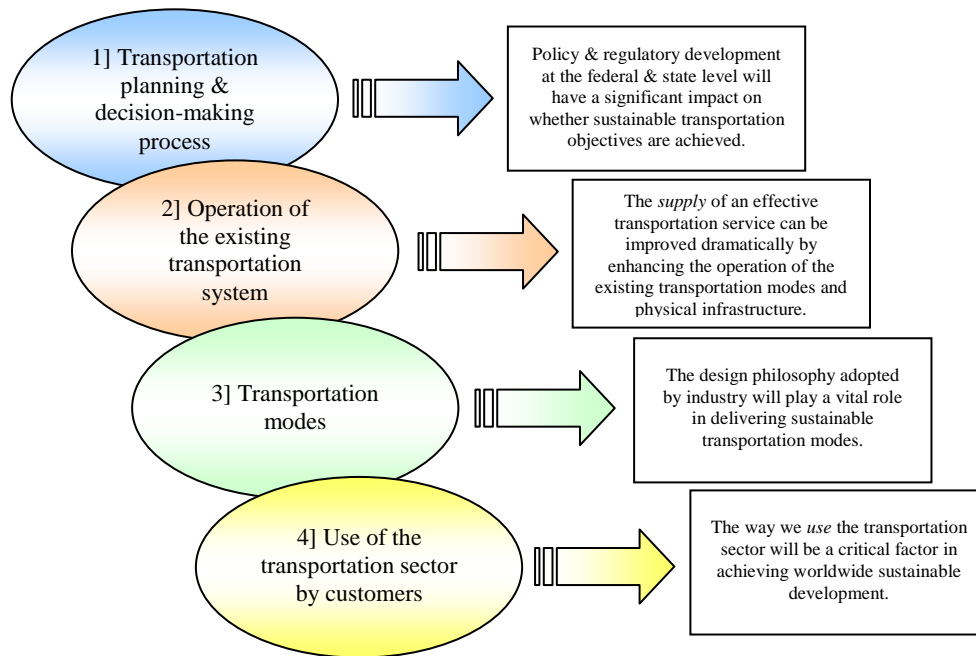


Figure 1: Framework for Discussions on Sustainable Transportation

2.3 TRANSPORTATION AS A *CONSUMPTION SUMP* & AN *ENABLING MECHANISM* FOR UNSUSTAINABILITY

Further examination of the fourth area of the conceptual framework (Section 2.2), which describes the *use* of the transportation system, reveals a depressing realization. If the transportation sector itself becomes completely sustainable in every aspect⁶ and the throughput of global consumption continues to increase, global growth and development will be unsustainable, leading to the eventual overshoot and collapse of natural and social systems (Meadows, 1992).

Ashford provides us with a useful framework (Figure 2) from which it is possible to explain the above statement in more detail. Ashford describes how the *demand* and *supply* drivers behind the global economy are moving us towards an unsustainable outcome. Figure 2 provides a visualization of these drivers, which is combined with Maslow's (1954) description of human needs, and a list of the problems and areas where action is required to halt the trends of over-consumption.

⁶ 'Completely' sustainable in the sense that it no longer pollutes the environment, natural and man-made resources used to create infrastructure and transportation mediums form technically and biologically closed loops (McDonough, 1998), all members of society have equitable access to mobility, sustained economic growth can occur, etc. – these outcomes provide only an indication of what a sustainable transportation sector might be like and are not meant to be exclusive.

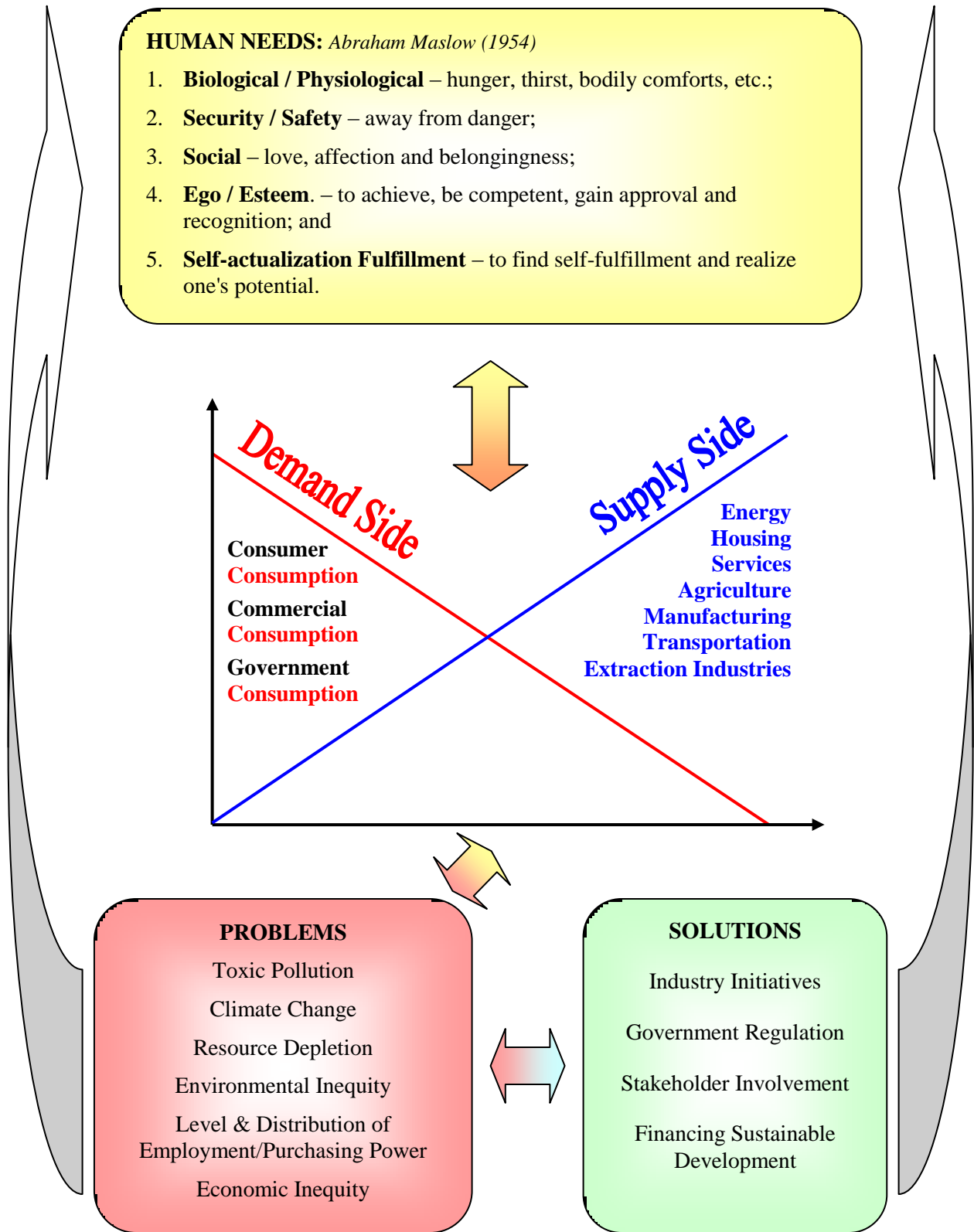


Figure 2: Drivers, Problems & Solutions to Globalization⁷

⁷ This diagram was based on an original figure produced by Prof. N. A. Ashford, 2001.

Figure 2 indicates that *our* desire to meet our own needs (as defined by Maslow) is driving the demand and supply of goods, which in turn is causing many of the environmental and social problems we currently face throughout the world. It can be seen that the transportation sector is one of the elements located on the supply side of the equation. On the demand side there are three categories of consumption; *consumer* – the items purchased by society, *commercial* – the consumption of products by industry (this is a major area which is often forgotten in discussions about consumption), and *government* – the consumption of military hardware and the purchase of materials and equipment for infrastructure and public services. In this framework, the transportation sector can be described as being both a *consumption sump*⁸ and an *enabling mechanism* through which consumption demands are met. It is likely that progress towards sustainability will only occur in the former of these two concepts in the medium-term.

Having framed transportation in this context, it can be argued that even if the transportation sector's (consumer, commercial and governmental) consumption levels were sustainable, unsustainable consumption rates in other sectors are likely to result in the overshoot of earth's capacity to *assimilate* waste/pollution and *regenerate* new resources. It also becomes clear that the transportation sector's role as an *enabling mechanism* to transport produce, products and raw materials, is a critical element in addressing over-consumption. This argument increases the importance of the fourth area of the conceptual framework – the *use of the transportation system* by customers.

Figure 2 identifies four areas where solutions to the over-consumption problem may arise – *industry initiatives*, *government regulation*, *stakeholder involvement* and *financing for sustainable development*. Decisive actions in each of these areas to signal new sustainable pathways for growth and development, are likely to be the most effective means of addressing the problem of over-consumption.

The use/management of the transportation sector to limit the movements of goods between nations provides a mechanism through which over-consumption might be controlled. There is a concern that exploiting a developing country's comparative advantage leads to competitive advantage and this, in turn, leads to national specialization. It has been shown that national dependence on a specialization leads to economic vulnerability (Bhagwati, 1997) and if appropriate occupational health and safety, and environment protection measures are not in place, the rate at which resources are supplied to an industrial sector has the potential to severely harm the nation's overall welfare (O'Connor, 1994; Krugman, 1994). Hence, if decisive action is taken to internalize the true cost of transporting products, it is likely that the higher costs of merchandize would result in a significant reduction in freight transport. Reducing the trade of goods between nations and continents will result in a loss of income to the exporting countries. In the short-term this is likely to have negative impacts on the distribution of wealth within exporting nations; however, the

⁸ The term 'consumption sump' was developed for the purpose of this discussion. It refers to the final destination of consumables (materials, equipment, products, etc.) and also to the fact that currently very few of the products and materials used in the transportation sector are reused or recycled.

potential long-term gains in environmental protection and higher levels of health are significant. In addition, shielding domestic markets from potential exploitation by limiting trade to and from the country, would enable the nation to establish a strong internal market before it is opened to international trade. This type of protectionist policy is likely to benefit developing countries that are susceptible to exploitation, although there will be circumstances where limited access should be permitted to allow for the transfer of technology and knowledge (via Multi-national Corporations and Trans-national Corporations).

Simply internalizing the true cost of transportation is only part of the solution. The individual's desire to consume is at the heart of this debate. Therefore, industry initiatives, government regulation, stakeholder involvement and financing for sustainable development will each play an important part in defining the role of the transportation sector in achieving sustainability. The challenge will be to decide whether we, as a society, should reduce our consumption levels or follow McDonough's *Next Industrial Revolution*, in which we only consume products that are highly sustainable. The final decision will depend on the interactions between governments, industry and consumers, and on the positions that each stakeholder takes.

It is clear that the above discussion raises far more questions than it answers; indeed, this was the intention. It shows that the concept of sustainable transportation cannot be considered in isolation from other sectors and that decision-making must transcend the balkanization of governmental structures.

The results of this research attempt to identify the international perception of what is believed to be the path towards sustainable transportation. This document is not intended to provide a comprehensive solution to the problems faced, but instead to be a useful reference which will stimulate discussion and help frame positions. This research focuses on the concept of the transportation sector being a *consumption sump* and propounds methods by which the U.S. Department of Transport can develop a portfolio of actions to make the surface transportation sector more sustainable. While the fundamental question of over consumption remains at the heart of the sustainable development debate, it will not be directly addressed in this research due to constraints of time.

In summary, with regards to transportation, the real challenge facing international agencies, national and local governments, industry and non-governmental organizations, is to find common ground between the perspectives of all the stakeholders involved with sustainable development. In essence, the discussion presented above means it is highly unlikely that there will be a universally applicable blueprint for sustainable transportation for all nations under all circumstances. However, making the transportation sector less unsustainable should be the major objective in the short- and medium-term, whereas in the long-term the ultimate goal should be to reach a level of sustainable mobility. While the future path is uncertain, the international momentum behind the goal of achieving sustainable development means that pressure on national transportation sectors to become sustainable will increase.

3 SUSTAINABLE TRANSPORTATION POLICY REVIEW

It became apparent during the early stages of this research that there was a significant volume of high quality literature available on the topic of sustainable transportation. A literature search identified that virtually all the major international organizations (i.e. United Nations (UN), World Bank, Organization for Economic Co-operation and Development (OECD), and the World Business Council for Sustainable Development (WBCSD)), and several nations (i.e. U.S., Canada, UK, and the European Community – a list that represents the nations reviewed and not therefore intended to be all inclusive) have invested significant resources into the question of how the transport sector could be made more sustainable. Capturing this knowledge became an essential element of this research.

The sheer volume of information available from each institution and government presented a difficulty in itself. In an attempt to streamline the review process and create a structure through which the information from each report could be extracted, the following categories were established.

- Definitions
- Principles
- Challenges
- Recommendations for Change

The rationale behind this categorization is that a definition should be supported by principles, fulfilling these principles confronts challenges, and overcoming these challenges will require changes to the transportation sector (see Figure 3).

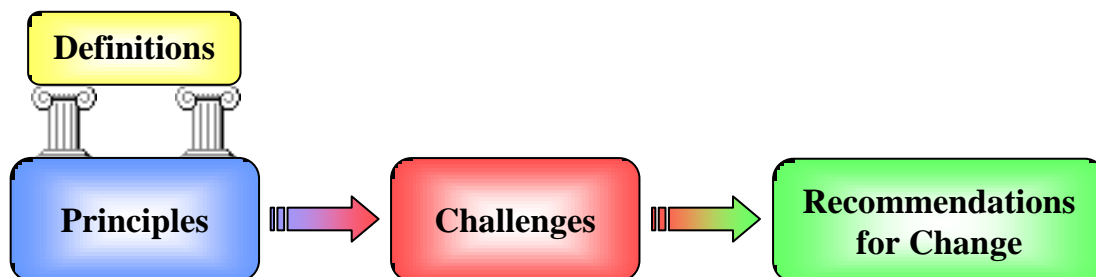


Figure 3: Structure of Policy Review

Text relevant to *sustainable transportation* was extracted from each of the reports reviewed, then sorted into appropriate categories. Appendixes A1 (Definitions), A2 (Principles), A3 (Challenges) and A4 (Recommendations for Change) display the results of this exercise. It should be noted that the tables represent the author's interpretation of whether a statement is viewed as a definition, principle, challenge or recommendation for change. Great care was taken to ensure that the information was displayed in a consistent

format, although there may be occasions where the location of a statement is open to debate. Despite this the tables provide a rich source of information that tracks the development of concepts and issues, and frames the sustainable transportation debate. Sections 3.1 to 3.4, present the results of this policy review giving the author's opinion of which are the most important issues for today.

3.1 DEFINING SUSTAINABLE TRANSPORTATION

In 1987, the World Commission on Environment and Development (the Brundtland Commission) developed what has since become the most widely accepted general definition of sustainable development.

'Humanity has the ability to make development sustainable – to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED, 1987: p8 – also known as the Brundtland definition.)

The wide acceptance of the Brundtland definition is partly due to its simplicity. People of all nations are able to understand the definition since it is easy to relate to their current needs and the future needs of their children and grandchildren. Unfortunately, when considering the concept of sustainable transportation, the simplicity of the Brundtland definition means that it does not provide decision-makers with a robust set of objectives that can guide the effective and consistent development of legislation, and transportation plans and programs. Hence, the practical application of the Brundtland definition has spawned much discussion centered around the concept of sustainable transportation.

The two core principles contained within the full text of the Brundtland definition call for the establishment of 'stable' *social* as well as *physical* systems.

Humans have evolved to be highly dependent on their societies, and thus the stability of societies is a necessary condition for meeting human needs (CST 1997). In addition, existing societal factors are important because they determine the present quality of life and because they can be a major component of our legacy to our descendants.

Physical systems relate to both *natural* and *man-made* systems, and the mechanisms through which they interact. A stable natural system provides the resources that humans and all other species need for survival. A stable man-made system – while it too might provide resources and access to resources for the survival of humans and other species – facilitates societal interactions.

Today, our society provides people, who have common traditions, institutions, and collective activities and interests, with the opportunity to come together to give support to and be supported by each other as a means of ensuring the continued existence of their quality of life. For society to function effectively people need to be able to move freely,

communicate, trade, establish relationships, have a common set of rules for relating to one another and share in the working of common institutions (Bull, 1977). However, a major problem appears to be the incentives and beliefs that inform us whether we have met our own needs.

As highlighted in the Brundtland definition, the key indicator that determines whether sustainability has been achieved is whether the individual's needs have been met without damage occurring to the social or physical systems. A key argument in Section 2.2, was that social well-being is closely associated with the attributes that accompany industrialization – i.e. the ability of the individual to achieve economic and hence material wealth. Therefore, we find ourselves in a situation where the drive to satisfy our own needs is leading us down a 'self-reinforcing' unsustainable path of increasing *resource throughput* and hence *overconsumption* (or overshoot as described by Meadows, 1992). The more we have the more we need to satisfy our own needs.

While the scenario presented above is somewhat bleak, there are ways in which the challenge of living within the limits of the global system can be achieved. One possible solution lies in the leadership of developed nations and international institutions and their ability to alter the 'developed nation model'. By recognizing that each sector is not independent and is part of the global system, decisions can be made which ensure that rates of resource utilization and hence throughput by all sectors, do not exceed the earth's *assimilative* and *regenerative* capacity. Solutions are not limited to developed nations and the ability of developing nations to take active and lead roles will be essential in making transportation more sustainable. A crucial element in the ability of both developed and developing nations to initiate change will be their capacity to alter peoples' *behavioral characteristics*. Changing the way in which we perceive value (both in an economic and intangible [e.g. goodwill] sense), will have significant implications for how we evaluate problems and develop solutions.

This type of discussion of sustainability has spawned definitions of sustainable transportation that strive to protect the environment, achieve social equity, and establish a stable economic environment.

The information displayed in Appendix A1, provides evidence that the international community has reached a consensus that sustainable transportation can be defined under the 'Three E's' of Environment, Equity and Economy. The following text provides a summary of the key definitions presented under each of these categories.

Environment

*Health & Environmental
Damage
Standards*

Emissions and Waste

*Noise
Land Use
Renewable Resources*

*Energy
Non-renewable Resources*

Recycling

A Sustainable Transportation System ...

- minimizes activities that cause serious public health concerns and damage to the environment;
- maintains high environmental quality standards throughout urban and rural areas;
- limits emissions and waste to levels within the planet's ability to absorb them, and does not aggravate adverse global phenomena, including climate change, stratospheric ozone depletion, and the spread of persistent organic pollutants;
- minimizes the production of noise;
- minimizes the use of land;
- ensures that renewable resources are managed and used in ways which do not diminish the capacity of ecological systems to continue providing those resources;
- is powered by renewable energy sources;
- ensures that non-renewables are managed and used in ways which account for future needs and the availability of alternative resources; and
- recycles its components.

Equity

Safety

Economic Equity

*Intergeneration Equity
Access*

A Sustainable Transportation System ...

- allows the basic needs of individuals and societies to be met safely;
- ensures the secure movement of people and goods;
- ensures the equitable distribution of economic benefits derived from the transportation sector's role in national economic growth;
- ensures equity within and between generations; and
- provides access to goods and services in an efficient way.

Economy

*Affordability
Efficiency*

A Sustainable Transportation System ...

- is affordable; and
- operates efficiently to support a vibrant economy.

Discussions with leading transportation research institutions have highlighted a growing international acceptance of the definition of sustainable transportation developed by the Canadian 'Centre for Sustainable Transportation' (CST, 1997). The CST definition (Box 1) recognizes that the concept of sustainable transportation goes beyond the issue of environmental protection and highlights the need for a fundamental change in the planning process. It recognizes that the concepts addressed by the 'Three E's' are closely interconnected and present a useful policy statement from which governments and international institutions can develop their transportation strategies and advice. In addition, if followed with conviction by developed nations, it will begin to create a new paradigm for transportation development. As successful projects and technological solution are created, they can be benchmarked and re-applied (with alterations to suit local circumstances)

throughout the world. However, transportation is only one sector and it must work in conjunction with other sectors, such as the energy or the commercial sector, to realize the true goal of sustainable development.

In summary, while the CST definition is seen to encompass all the major elements required to achieve sustainable transportation, if we consider the transportation sector as part of the global system, the definition misses the important issue of managing the increasing *throughput* of natural and man-made resources. In essence the transportation sector can be seen as an enabling mechanism that facilitates consumption at ever increasing rates. The CST definition makes no reference to the actual use of the transportation system and to how this can have a dramatic affect on whether the final goal of global sustainability is achieved. Therefore, an additional element has been added to the CST definition to take this aspect into account (Box 1).

Box 1: Definition of Sustainable Transportation (CST, 1997: p2)

A sustainable transportation system is one that:

- allows the basic access needs of individuals and societies to be met safely and in a manner consistent with human and ecosystem health, and with equity within and between generations.
- is affordable, operates efficiently, offers choice of transport mode, and supports a vibrant economy.
- limits emissions and waste within the planet's ability to absorb them, minimizes consumption of non-renewable resources, reuses and recycles its components, and minimizes the use of land and the production of noise.

[Additional Element]

- controls the *throughput* of natural and manmade resources to rates within the carrying capacity of the environment, society and the economy.

It is recommended that the *amended* CST definition be used as the starting point when discussing the topic of sustainable transportation, since it will enable decision-makers to think outside of their areas of direct influence. The appreciation of other sectors will play a major role in making sustainable development a reality. Figure 4 provides a useful visualization of the definition, which shows how the Three E's interact.

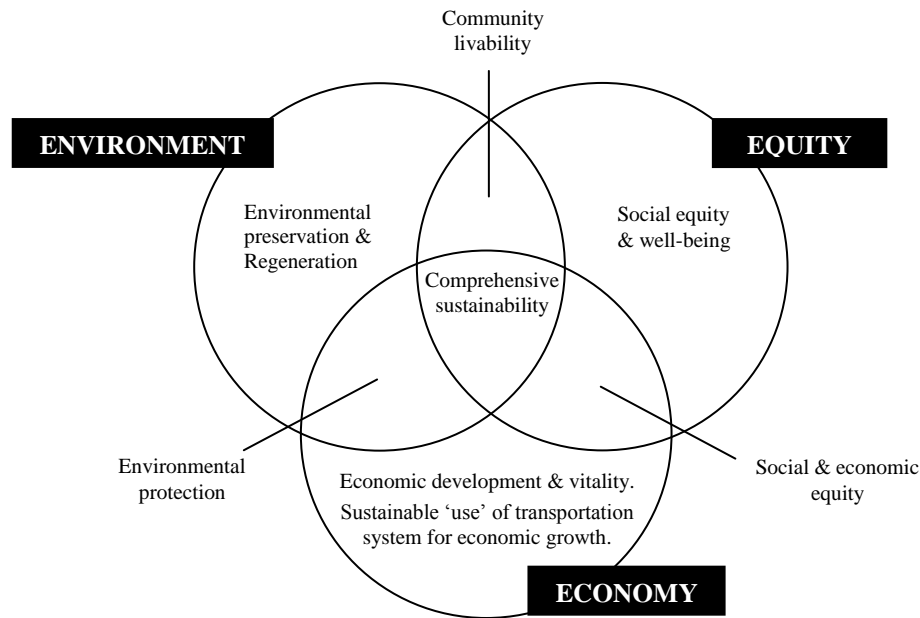


Figure 4: Visualization of Sustainable Transportation Definition⁹

3.1.1 The Buck Stops Where?

The additional element to the CST definition (Box 1) is clearly controversial. It has been debated whether this element should be altered or removed to make the definition of sustainable transportation less radical and as such, more politically palatable. However, the author has decided to leave the definition unchanged. Section 2.3 concluded that excluding the use of the transportation sector from discussions, would mean that while the transportation sector *itself* might eventually become sustainable, the goal of achieving sustainable development in a global context might not be reached due to increasing rates of resource throughput. On this premise, the exclusion of the use of the transportation sector from the definition could not be justified.

In essence, including the use of the transportation sector in the CST definition is comparable to stating that banks or other financial institutions should not transfer money between nations if it is thought that it could be used by terrorist organizations to purchase military hardware. An important aspect of this analogy is that the banks are seen as *facilitating mechanisms* for the movement of money. Thus, are banks to be held responsible for the end results of their actions when they are simply facilitating a business transaction

⁹ The diagram was reproduced and amended slightly from a diagram prepared by the Centre for Sustainable Transportation in their *Definition and Vision of Sustainable Transportation* (1997), developed from an original diagram produced by the Ontario Round Table on the Environment and the Economy (1995).

between clients? Stapleton (1999) presents a possible answer to this question in a paper on ethical banking, which calls for reform in the banking sector and for the public to be educated about how money is being manipulated and misused. When used positively, banks can finance ethical projects and be an agent of much good but when used negatively they can control and dominate governments and nations, or at a minimum harm society. Stapleton also calls for the establishment of governance and ethical committees for governments, banks and corporate businesses. In his conclusion, Stapleton asks banks to raise their conscious awareness of world events and issues and to identify what lies behind them.

It is important to bring the above discussion back to the transportation sector, for one might question the relevance of the analogy. The comparison being made is that the transportation sector, like the banking sector, should not act without assessing the moral dimensions and social implications of its actions. To be more specific, the role that the transportation sector plays in *facilitating* the movement of goods and people, has the potential for enormous social and economic benefit but at the same time it can result in environmental degradation and social and economic inequalities on a global scale. Preventing the transport of unsustainable amounts of natural resources and goods by using trade measures or other similar instruments will be extremely difficult, though not impossible. A major problem with this solution is that it runs against the principles of trade liberalization. Thus, overcoming the political pressures which resist the introduction of such instruments will be a formidable challenge.

The effectiveness of trade measures in pursuing environmental goals was a question posed by Congress to the Office of Technology Assessment (OTA) in 1992. The final report, titled *Trade and Environment: Conflicts and Opportunities*, provides a detailed discussion on the topic. The following aspects of this report have been extracted, since they are of particular relevance to this discussion.

The OTA report concluded that;

*‘[t]rade measures (especially import restrictions), and the threat of such measures, can potentially further environmental goals in various ways. They can help **convince** a country to join an international environmental agreement or to behave according to certain environmental norms; **deny** a country economic gain from failing to follow such norms; **prevent** a country’s actions from undermining the environmental effectiveness of other countries’ efforts; and **remove** the economic incentive for certain environmentally undesirable economic activity’ (OTA, 1992, p42).*

Examples of such measures can be found in the Convention on International Trade in Endangered Species of wild fauna and flora (CITES), established to ensure that international trade in specimens of wild animals and plants does not threaten their survival, and the Basel Convention on the control of transboundary movements of hazardous waste and its disposal. In parallel with these conventions, it is possible to envision an agreement which controls the throughput of natural and manmade resources with the overall objective of protecting both

human health and the environment at the point of resource extraction, during the resources' (or products') use and at its final disposal. Opponents of such a measure might take the position of promoting employment and income growth for people in developing nations instead of trade measures, by implementing instruments such as domestic economic reform and access to foreign markets. While the author does not disagree with such measures, he believes that the final solution will lie somewhere between protective instruments and a reliance on the free market.

The title of this section '*The Buck Stops Where?*' was used to try to characterize the nature of the discussions between the author and members of the transportation and policy community, when discussing the amended CST definition of sustainable transportation. In general, there was overwhelming support for the removal of the new element, since it was thought that in practice the transportation sector is *not* responsible for managing and controlling the rates at which goods are moved between and within nations. These rates are currently determined by factors such as governmental policies, the strength of the commercial sector and the ability of the transportation sector to provide a reliable, high capacity service. While the author accepts that the control of freight movement is not currently the *legal* or *institutionalized* responsibility of the transportation sector, it does not mean that this practice is necessarily correct or morally defensible. As discussed in Section 4.4, Forrester¹⁰ states that two characteristics of highly complex systems are their ability to transfer the burden of solving difficult issues onto the intervener and to transfer the problems between sectors. In addition, complex systems present significant resistance to most policy changes, a reality which initiated the rationale for this discussion.

Making government departments of transportation an integral part of the decision-making process in order to manage the throughput of natural and manmade resources; will require new forms of institutional and legislative frameworks. Decision-making processes for formulating national trade, labor and environmental standards, will need to be *integrated* with transportation planning, and boundaries between traditionally segregated government administrations will need to be removed.

At the heart of the idea for merging the decision-making authority of governmental departments, is the question of the *social responsibility of the transportation sector*. To provide a clear understanding of what is meant by this statement, the following scenario is created.

Imagine that *you* are responsible for the design and implementation of the next generation of transportation infrastructure to transport freight between nations in a more effective and efficient manner. Under this design paradigm, it is clear that the volume and rates at which goods are transported should be maximized – i.e. more should be transported, more quickly, using less energy and at a lower cost. There is no incentive to consider the implications that enhanced mobility brings, since managing the rates at which goods are

¹⁰ Professor Jay Forrester, MIT, presented the Characteristics of Complex Systems during a lecture on System Dynamics and Sustainability, held at MIT on 18th January 2002, building E51-325.

transported is, in general, left to the free market. However, if made aware of the potential implications that your new conveyance system might have on the sustainability of *natural* and *physical* systems, how then would you address these issues under the current governmental structure? Is there any way you could have resolved these potential problems in the design of the transportation system? A more fundamental question might be whether you believe it to be your *responsibility* to address these issues in the first place.

The matter of *social responsibility* – as opposed to an institutional mission¹¹ – unleashes a wealth of interesting arguments. Designers of artillery do not question whether their product will be used in an unsustainable manner, since it is their responsibility to create weapons which deliver the highest explosive capability at the point of detonation. Likewise, in the above scenario, you are not likely to question whether the new transportation system will be used in a manner that reinforces unsustainable growth, since you have a responsibility to deliver a highly efficient and effective freight conveyance system. It might be argued that these two examples are similar; the rationale being that it is not the designer's responsibility to control or manage how their product is used. It is the author's belief however, that these two examples are fundamentally different. Designers of artillery undertake their work with a full appreciation of the repercussions of their actions, and it is this fact which delineates the two examples. Before exploring this position further, it is worth stating that the moral and ethical standards of transportation system designers are not being brought into question. Having been a transportation consultant himself, the author fully appreciates that transportation academics, engineers, planners and officials are highly moral and ethical people from diverse ethnic backgrounds. Therefore, if the moral standards of the individual are not the core issue, where should the *social responsibility* lie?

To help answer this somewhat abstract question, we can turn to the U.S. legal profession for assistance. In 1983, Caldart highlighted the need for a recognition of moral obligations within the legal profession by reviewing the lawyer's duty and the client's interest. Caldart states, that under the adversarial system there is no reason why the attorney cannot serve the moral interest of the client. However, evidence is subsequently presented which shows how this does not always occur in practice. The judicial language on the topic of moral standards is almost entirely directed at the attorney's obligation to deal fairly and honestly with the client and the client's money, and not to help the client fulfill their moral obligations to society. Hence, the *legal system* actually discourages the attorney from serving the clients moral interests. An example of how this problem occurs can be found in The American Bar Association's (ABA's) Code of Professional Responsibility. Principle 7 of the Code states that 'A lawyer should represent a client zealously within the bounds of the law', which is the central assertion of the adversarial system – i.e. a lawyer's principle duty

¹¹ *Institutional Mission* refers specifically to the defined mission statement of an institution, which might not capture all aspects of social responsibility. For example, the institutional mission of the U.S. DOT is to '[s]erve the United States by ensuring a safe, fast, efficient, accessible and convenient transportation system that meets our vital national interests and enhances the quality of life of the American people, today and into the future. U.S. DOT Strategic Plan 2000 – 2005, p9, <http://stratplan.dot.gov/> (02/27/02). An interesting question to consider is whether it is possible to enhance the quality off life of the American people through both socially *responsible* and *irresponsible* ways.

lies with their client and their client's interests. The Code provides a clear definition of what is meant by the client's interests under the first disciplinary rule (DR) under principle 7.

'A lawyer shall not intentionally ... fail to seek the lawful objectives of his client through reasonably available means permitted by the law and the disciplinary rules ...' (ABA, DR 7-101 (A))

Caldart promulgates that the interests to be served by the attorney are the client's '*lawful objectives*'. And under the code, a '*lawful*' objective need not be a moral one.

Again, it is important to link the above analogy to the transportation sector, since the connection may not at first seem obvious. The main reason for using the U.S. legal profession to illustrate the question of moral standards was to highlight how the *system* itself might potentially be at fault. In the case of the legal system, Caldart shows how an attorney who follows the Code of Professional Responsibility to the letter, without consideration of moral standards, may obtain a lawful, but immoral result for the client. To solve this dilemma either the legal system itself must be changed or moral inquiry must be integrated into the foundation of legal education. Caldart calls for the latter. It would be wrong however, to assert that the same scenario holds true for transportation planners or other members of the transportation community. The absence of an adversarial approach to transportation planning means that decisions taken by planners and officials, though moral and ethical within the confines of their sector, may not be so when set in a context of worldwide sustainable development. Therefore, to appreciate the subtleties of the analogy between the legal system and the transportation sector, we must return to Stapleton's earlier comments.

Stapleton asserts that only by raising the conscious awareness of how a person's actions might affect world events and issues, can that person begin to appreciate their impact on issues such as social equality or environmental harm. In the case of the transportation and banking sectors, the author of this thesis asserts that it is the *sectors as a whole*, which must take the lead in raising the conscious awareness of the implications of their actions. The present segregation of governmental departments and a growing confidence in the free market economy means that in the case of the transportation sector, the transportation community is, in effect, shielded from the implications of their decisions. For example, relying on the free market to dictate how transportation systems are used means that the transportation sector is acting as a *facilitating mechanism* and does not need to question whether its actions might be socially objectionable.

Ashford, R. (1999) offers a parallel discussion to Caldart, about the positive, moral and ethical dimensions of socio-economics¹² and how it provides an alternative systematic

¹² Socio Economics draws upon economics, sociology, political science, psychology, anthropology, biology, and other social and natural sciences, philosophy, history, law, management and other disciplines, and regards competitive behavior as a subset of human behavior within a societal and natural context that both enables and constrains competition and cooperation. (Ashford, R. 1999).

approach to understanding important connections between economic behavior and law. Ashford describes how a lawyer's ethics can be categorized under the *five c's*: competence, candor, confidence, conflicts, and conscience. For this discussion the characteristic of *conscience* is of particular interest, since it provides an avenue by which change can occur without relying on a system's *process* or set of *procedures* to obtain the socially responsible outcome.

'Conscience is the broadest category of all. It raises the distinction between professional and personal ethics. In situations where lawyers may, but are not ... required to act, discretion must be exercised; and discretion is to be guided by conscience. ... [C]onscience imposes a duty to improve the law and the legal system, not only for the benefit of clients, but for the general welfare and the public good' (Ashford R., 1999, p618)

Hence, lawyers are connected to clients in a manner which means they must act according to behavioral standards above those applicable in the free market.

Consequently, the author believes that the transportation sector has similar obligations to the legal profession to act in a *socially responsibly manner*. Transportation systems should be developed to promote economic and social well-being, without putting worldwide development on a path which leads towards unsustainability – i.e. the potential overshoot and collapse of natural and manmade systems.

In the case of the design assignment presented earlier, it should become clear that if you were *consciously aware* of the impacts of enhancing the rates of resource throughput, and had the opportunity to address the issue, you might seek a radically different type of solution. For example, instead of only designing faster and more efficient modes of transportation, you might decide to support and encourage product innovations which create recyclable products (both technically and biologically), and which result in lighter and fewer cargo shipments. In parallel with this, it is also interesting to identify who are the *clients* to the transportation sector. In the analogies with the U.S. legal profession the client is well defined, however in the case of the transportation sector the distinction is not so clear. In general, clients can be described as the paying customers and these can be categorized into groups such as the general public, the commercial sector, government, etc.. If the analogies with the U.S. legal profession are considered more closely, an interesting question can be raised about the client's interests. That is, should the transportation sector serve the moral interest of the client? As far as the author is aware this question has not been directly addressed by the transportation community.

In summary, the answer to the question, '*The buck stops where?*', is that the buck stops not with one governmental department or the free market, but with a cohort of leaders from many governmental departments and industry. This discussion has attempted to take an alternative look at the traditional way of thinking about the transportation sector. While the effects of progress in areas such as product and technological innovation are likely to have a

significant *positive* affect on social and on natural and manmade systems, the author believes that this alone will not be sufficient to reach the goals of sustainable development.

3.2 PRINCIPLES OF SUSTAINABLE TRANSPORTATION

The amended CST definition of sustainable transportation provides a good indication of the final policy objectives; however it is the underlying principles which support the definition that provide additional breadth and depth to their meaning.

Appendix A2, presents the results from the policy review, which focuses specifically on identifying the principles of sustainable transportation. The review in Appendix A2, highlights five main categories under which the principles are located. As might be expected, three of the categories follow the ‘Three E’s’ of Environment, Economy and Equity. For simplicity, Table 1 (below) combines the remaining two categories of Institutional and Technical Innovation, under the one heading of ‘Institutional’. The principles listed in Table 1, and the text displayed in Boxes 2 through to 5, were extracted from the 22 reports reviewed¹³. The majority of the text presented in the four boxes presents the original wording from these reports, with some slight amendments. Appendix A2, displays the original text from which the boxes were created.

Table 1: Principles of Sustainable Transportation

Environment	Economy	Social Equity	Institutional	
Precautionary; Preventative; Regenerative; Substitutability; Assimilative Capacity; Avoidance of Irreversibility; Use of Energy; Stewardship; Ability to Recycle	Polluter Pays; Cost Internalization; Affordability; Cost-effectiveness; Economic Well-being	Access & Choice; Equity; Social Well-being; Social Responsibility	Integration; Comprehensive & Long-term Planning; Transparency & Accountability; Goals, Performance and Outcomes; International Co-operation; Technical Innovation	Reduction of Automobile Dependency; Improvement in Efficiency; Protection of Health & Safety; Appropriate Use of Land & Resources; Participation & Education

Sections 3.2.1 to 3.2.4 inclusively provide a summary of the principles that are recognized as being most effective in striving towards the final goal of a sustainable transportation system. The principles form a comprehensive foundation upon which this research paper has been based and provide a set of values that effectively capture the essence of sustainable transportation.

¹³ Refer to the References listed in Appendix A1, for a list of all the publications used in the development of the principles.

3.2.1 Environmental Principles

The Environmental principles (Box 2) are seen as being crucial for the short-, medium- and long-term protection of the natural environment.

The principles ask governments to; apply *precaution* and take action to *prevent* environmental damage as appropriate in situations where there is lack of scientific certainty that damage will occur; use non-renewable resources efficiently while searching for *substitutes*, and ensure that the use of renewable resources do not exceed their *regenerative* capacity; avoid the release of pollutants into the environment at a rate that is greater than the environment's ability to *assimilate* the pollution; reduce the consumption of fossil fuels through improvements in engine efficiency and take full advantage of essentially *renewable* or *inexhaustible energy sources*; consider the potential environmental impacts of new initiatives, and apply risk management and due diligence practices consistently to real property assets; and develop transportation infrastructure and vehicles for *reuse* or *recycling*.

Box 2: Environmental Principles

Precautionary

Requires that environmental degradation should be prevented and recognizes that where there are threats of serious or irreversible damage to the environment, the lack of full scientific certainty should not be used as a reason to delay taking cost-effective action to prevent or minimize such damage. Hence, when designing policies for sustainable development, precaution should be applied as appropriate in situations where there is lack of scientific certainty (UK RT, 1996; TC, 2001; OECD, 2001a; VTPI, 2001).

Preventative

Recognizes that it is better for society to avoid incurring the costs that result from development activities which seriously damage natural or physical capital. Entails the application of preventive measures in situations of scientific uncertainty where a course of action may cause harm to the environment. Action should be taken to avoid or minimize environmental pollution at its source (UK RT, 1996).

Regenerative

Renewable resources should be used efficiently and their use should not be permitted to exceed their long-term rates of natural regeneration (CST, 1997; OECD, 2001a; OECD, 2001b).

Substitutability

Non-renewable resources should be used efficiently, and their use limited to levels that can be offset by renewable resources or other forms of capital (Baltic 21, 1998; OECD, 2001a; OECD, 2001b).

Assimilative Capacity

Releases of hazardous or polluting substances to the environment should not exceed its assimilative capacity, and concentrations should be kept below established critical levels necessary for the protection of human health and the environment. When assimilative capacity is effectively zero, there should be no release of such substances since this will result in their accumulation in the environment (Baltic 21, 1998; OECD, 2001a).

Avoidance of Irreversibility

Irreversible adverse effects of human activities on ecosystems and on bio-geochemical and hydrological cycles should be avoided. The natural processes capable of maintaining or restoring the integrity of ecosystems should be safeguarded from adverse impacts of human activities. The differing levels of resilience and carrying capacity of ecosystems should be considered, in order to conserve their populations of threatened, endangered and critical species. The principle rests on the need to recognize that harm to the environment can be irreversible, and therefore it is better to avoid any possible harm than to try to remedy it later. The latter course of action may be impossible (for example, reversing the extinction of a species) or excessively costly (OECD, 2001b).

Cont ...

Use of Energy

The transportation system should be developed to take full advantage of essentially renewable or inexhaustible energy sources. The consumption of fossil fuels should be reduced through improvements in engine efficiency, which will reduce their impact on health and the environment (OECD, 1996; CST, 1997).

Stewardship

As both custodian and landlord, governments should consider the potential environmental impacts of new initiatives, and should apply risk management and due diligence practices consistently to its real property assets (TC, 2001).

Ability to Recycle

Where appropriate, transportation infrastructure and vehicles (trains, cars, buses, planes, bikes, etc.) should be designed for reuse or recycling (CST, 1997).

3.2.2 Economic Principles

The Economic principles (Box 3) can be broken down into three strands that aim to encourage sustainable transportation practices. The first strand aims to pass the cost of transportation related pollution onto the polluter. Both the *Polluter Pays* and the *Cost Internalization* principles aim to achieve this goal. The second strand seeks to ensure that the measures taken are *affordable* and *cost-effective*. The third strand tries to ensure that the first two strands achieve *economic well-being*, since it is clear that both appear to be at odds with each other. Hence, all the principles need to be considered carefully when making decisions that have economic implications.

The quote below, by Herman Daly, provides a useful description of the overall objectives of the economic principles.

*'I see the economy as an open subsystem dependent on the ecosystem for sources of raw material and sinks for waste material and energy. The ecosystem is finite, nongrowing, and materially closed. Our economy has grown so large relative to the system that its demands threaten to overwhelm the ecosystem's natural capacities to regenerate resources and to absorb wastes. To me, that means that the path of economic progress must shift from growth (quantitative expansion) to development (qualitative improvement).'*¹⁴

¹⁴ The quote was extracted from Herman Daly's web page at the University of Maryland School of Public Affairs. <http://www.puaf.umd.edu/faculty/facultystaff/daly.htm> (11/24/01).

Box 3: Economic Principles***Polluter Pays***

The Organization of Economic Co-operation and Development first set out the principle in 1974, to recognize that the costs of preventing or cleaning up pollution and waste should be borne by those responsible for causing the pollution and waste, and not by society at large. Legislation should be developed to support the principle and to ensure the principle is not merely a policy goal (UK RT, 1996; Baltic 21, 1998).

Cost Internalization

For markets to support sustainable outcomes, prices should reflect the full costs and benefits to societies of the goods and services being produced. This will require the elimination of incentives which encourage the over-use of natural resources that degrade the environment, and the introduction of new incentives to improve the environment. The value of full cost pricing should be recognized, whereby the costs of transportation reflect, to the extent possible, the full economic, social and environmental impacts. Internalization measures bring the costs or benefits back into the decision-maker's evaluation framework, thereby making them internal to market-based transactions (Ontario RT, 1995; Canadian RT, 1996; UNCHS, 2000; TC, 2001; OECD, 2001a; VTPI, 2001).

Affordability

Transportation systems should be affordable to all potential customers. Governments should promote sustained strategic investment in transportation through new partnerships, innovative financing and a clear identification of priorities (CST, 1997; TC, 2001).

Cost-effectiveness

Policies should aim at minimizing their economic cost. This will require ensuring that the costs of each extra resource spent are equal across the range of possible interventions. Cost-effectiveness allows the minimization of aggregate costs and the setting of more ambitious targets in the future (CST, 1997; OECD, 2001a).

Economic Well-being

Taxation and economic policies should work for, and not against, sustainable transportation, which should be seen as contributing to improvements in economic and community well-being (OECD, 1996).

3.2.3 Social Equity Principles

The Social Equity principles (Box 4) are seen as being essential to ensure the equitable treatment of all people and organizations that are affected by transportation. The principles seek to; promote a more diverse transportation system in order to provide people with reasonable *access* to other people, places, goods and services; ensure social *inter-* and *intra-regional* and *inter-generational equity*, meeting the basic transportation related needs of all people; enhance the *social well-being* of different communities and regions; and make sure individuals *act responsibly* and make sustainable choices with regard to personal movement and consumption.

Box 4: Social Equity Principles***Access and Choice***

Transportation systems should provide people with reasonable access to other people, places, goods and services. Governments should promote a more diverse transportation system, including access to innovative alternatives (e.g. information technologies) (OECD, 1996; Canadian RT, 1996; CST, 1997; Baltic, 21 1998; UNCHS, 2000; TC, 2001).

Equity

Equity is a fundamental goal of sustainable development. Nation states and the transportation community must strive to ensure social, inter-regional and inter-generational equity, meeting the basic transportation related needs of all people including women, the poor, the rural, and the disabled. Developed economies must work in partnership with developing economies in fostering practices of sustainable transportation (OECD, 1996; Canadian RT, 1996; VTPI, 1999; VTPI, 2001).

Social Well-being

With respect to society, transportation systems should meet basic human needs for health, comfort, and convenience in ways that do not stress the social fabric. A key component of social well-being is community livability, which includes local environmental quality, the quality of community interactions and community cohesion (whether community residents work together and support each other, sometimes referred to as “civil society” or “social fabric”), and the ability of a community to satisfy the basic needs of residents (such as food, shelter, education and medical services). Creating a more attractive, interactive, pedestrian-friendly streetscape, and initiating other policies that encourage non-motorized transport, may be an important step towards achieving social well-being (CST, 1997; VTPI, 1999; TC, 2001).

Social Responsibility

All individuals have a responsibility to act as stewards of the natural environment, undertaking to make sustainable choices with regard to personal movement and consumption. Hence, individual *participation* will be an important element in achieving the goals of sustainable transportation (OECD, 1996; Canadian RT, 1996).

3.2.4 Institutional Principles

The Institutional principles (Box 5) are aimed specifically at governments and planning authorities and seek to;

- *integrate* sustainable transportation requirements into the definition and implementation of all policy-making;
- make the decision-making process *transparent* and *accountable*, and assist this principle through the use of *goals* and *performance measurement*;
- increase the level of *international co-operation*;
- nurture *technological innovation* that supports the objectives of sustainability through partnerships between government, industry and academic research centers;
- ensure that transportation decisions are based on the principles of *comprehensive and long-term planning*;
- reduce *automobile dependency*;
- explore ways of promoting *efficient travel behaviour*;
- design and operate transportation systems in a manner that protects the *health and safety* of all people;

- promote the *efficient use of land* and other *natural resources* while ensuring the preservation of vital habitats and other requirements for maintaining biodiversity; and
- encourage *public involvement* in decision-making with the objective of achieving community cohesion and livability.

Box 5: Institutional Principles

Integration

Recognizes that sustainable transportation requirements must be integrated into the definition and implementation of all areas of policy-making. Governments should set priorities and responsibilities, allocate resources, and apply tools to integrate sustainable development into their policies, programs and operations. Sustainability emphasizes *integrated* rather than reductionist decision-making. For example, it requires coordination between transportation, land use and social planning. Unsustainable practices may result from incoherent policies in different domains. Sectoral policies, in particular, are often introduced without due regard for the externalities being targeted by environmental policies, leading to inconsistencies and spill-over effects. Improving policy coherence requires better *integration* of economic, environmental, and social goals in different policies (OECD, 1996; Canadian RT, 1996; UK RT, 1996; UNCHS, 2000; TC, 2001; OECD, 2001a; VTPI, 2001).

Transparency and Accountability

A *participatory* approach is essential if the challenge of sustainable development is to be met, since the criteria for sustainability cannot be defined in purely technical terms. This requires that the process through which decisions are reached is *transparent*, is informed by the full range of possible consequences, and is *accountable* to the public (OECD, 2001a; TC, 2001; VTPI, 2001).

Goals, Performance and Outcomes

Sustainability requires that planning be based on goals and outcomes, such as improved social welfare, ecological health and access. It does not limit analysis to financial impacts and market activities. It also accounts for non-market activities and impacts. Governments and planning agencies should make a concerted effort to measure and report their progress in achieving sustainable development objectives and targets. To this end, they should develop and refine *sustainable transportation indicators* (UNCHS, 2000).

International Co-operation

With deepening international interdependency, spillovers become more pervasive. A narrow focus on national self-interest is not viable when countries are confronted with a range of environmental and social threats that have global implications. Many of the benefits from government interventions needed to promote sustainable development have the characteristics of public goods (basic research, information, health and education). Also, many of these public goods are global, as they will benefit several countries (e.g. information on the state of global ecosystems). Effective delivery of these public goods requires overcoming obstacles to co-ordination, through burden-sharing rules that recognize the different responsibilities and response capacities of individual countries (UNCHS, 2000; OECD, 2001a).

Technological Innovation

The ability of governments to implement sustainable transportation policies will depend to a large extent on the level of technological support provided by industry. To nurture technological innovation governments should;

- develop *robust* programs and strategies to cope with differences in project evaluation techniques and external environmental variations;
- *prioritize* their objectives to signal commitment to research areas;
- ensure research programs are *flexible* and can adapt when significant changes occur in the environment;
- create *coherency, consistency, and integrity* in the R&D process to stimulate cooperation between research participants and reduce the level of risk;
- develop a *transparent* research program and policy to ensure that all the actors involved in a project are contributing to the same final outcome; and
- foster reliability and trust within research consortia consisting of participants with different backgrounds to stimulate cooperation (Geerlings, 1999).

Cont ...

Comprehensive and Long-Term Planning

Sustainability requires planning that considers all impacts, including those that are indirect and long-term. Governments and planning authorities should ensure that adequate information is collected and effective evaluation tools are developed and utilized to allow stakeholders and decision-makers to understand the effects of their decisions over the appropriate time frame (UNCHS, 2000; OECD, 2001a; VTPI, 2001).

Reduction of Automobile Dependency

Sustainable transport plans should require reduced automobile dependency (defined as high levels of automobile use, automobile oriented land use, and a lack of travel alternatives). Two mechanisms that will be instrumental in this process will be the reduction of market distortions and the establishment of decision-making bodies in large urban areas to evaluate, plan and deliver integrated transportation and urban development, as well as the integration of transit systems and services (Ontario RT, 1995; VTPI, 1999; UNCHS, 2000).

Improvement in Efficiency

Transportation planning agencies should explore ways of promoting efficient travel behaviour (UNCHS, 2000; TC, 2001).

Protection of Health & Safety

Transportation systems should be designed and operated in a way that protects the health (physical, mental and social well-being) and safety of all people. Air quality and noise should not exceed the health standards suggested by the WHO (World Health Organisation), accident risks should be minimized (OECD, 1996; Canadian RT, 1996; CST, 1996; Baltic 21, 1998; TC, 2001).

Appropriate Use of Land & Resources

Transportation systems must make efficient use of land and other natural resources while ensuring the preservation of vital habitats and other requirements for maintaining biodiversity. Plans to bring about more compact, mixed-use development, reducing urban sprawl and shorten travel distances should be considered by transportation planning agencies (OECD, 1996; UNCHS, 2000).

Participation & Education

Recognizes that an essential prerequisite for achieving sustainable development is to encourage widespread and informed public participation in decision-making. Transportation planning agencies should inform and engage employees, stakeholders and communities in their decision-making processes as appropriate, and encourage them to participate in achieving the goal of sustainable transportation. Such engagement activities are likely to be the most effective means of altering the *behavioral characteristics* of the people and organizations involved in the decision-making process. True and effective reform will arise only when community outcomes and desires drive the decision-making process. (Ontario RT, 1995; OECD, 1996; UK RT, 1996; Volpe, 1999; UNCHS, 2000; TC, 2001).

3.3 CHALLENGES OF SUSTAINABLE TRANSPORTATION

It is widely accepted by governments and the transportation research community, that the path to achieving a global sustainable transportation sector will be long and complex. The process will involve the development of new and integrated ways of thinking and a core element will be the education of government officials, decision-makers, transportation planners and the greater public in the principles behind the concepts of sustainable transportation. The OECD experience has shown that developed countries have faced significant challenges in adopting sustainable transportation policies, and only a few countries have managed to partially implement one or two of the three reinforcing strands of good practice outlined in the 1995 Urban Travel and Sustainable Development report (Weiner, 2000).

Barriers to overcome in achieving sustainable transport include a wide array of technical, institutional, financial and behavioral characteristics and conditions that are often firmly entrenched in current economic and social systems.

Appendix A3 provides a summary of the challenges identified from the sustainable transportation policy review. The challenges have been categorized using the framework established to review the principles, which means that it is possible to compare the principles with the challenges. Table 2 provides a continuation of Table 1, with the addition of the challenges under each of the four main categories. The challenges listed in Table 2, and the text displayed in Boxes 6 through to 9, were extracted from the 22 reports reviewed¹⁵. The majority of the text presented in the four boxes presents the original wording from these reports, with slight amendments. Appendix A3, displays the original text from which the boxes were created.

Table 2: Principles & Challenges of Sustainable Transportation

	Environment	Economy	Social Equity	Institutional	
PRINCIPLES	Precautionary; Preventative; Regenerative; Substitutability; Assimilative Capacity; Avoidance of Irreversibility; Use of Energy; Stewardship; Ability to Recycle	Polluter Pays; Cost Internalization; Affordability; Cost-effectiveness; Economic Well-being	Access & Choice; Equity; Social Well-being; Social Responsibility	Integration; Comprehensive & Long-term Planning; Transparency & Accountability; Goals, Performance and Outcomes; International Co-operation; Technical Innovation	Reduction of Automobile Dependency; Improvement in Efficiency; Protection of Health & Safety; Appropriate Use of Land & Resources; Participation & Education
CHALLENGES	Emissions; Freshwater; Biodiversity; Renewable Energy; Environmental Management	Economic Reform; Globalization of Production & Trade; Financial Restrictions	Access & Affordability; Access, Equity & Choice	New decision-making Processes; Measurement of Progress Through Indicators; Institutional Capability; International Governance; Technological Innovation; Automobile Dependency;	Efficient Transportation; Competition for Resource and Access to Infrastructure; Land Use; Congestion; Maintenance; Education about Sustainable Transportation Issues

3.3.1 Environmental Challenges

With regards to the Environment (Box 6), the major challenges facing the transportation community will be to; control or prevent *air emissions* and *water*

¹⁵ Refer to the References listed in Appendix A1, for a list of all the publications used in the development of the principles.

contamination from transportation modes; maintain, restore and enhance the *diversity of landscapes, ecosystems, species and genetic material*; develop and deliver *clean and renewable energy sources* to power a new breed of vehicles; and improve the *environmental practices* and take action to mitigate the environmental impacts of government operations.

Box 6: Environmental Challenges

Emissions

A major challenge to overcome in achieving sustainable transportation will be to control or prevent air pollution and other air emissions from transportation, such as greenhouse gases, nitrogen oxides, volatile organic compounds, particulate matter and other air contaminants. Progress in this area is likely to depend on whether a nation has agreed to meet all obligations under the UNFCCC (1992) and the Kyoto Protocol (1998) and to work through international processes to take forward the Protocol's objectives. For a large majority of OECD countries this means seeking to enforce the Kyoto Protocol, with timely ratification processes, and with the broadest possible support of the international community. The task of convincing all nations to sign and ratify the Kyoto Protocol will be extremely difficult and will require clear leadership from developed nations. (TC, 2001; OECD, 2001b; WBCSD, 2001).

Fresh Water

Transportation activities contribute to water pollution through the release of liquid effluents and waste. Transportation activities also create a risk of accidents that can release fuels or hazardous materials into the environment. Preventing and controlling the discharge of effluents and wastes which contaminate rivers, lakes, oceans, harbors and beaches, and preventing the introduction of non-native aquatic species through the discharge of ships' ballast water, will be a significant challenge (TC, 2001; OECD, 2001b).

Biodiversity

A major environmental challenge will be to maintain, restore and enhance the diversity of landscapes, ecosystems, species and genetic material. Threats to ecosystems and their species from habitat loss and fragmentation, changes in land use patterns, pollution, introduction of invasive species, and over-exploitation or extinction of wild species, etc., will need to be significantly reduced (OECD, 2001b).

Renewable Energy

Combustion of low-cost oil provides more than 99 per cent of the energy for motorized transportation and is the cause of many of the environmental problems that result from transportation. The need to develop and deliver clean and renewable energy sources to power new breeds of vehicle is of paramount importance. Harnessing renewable alternatives will be a major challenge (TAC, 1996; CST, 1997; OECD, 2001b).

Environmental Management

Another challenge for sustainable transportation is to improve environmental practices and take action to mitigate the environmental impacts of government operations. A key task is to promote and facilitate the adoption of improved environmental management by those operating on the transportation system. Governments, as one of the largest organizations in each country, can set an example in environmental management. By showing leadership, governments can reduce their own environmental impacts and lead by example for others in the transportation sector (TC, 2001).

3.3.2 Economic Challenges

With regards to the Economy (Box 7), the major challenges facing the transportation community are to; reform *transportation prices* and *investment practices* to create an optimal transportation market; achieve a balance between *trade policies* that increase the need to transport products to international markets and policies that ensure national economic growth while limiting import and export commitments; and to manage *budget and financial restrictions* which threaten to limit the financing of sustainable transportation measures.

Box 7: Economic Challenges***Economic Reform***

The reform of transport prices and investment practices to create an optimal transportation market will be a considerable challenge. Such market reforms will include full-cost pricing (i.e., charging motorists directly for the marginal costs they impose), congestion pricing, tax shifting, least-cost planning, and the equitable distribution of economic benefits derived from the transportation sector's role in national economic growth (VTPI, 2001).

Globalization of Production & Trade

Domestic and international trade liberalization is resulting in the movement of larger volumes of goods (particularly intermediate goods) over longer distances than was the case in the past. Competition for increasingly mobile production and assembly processes is hindered in many countries by inefficient administrative arrangements and regulations that govern freight and passenger transport. Transport infrastructure bottlenecks are emerging as a constraint on growth in some rapidly growing countries, such as China. Economic reform and political realignment in Eastern Europe and the FSU, and emerging free trade areas and customs unions in Latin America, will also generate needs for transport investment and harmonization of regulations to facilitate new trade and transport patterns. Achieving a balance between trade policies that increase the need to transport products to international markets and those which ensure national economic growth while limiting import and export commitments, will be a complex challenge to overcome (World Bank, 1996).

Financial Restrictions

Budget and financial restrictions accompanied by limitations to the flexibility with which revenues can be used to finance sustainable transportation measures, are significant obstacles that must be overcome to enable the successful implementation of sustainable transportation strategies (PROSPECTS, 2001a).

3.3.3 Social Equity Challenges

With regards to Social Equity (Box 8), the major challenges facing the transportation community will be to; provide the rural poor with *access* to markets and amenities while keeping the transportation system *affordable*; provide a public transportation network that is either a primary or backup system, which reaches all members of society; *or* to adapt the personal-use motor vehicle to future accessibility needs/requirements, whereby the reliance on public transport is reduced.

Box 8: Social Equity Challenges***Access & Affordability***

Increasing the access of the rural poor to markets and amenities requires a further expansion of secondary and tertiary transport networks and more public transport services. Providing this access while keeping the transportation system affordable for its users will be a significant challenge (World Bank, 1996).

Access, Equity & Choice

Equity is a fundamental goal of sustainable development. The growing reliance on privately owned motor vehicles for transportation, means that those without access to such a vehicle may find themselves seriously disadvantaged in their ability to access jobs and services. Particularly vulnerable are groups such as the elderly, the poor, people with disabilities, and youth. In addition, it is important to provide those people who own motor vehicles with the choice of an alternative transport mode. Providing a public transportation network as a primary or backup system to reach all members of society will be a major challenge, requiring the careful consideration and implementation of the full range of financing and transportation planning techniques. An alternative solution might be to adapt the personal-use motor vehicle to meet the future accessibility needs/requirements, whereby the reliance on public transport is reduced. Finding a solution to these options will not be easy and presents one of the most difficult challenges facing transportation authorities (WBCSD, 2001).

3.3.4 Institutional Challenges

With regards to the Institutional considerations (Box 9), the major challenges facing governments and planning authorities will be to;

- develop tools for better *decision-making*;
- develop *standards* that will be accepted by all parties for evaluating transport performance;
- create *institutional capacity* to address complex, long-term issues;
- develop consensus on the environmental effects of international trade and globalization, with the goal of enhancing the influence of *international institutions* to effect change;
- develop and promote the use of new and *innovative technologies* that reduce the environmental impacts of transportation while meeting the needs of passengers and shippers.
- ensure the development of a balanced approach to promoting *transportation efficiency*;
- manage *competition for resources* and *access to infrastructure* between personal and freight transportation;
- manage *automobile usage* and encourage the development of a more balanced transportation system;
- initiate *smart land use planning* to ensure that land use planning becomes closely linked with transportation and environmental planning at the national, regional and local level;
- anticipate congestion and develop a portfolio of *mobility options* for people and freight;
- ensure adequate *finance* is allocated to preserve the existing transportation infrastructure; and
- improve *education and awareness* of sustainable transportation to make the public more aware of the environmental impacts of their transportation choices.

Box 9: Institutional Challenges

New decision-making Processes

To make better decisions governments will need to develop better data, information, analyses and tools. Decision-making about transportation – by governments, corporations, and individuals – has become locked into modes that reinforce the present unsustainable arrangements and trends. Sustainable transportation planning requires a paradigm shift: a fundamental change in the way people think about and solve problems. The challenge is to develop tools that enable a more comprehensive analysis of impacts, consider indirect and cumulative impacts, consider demand management solutions, and enhance public involvement in transportation decision-making (TAC, 1996; CST, 1997; VTPI, 1999; TC, 2001; VTPI, 2001).

Cont ...

Measurement of Progress Through Indicators

Those in charge of transportation decision-making often approach the use of performance indicators with caution. Developing standards that will be accepted by all parties for evaluating transport performance will be a significant challenge. The use of environmental indicators and targets to measure progress in achieving environmental sustainability and in implementing a sustainable transportation strategy, is likely to play a major role in moving towards a more sustainable transportation sector. In addition, support for national policies that stimulate greater accountability, with respect to their national objectives and international commitments (global and regional), are seen as being essential (World Bank, 1996; OECD, 2001b).

Institutional Capability

Overcoming the institutional barriers that prevent good decision-making for transportation may prove to be a greater challenge than overcoming the technological barriers that stand in the way of reducing the use of fossil fuels. The challenge of creating the institutional capacity to address complex, long-term issues is formidable. If governments rely on current institutional capabilities, they will find it nearly impossible to develop consensus about how sustainable transportation issues ought to be addressed, develop the plans to implement consensus solutions, and carry these plans through to fruition. It is likely to be limits on institutional capacity, not limits on technology, that determine the speed with which the challenges will be addressed (Vopie, 1999; PROSPECTS, 2001a; WBCSD, 2001).

International Governance

The effects of international environmental standards and trade regimes on national transportation standards and strategies present an area of significant importance. International governance will play a major role in ensuring that sustainable transportation practices are disseminated and implemented throughout the world. In order to strengthen international governance, nations should ensure their standards are compatible with international guidance where possible and assist trade and investment organizations such as the World Trade Organisation (WTO) and international financial institutions in achieving their objectives. The acceptance of international guidance and protocols can be a contentious issue, e.g. the U.S.'s reluctance to accept and ratify the Kyoto Protocol. The challenge is to develop consensus on the environmental effects of international trade and globalization, with the goal of enhancing the ability of international institutions to influence change (OECD, 2001b).

Technological Innovation

Technological innovations have led to a reinforcement of the overall trend towards faster and more flexible forms of transport, and also towards greater negative external effects. Developing and promoting the use of new and innovative technologies that reduce the environmental impacts of transportation while meeting the needs of passengers and shippers, is an important challenge. In the long term, technology holds the promise of providing transportation options that are safe, efficient and environmentally friendly. In addition, new technology can reduce the costs of meeting environmental objectives and provide a basis for improvements in productivity and new markets for products and services (Geerlings, 1999; VTPI, 1999; TC, 2001).

Automobile Dependency

Automobile dependency is defined as high levels of automobile use, automobile oriented land use, and a lack of travel alternatives. Automobile dependency imposes a number of economic, social and environmental costs, and results in part from distortions in transportation and land use markets. The challenge is how to reduce these distortions and encourage the development of a more balanced transportation system (WBCSD, 2001; VTPI, 2001).

Efficient Transportation

A key challenge for sustainable transportation decision-makers and planners is the implementation of measures that improve the efficiency of the different modes of transport, as well as of the transportation system as a whole. Since there is no single means of achieving efficient transportation, there is a challenge to ensure the development of a balanced approach to promoting transportation efficiency. Measures could include:

- encouraging more integration between transportation modes to increase competitiveness and reduce environmental impacts;
- promoting the development and funding of a strategic transportation infrastructure;
- encouraging people to use more environmentally efficient modes;
- encouraging users to explore all transportation options available and choose the most efficient mode, particularly for shipping; and
- promoting advanced technologies that enhance system operations (TC, 2001).

Cont ...

Competition for Resource and Access to Infrastructure

There is growing concern regarding the competition for resources and access to infrastructure between personal and freight transportation, particularly in the urbanized areas of the developed and developing world. Resolving this competition for resources and access will be a difficult challenge for transportation authorities (WBCSD, 2001).

Land Use

Transportation patterns can be affected significantly by land use patterns. In particular, low density development, hierarchical street patterns, generous road and parking capacity, and automobile oriented site design tend to increase automobile dependency, leading to high levels of per capita motor vehicle mileage and a reduction in the quality of travel alternatives (transit, walking and cycling). The challenge is to ensure that land use planning becomes closely linked with transportation and environmental planning at the national, regional and local level (VTPI, 1999; WBCSD, 2001; VTPI, 2001).

Congestion

Cities are major engines of growth in most developing countries. As a result, urban populations are expanding at a very high rate (over 6 percent per annum). Stimulated by growing per capita income in urban areas, ownership of motor vehicles is increasing in developing countries at a faster rate than the proportion of central urban space devoted to roads. In developed countries, the increased dependence on automobiles is reducing the diversity and availability of public transport services for the non-motoring public, particularly the poor. In the U.S. for example, the demand for transportation exceeds the capacity of the transportation infrastructure in many areas. Americans spend millions of hours every day in congested traffic at an annual cost of billions in lost wages and wasted fuel. The challenge is to anticipate congestion in both developed and developing countries and create a portfolio of mobility options for people and freight (World Bank, 1996; WBCSD, 2001).

Maintenance

Inadequate maintenance regimes are resulting in significant losses in infrastructure assets in both developed and developing countries. For example, over a two decade period (1964-84), US\$45 billion worth of road infrastructure assets were lost in eighty-five developing countries owing to inadequate maintenance. Every dollar of maintenance postponed increases vehicle operating costs in the current period by more than 3 dollars as well as increasing the road agency costs in the long run. Confronting the maintenance crisis is a major challenge in both developed and developing nations (World Bank, 1996; WBCSD, 2001).

Education about Sustainable Transportation Issues

A key challenge is to make the public more aware of the environmental impacts of their transportation choices. Building awareness about sustainable transportation is not an easy task. It involves raising awareness about the issues themselves, as well as promoting concrete actions that individuals can take to reduce the negative impacts of transportation and improve their quality of life. Partnerships with other federal departments, provinces and territories, industry groups, and non-governmental organizations are necessary in developing and delivering consistent messages that promote sustainable transportation options (TC, 2001; PROSPECTS, 2001a).

3.4 RECOMMENDATIONS FOR CHANGE

Appendix A4 provides a detailed summary of the recommendations for change extracted from the twenty-two reports reviewed in the policy analysis.

It is not practical to present these recommendations in a format similar to the principles and challenges, since the pure application of each instrument identified in the analysis is likely to eventuate in an overall sub-optimal solution. Each report reviewed was intended for a specific audience; hence the recommendations presented were designed for varying political, economic and geographical/environmental conditions. For example, those recommendations propounded by the World Bank and the UN contain different connotations

from those of the World Business Council for Sustainable Development or the OECD. Although there are general categories, such as ‘*access and choice*’ and ‘*assessment of programs and choices*’, for which recommendations or policy objectives can be identified in almost all of the reports.

Table 3 categorizes recommendations under the four headings of Environment, Economy, Social Equity and Institutional. The Institutional category encompasses the Science and Technology, Government and Planning categories displayed in Appendix A4.

In the case of the U.S. transportation sector, Sussman (2002) asserts that the traditional role of large scale infrastructure planning and investment in developed countries will evolve towards management and operations. As the rate of construction of new capital assets declines, the importance of enhancing the *operation* of transportation infrastructure will increase. Evidence of this evolution towards the integration of systems, can be seen in the formation of Regional Operating Organizations (ROOs). Although many ROOs around the U.S. were established to enhance the coordination of emergency response to accidents, their true potential has yet to be exploited (Briggs, 2001). For example, as the capabilities of intelligent transportation systems advance and real-time information becomes a daily part of mobility, the need to integrate the operation of all forms of transportation will increase. Organizations such as the ROOs will be in a position to provide robust technological and institutional platforms upon which this development can occur.

Under the above scenario, those recommendations for change, such as flexible working hours, promotion of new technology, efficiency of goods distribution, optimization of the existing system, charging and fares, and the enhancement of appropriate infrastructure, are likely to become more important. While the more conventional recommendations, such as integrating environmental planning and land use issues, are not likely to be the driving factors behind future transportation system developments.

In summary, the text displayed in Appendix A4 provides a comprehensive listing of the major recommendations and policy instruments/objectives which, if selected carefully and implemented appropriately, would, it is believed, move transportation towards a more sustainable agenda. It is recommended that the information be used as a reference document to stimulate discussions and highlight important ideas and concepts that will assist the transportation policy development process.

Table 3: Recommendations for Change - Categories

Environment	Economy	Social Equity
Environmental Carrying Capacity; Environmental Quality Standards; Emissions; Protection of Natural & Physical Capital; Management of Non-Renewable Resources; Management of Renewable Resources; Environmental Protection; Transportation Noise & Vibration; Protection of Ecosystems; Health Threatening Impacts; Reduction of Solid Waste	Internalization of Transportation Costs; Stable Fiscal Environment; Social & Economic Implications; Financial Mechanisms; Economic Efficiency; Contribution to Economic Growth; Market Reforms; Use of Competitive Market Structures; Appropriate Investments;	Access & Choice; Services & Goods; Flexible Working Hours; Equity and Social Inclusion; Equity for The Poor
Institutional		
Research & Innovation; Technology Policy; Use of Existing Technology; Promotion of New Technology; Transfer of Technology; Strategy for Technological Innovation; Government Decision-Making Processes; Policy Packages / Frameworks; Policy Integration; Future Transport Policy; Regional Transport Planning; Tools For Decision-Making; Government Support for Initiatives; Support for Public Transport; Strategic Planning & System Management Capabilities; Transport Regulations; Assessment of Long-term Trends; Monitoring & Evaluation; Assessment of Programs / Problems; Public / Private Partnerships; Goals, Performance & Outcomes; Conventions (general); Linkages with the Global Economy; Partnerships with Developing Countries;	International Cooperation; Project Appraisal; Expansion of Options; Reduction of Congestion; Reduction of Car and Lorry Growth; Increasing Accessibility to Freight Transportation; Automobile Usage; Transit; Rail; Bus; Cycling; Walking; Non-Motorized Transport; Ridesharing; HOV; Reduction of Commute; Travel Demand Management (TDM); Update of TDM Knowledge; Connections; Efficiency of Goods Distribution; Promotion of Efficient Transport; Traffic Management; Optimization of the Existing System; Safety; Long-term Planning Horizons; Implementation Plan; Land Use & Transportation Planning;	Livable Streets and Neighborhoods; Location Efficient Planning; Least-Cost Planning; Smart Growth; New Urbanism; Reduction of Impervious Surface; Road Maintenance; Job Creation; Impacts of tourism; Teleworking; Park and Ride; Parking; Road Pricing; Value Capture and Business Taxes; Taxes; Charging; Fares; Developer Contributions; Company Travel Plans; New Road Construction; Public Transport Service Levels; Promotion of Responsible Behaviour; Public Awareness Programs; Public Realm; Enhancement of Appropriate Infrastructure;

PART B

4 U.S. TRANSPORTATION PLANNING FRAMEWORK

Part A of this research addressed the issue of sustainable transportation with the intention of creating a comprehensive reference document that can be used by transportation officials to shape effective and sustainable transportation policy. The reauthorization of TEA-21 in 2003, presents an excellent opportunity to apply this information to a real case.

The purpose of Part B of this research is to review the U.S. DOT's transportation planning framework, and to recommend how TEA-21 could be altered to make the act more sustainable. The author has assumed that TEA-21 will be reauthorized in 2003, without any major alterations to the existing transportation planning framework.

Sections 4.1 and 4.2 look specifically at the legislative authority of the U.S. DOT and the Strategic Plan for 2000 to 2005, to identify whether the U.S. DOT has a] the authority, and b] the strategic objectives, to enable the Department to take a lead role in realizing the goals of sustainable development in general. These sections are followed by a review of the key components and objectives of TEA-21, which concludes by highlighting the link between TEA-21 and the Clean Air Act Amendments (CAAA) of 1990.

In order to obtain a fuller understanding of how the transportation planning framework has been adopted by the 50 states; three State DOTs (Pennsylvania, Kentucky and South Carolina) were interviewed during the summer of 2001. The results of these interviews are discussed in Section 5.

Section 6, concludes Part B by reviewing two research projects that are seen to support the objectives of sustainable transportation and which assess the metropolitan and rural transportation planning processes. In addition, a summary of the work on sustainable transportation being undertaken in the UK is presented (Section 7). This summary, drawn from an original research paper presented to the OST, is included because it offers some useful insights to future policy options for the U.S. DOT.

4.1 LEGISLATIVE AUTHORITIES OF THE U.S. DOT

The United States Code (U.S.C.) provides the legislative authority necessary to establish the U.S. DOT. The extracts below provide a useful insight into the statutory

framework within which the U.S. DOT must work and presents the guidelines from which the DOT's strategic vision has been prepared.

Section 101 of Title 49 United States Code (U.S.C.) describes the U.S. DOT's purpose as follows:

'(a) The national objectives of general welfare, economic growth and stability, and security of the United States require the development of transportation policies and programs that contribute to providing fast, safe, efficient, and convenient transportation at the lowest cost consistent with those and other national objectives, including the efficient use and conservation of the resources of the United States.

(b) A Department of Transportation is necessary in the public interest and to –

- (A) ensure the coordinated and effective administration of the transportation programs of the United States Government;*
- (B) make easier the development and improvement of coordinated transportation service to be provided by private enterprise to the greatest extent feasible;*
- (C) encourage cooperation of federal, state, and local governments, carriers, labor and other interested persons to achieve transportation objectives;*
- (D) stimulate technological advances in transportation, through research and development or otherwise;*
- (E) provide general leadership in identifying and solving transportation problems; and*
- (F) develop and recommend to the President and Congress transportation policies and programs to achieve transportation objectives considering the needs of the public, users, carriers, industry, labor and national defense.'* (49 U.S.C. 101)

To enable the Secretary of Transportation to fulfill these obligations, Section 301 of Title 49, U.S.C., outlines the duties which accompany the appointment.

'The Secretary of Transportation shall –

- (1) under the direction of the President, exercise leadership in transportation matters, including those matters affecting national defense and those matters involving national or regional emergencies;*
- (2) provide leadership in the development of transportation policies and programs, and make recommendations to the President and Congress for their consideration and implementation;*
- (3) coordinate federal policy on intermodal transportation and initiate policies to promote efficient intermodal transportation in the United States;*
- (4) promote and undertake the development, collection, and dissemination of technological, statistical, economic, and other information relevant to domestic and international transportation;*
- (5) consult and cooperate with the Secretary of Labor in compiling information regarding the status of labor-management contract and*

- other labor-management problems and in promoting industrial harmony and stable employment conditions in all modes of transportation;*
- (6) promote and undertake research and development related to transportation, including noise abatement, with particular attention to aircraft noise, and including basic highway vehicle science;*
 - (7) consult with the heads of other departments, agencies and instrumentalities of the United States Government on the transportation requirements of the Government, including encouraging them to establish and observe policies consistent with maintaining a coordinated transportation system in procuring transportation or in operating their own transport services;*
 - (8) consult and cooperate with state and local governments, carriers, labor, and other interested persons, including, when appropriate, holding informal public hearings; and*
 - (9) develop and coordinate federal policy on financing transportation infrastructure, including the provision of direct federal credit assistance and other techniques used to leverage federal transportation funds.’ (49 U.S.C. 301)*

In addition to these statutory requirements, the Secretary of Transportation is required to consider how the U.S. can achieve an Intermodal Transportation sector.

National Intermodal Transportation System policy:

‘(a) General. It is the policy of the United States Government to develop a National Intermodal Transportation System that is economically efficient and environmentally sound, provides the foundation for the United States to compete in the global economy, and will move individuals and property in an energy efficient way.

(b) System characteristics.

- 1. The National Intermodal Transportation System shall consist of all forms of transportation in a unified, interconnected manner, including the transportation systems of the future, to reduce energy consumption and air pollution while promoting economic development and supporting the United States’ preeminent position in international commerce...’. (49 U.S.C. 5501)*

In 1991, the Intermodal Surface Transportation Efficiency Act (ISTEA) was authorized to achieve the above statutory objectives and provided \$151 billion over six years for highways, mass transit and safety programs. Intermodal planning was the central theme of the act and largely a new theme at that time. In 1998, ISTEA was reauthorized with a record guarantee of \$200 billion in surface transportation investment and was renamed TEA-21 (refer to Section 4.3 for a more detailed description of the structure of TEA-21).

The purpose of this section is to ascertain whether the U.S. DOT has the authority to implement sustainable transportation policies and programs. Due to the sufficiently general character of the legislative authorities, it is believed that this is possible. The definition of

sustainable transportation put forward in Part A of this research, states that a sustainable transportation sector shall ensure social equity, environmental protection and economic growth, and that the use of the sector does not facilitate harm to any of these three elements, both in the short- to long-term at a global level. In practice, the full implementation of these requirements will be extremely difficult; however, establishing that the U.S. DOT has the authority to move towards these objectives is of significant importance.

The legislative authorities provide a clear indication that the role of the Secretary of Transportation and the U.S. DOT in general, is to ensure the U.S. maintains its preeminent position in international commerce, through an approach which maintains the security¹⁶ of the U.S. and minimizes environmental harm (by calling for the efficient use and conservation of resources and specifically for reductions in energy consumption and air pollution). It follows that achieving these objectives will ensure that the general welfare (under which social equity falls) of the U.S. people will be enhanced. Specific instruction is given in 49 U.S.C. 101 to provide a fast, safe, efficient, and convenient transportation system at the lowest cost. Although items such as accessibility are not mentioned directly, it can be argued that they will be met through programs which aim to meet the national objective of general welfare.

In summary, the language used in the legislative authorities touches upon the ‘Three E’s’ of sustainable transportation; however, there is no specific text that provides the U.S. DOT with a mechanism to manage the use of the system other than to prevent illegal activities. Therefore it can be concluded from this assessment, that the U.S. DOT has the ability to move the transportation *sector* towards a sustainable agenda through the provision of appropriate policies and programs. There is however, no direct legislative authority in place to enable the U.S. DOT to address the larger question of its impact on worldwide sustainable development. To enable such action to be taken, there needs to be an entity in place which has sufficient authority and oversight to guide policies and programs across all governmental sectors. While there is not likely to be such an entity in the short- or even medium-term, this should not prevent direct action from being taken to establish a sustainable transportation sector in the U.S..

4.2 THE U.S. DOT’S STRATEGIC PLAN FOR 2000 – 2005

The U.S. DOT’s Strategic Plan for 2000 to 2005 is likely to have a significant influence on how TEA-21 is developed prior to its reauthorization in 2003. It is important therefore, to identify whether the plan will support the definition and principles of sustainable transportation.

The U.S. DOT’s Strategic Plan is accompanied by two documents entitled The Changing Face of Transportation (2000b), and its companion, Transportation Decision

¹⁶ Following the terrorist attacks of 11th September 2001, security is likely to take a more prominent role in the development of transportation policy.

Making: Policy Architecture for the 21st Century (2000c). The purpose of these two documents is to reinforce the objectives of the Strategic Plan.

The Changing Face of Transportation provides an historical perspective for policymaking. It documents the major achievements of the past 25 years along with the social and economic context for those achievements. The aim of the Policy Architecture is to combine the trends identified in The Changing Face of Transportation with the goals of the U.S. DOT, to develop scenarios that will inform decision-making for the next 25 years. The phrase ‘Policy Architecture’ was created to describe the development of a new framework for decision-making. This new framework will need to operate effectively within a decentralized and complex decision-making environment and be capable of confronting issues that arise from globalization and improved communications. In short, the Policy Architecture is an ‘*overarching set of principles to encourage more open, collaborative, and flexible decision-making*’ (U.S. DOT, 2000c, page 3) throughout the transportation sector¹⁷. The following discussion draws on these documents, which together form a formidable source of information and guidance.

To establish whether the Strategic Goals of the U.S. DOT align with the definition of sustainable transportation, a simple comparison was undertaken to identify commonalities. Figure 5 presents a visual representation of the results of this comparison.

The comparison shows there is a good correlation between the U.S. DOT’s Strategic Goals and the Definition of Sustainable Transportation. As discussed in the previous section, the U.S. DOT does not have the statutory authority to comprehensively manage the use of the system; hence there is no goal to this aim. In addition, the Strategic Goals do not look beyond the 2005 time horizon, which means that there is no consideration of intergenerational equity. Apart from these two important points, all remaining aspects of the definition of sustainable transportation can be identified in the Strategic Goals, which is an encouraging finding.

In addition, the Strategic Goals address the issue of National Security, a concern not covered specifically by the definition of sustainable transportation. Acts of terrorism now take on a new significance following the events on 11th September 2001, in New York City and Washington DC. It could be argued that National Security falls under Social Equity, i.e. the transportation system ‘*allows the basic access needs of individuals and societies to be met safely*’. However this argument seems relatively tenuous. Without security the core goals closely related to the human side of sustainability will be lost, i.e. equity and economic growth, though not so explicitly environment. Increasing awareness of the need to improve security in the transportation infrastructure is likely to be matched by a realization that security needs to be improved in many other aspects of national life. The resulting drain on public resources and reduction in private and public sector confidence might result in less

¹⁷ To clarify, the *transportation sector* includes all people, organizations and infrastructure involved with transportation investment, labor, management, operations, and uses. It includes private companies, public agencies, citizen groups and individuals.

investment in business and productivity, less work, less human development, and hence less wealth for all sectors. There is therefore, a compelling case to strengthen the definition of sustainable transportation to include a statement on the security of the transportation sector.

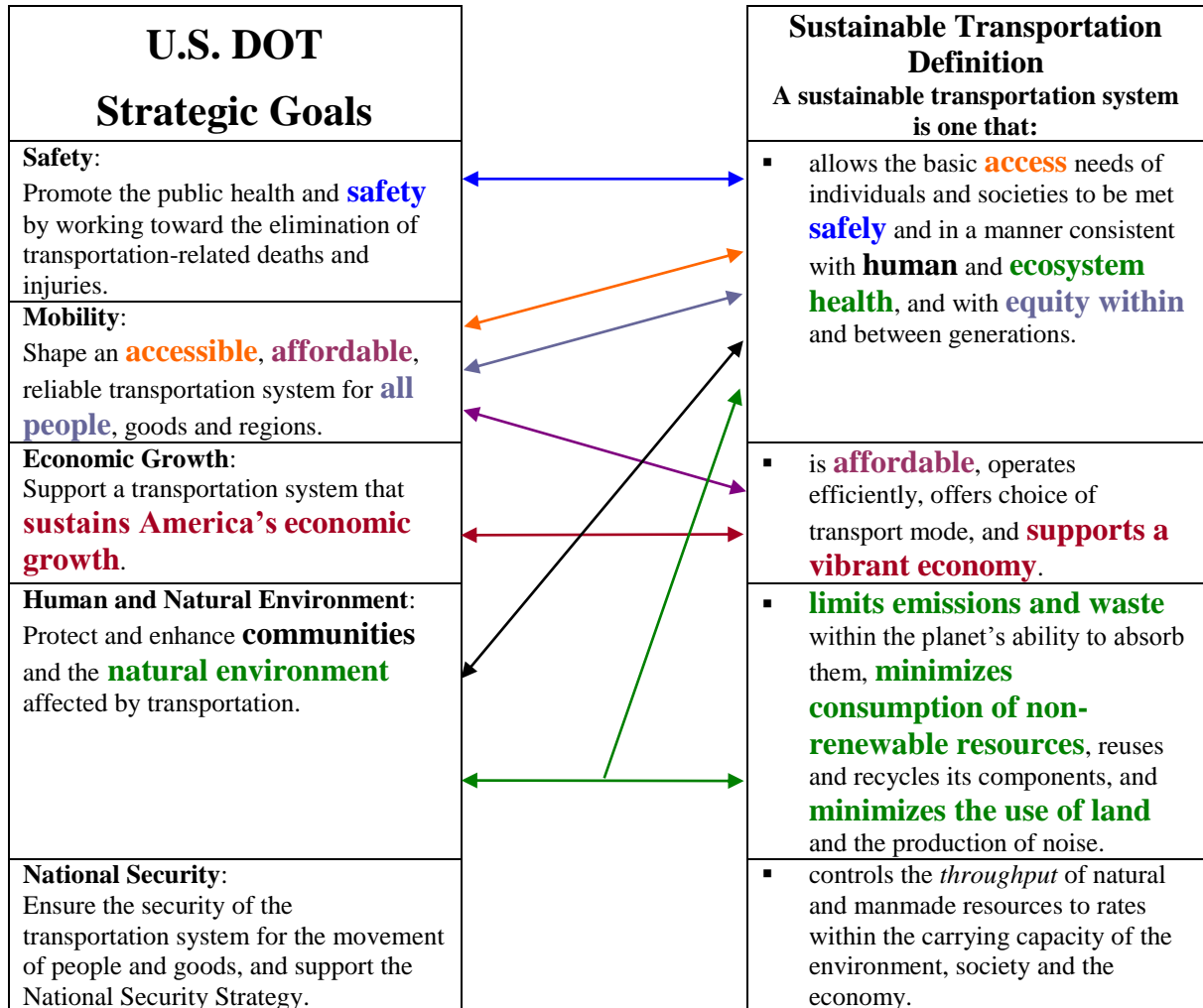


Figure 5: Comparison Between the U.S. DOT's Strategic Goals & the Definition of Sustainable Transportation

In addition to the Strategic Goals, the U.S. DOT has identified a series of principles presented in the Policy Architecture (refer to Box 10), to guide the decisions of all members of the transportation sector.

Since the principles in Box 10, describe the decision-making process in particular, it was not practical to compare them with the principles of sustainable transportation identified in Part A, which are more general in nature. Instead, the principles in Box 10, should be seen as essential guidelines for implementing those principles of sustainable transportation as outlined in Part A.

Box 10: Core Principles of the Transportation Policy Architecture (U.S. DOT, 2000c, p10)

A Holistic Approach¹⁸: Transportation decision making should recognize and foster appropriate tradeoffs among individual transportation choices, industry forces and societal goals.

Collaboration and Consensus Building: Transportation decision making should use an open and inclusive process, providing an opportunity for all parties and stakeholders to engage the issues and influence the outcomes.

Flexible and Adaptable¹⁹: The transportation decision-making process should be able to respond quickly and effectively to changing conditions and unpredictable, unforeseen events.

Informed and Transparent Decision Making: Transportation decisions should be made openly and based on the best information and analysis available.

Innovation: Transportation decisions should promote a continuing climate of innovation that reflects vision and speeds the movement of new ideas and products into service.

In addition to defining the U.S. DOT's Strategic Vision, the Strategic Plan provides a detailed assessment of how the U.S. DOT's Vision will be realized. Sections on management challenges (accompanied by milestones), competing program evaluations, external factors, the link between objectives and performance measures, data capacity, and cross-cutting programs, make the complete document a valuable guide for transportation officials. A decision was made to not highlight all the individual strategies, programs and milestones that support the goals of sustainability, since the analysis of the strategic goals has shown that there are numerous areas of commonality. A more useful approach is to select those instruments seen as being key drivers behind the move towards sustainability. Two such instruments have been identified.

The first instrument consists of a series of programs and policies that were created following the Livable Communities Evaluation²⁰. The Livable Communities Initiative (LCI) was created by the Federal Transit Administration (FTA) to establish transit as a means to link transportation and communities. The purpose of the LCI was to provide an alternative to low density sprawl development patterns served primarily by automobiles. In particular, the objectives of the LCI were to:

1. *strengthen the link between transit and community planning including supportive land use policies and urban design;*
2. *stimulate active and diverse participation by the community in the decision-*

¹⁸ The term *holistic* is used in the Transportation Policy Architecture in a similar way as the term *integrated* is used throughout this report. For example, the first Institutional Principle presented in Box 5 is '*Integration*', which refers specifically to the integration of sustainable transportation concepts into all areas of policy-making.

¹⁹ The *Policy Architecture* provides a clear indication that states and localities have growing *flexibility* in their use of federal transportation funds – i.e. legislation has increased funding flexibility. While there is no specific description of the term *adaptable*, it is assumed that it refers to the *ability* of the states and localities to manage change, driven by the funding flexibility built into the new legislation.

²⁰ Please refer to U.S. DOT's Strategic Plan 2000 – 2005, 9.4.1 Livable Communities Evaluation, page 51.

- making process;*
3. *increase access to employment, education, and other community facilities and services; and*
 4. *leverage resources from other Federal, State and local programs.*
(Weiner, 1997, page 228).

The Livable Communities Evaluation documented the results from 16 Livable Community projects and identified successful cases of community involvement in the planning process, leveraging of resources for transit improvements, planning for travel outside of the project area, and institutionalization of the LCI concepts. In response to this success, the concepts of the LCI have been incorporated into the Strategic Plan 2000 – 2005 and TEA-21. The most prominent example of their inclusion in the Strategic Plan can be seen in the ‘Infrastructure and Investment Strategies’ section (Box 11). These policies represent a significant step forward, since they are applicable to all types of infrastructure enhancement.

Box 11: Infrastructure and Investment Strategies (U.S. DOT, 2000a, p48)

- a) Form alliances for public and private investment in transportation facilities and services to make communities more livable by helping them link growth strategies, land use plans, safety, environmental quality and economic development;
- b) Help all levels of government and communities find ways to use transportation more effectively through planning techniques and operations that are sustainable, community friendly, improve environmental protection, environmental justice and scenic qualities;
- c) Advance environmentally preferable transportation solutions, such as pedestrian travel, bicycling, mass transit and virtual travel, as alternatives to personal vehicle use;
- d) Support, leverage and broker public and private investments in transportation by integrating economic development, environmental viability and social equity;
- e) Promote public involvement in planning and ensure compliance with Title VI of the Civil Rights Act to reduce adverse impacts of transportation infrastructure and operations on minority and low-income communities and ensure the equitable distribution of transportation facilities and services.
- f) Work with other agencies to improve and streamline the environmental review process while improving environmental protection; and
- g) Improve DOT-owned or controlled facilities for the benefit of host communities by preventing pollution, recycling, using recycled products, and cleaning up contaminated facilities.

In TEA-21, a good example of how the LCI concepts have been adopted is the Transportation and Community and System Preservation (TCSP) Pilot Program. The program is a comprehensive initiative of research and grants to investigate the relationships between transportation and community and system preservation and private sector-based initiatives. Section 5.3, provides a more detailed review of the policies and programs of TEA-21.

The second instrument is the U.S. DOT’s *Center for Climate Change and Environmental Forecasting*. The Center is the U.S. DOT’s focal point for technical expertise on transportation and climate change, and undertakes research to develop solutions that can address long-term environmental problems while accomplishing other national transportation objectives. The goals of the Center are to; address environmental and climate

change concerns through an intermodal systems approach; enable the transportation sector to contribute to national goals for greenhouse gas reductions; and ensure that the nation’s transportation systems are prepared to address the potential long-term effects of global climate change.

The Center’s broad-based approach to sustainability as related to transportation, is its strength. The Center not only functions as a ONE-DOT²¹ virtual unit to unite the nine administrations of the U.S. DOT (Figure 6), but also brings together many Agencies in the decision-making process. It should be noted that many are skeptical about the ONE-DOT vision, since the nine administrations are still operating in a relatively autonomous manner.

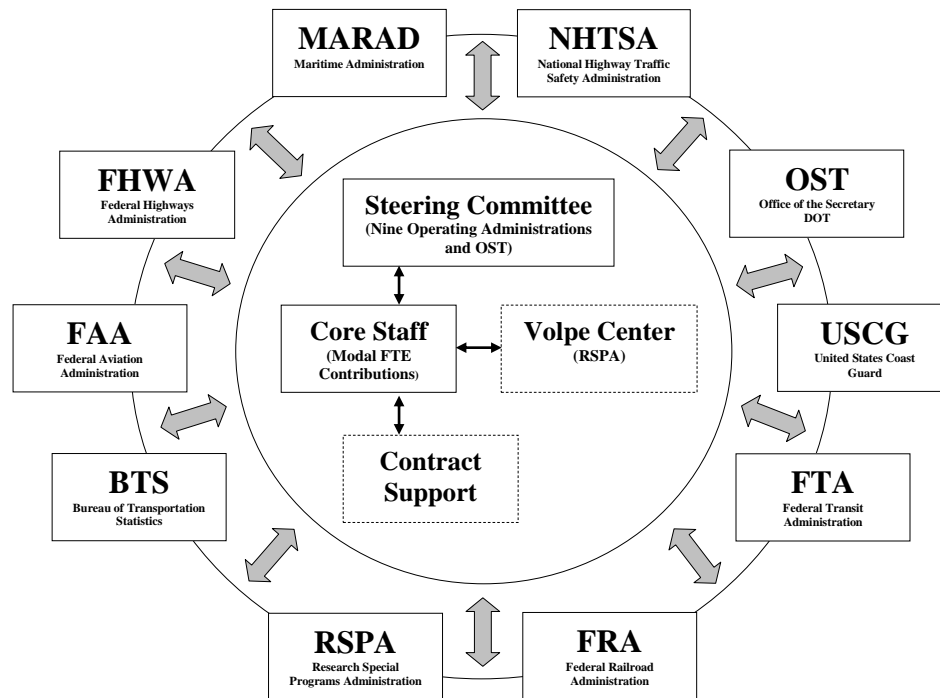


Figure 6: U.S. DOT Center for Climate Change and Environmental Forecasting: A Virtual ONE-DOT Center²²

Agencies which take an active role in the Center are: DOT/Office of Policy Lead; White House Task Force on Climate Change; the Departments of State, Energy and Agriculture; National Aeronautics and Space Administration; National Oceanic and Atmospheric Administration; and the Environmental Protection Agency.

²¹ ONE-DOT refers to the united vision that the Strategic Plan 2000 – 2005 portrays for the operation of the U.S. DOT, i.e. the integration of decision-making across the nine federal administrations.

²² This figure was reproduced from the DOT Center for Climate Change and Environmental Forecasting: Strategic Plan for 2001 – 2005. http://climate.volpe.dot.gov/plan/splan_2001.pdf (01/14/02).

If the Center was granted sufficient authority, its depth of knowledge and its transdisciplinary nature, would make it a lead candidate to support and guide the transition towards a sustainable transportation sector.

In summary, the U.S. DOT's Strategic Plan for 2000 – 2005, presents a comprehensive set of strategies, policies and programs which are closely linked to the principles of sustainable transportation identified in Part A. A more detailed analysis is required to review how the nine administrations have interpreted the Strategic Plan, before conclusions can be drawn which discuss the level of sustainable transportation achieved in practice. Two examples of potential areas of success are highlighted in this section. Section 4.3 attempts to review TEA-21 to identify whether the objectives of the Strategic Plan are being fulfilled.

There is concern however, that the U.S. DOT does not appear to have the statutory authority to make decisions and create policies to control the use of the transportation sector, and to ensure that the sector does not facilitate unsustainable activities on a national and global scale. Specific attention is drawn to the rate of resource utilization and to how efficient transportation systems might lead to greater environmental harm – since the movement of materials no longer becomes a constraining factor, both physically or economically. The lack of any direct statutory authority should not prevent the U.S. DOT from beginning to establishing dialogs with their sister governmental Departments, to bring the issues of the use of the transportation sector and, more generally, rates of consumption, into policy development. Unfortunately, it is likely that overcoming the reluctance to discuss these issues will present the greatest challenge. Until the message of this research has reached all levels of government, real change is unlikely to be forthcoming.

4.3 THE TRANSPORTATION EQUITY ACT FOR THE 21ST CENTURY

The purpose of this section is to assess the objectives and programs of TEA-21 to identify whether the sustainable transportation goals identified in Section 4.2, are being fulfilled in practice.

In 1991, the Intermodal Surface Transportation Efficiency Act (ISTEA) authorized \$151 billion over six years for highways, mass transit and safety programs. The main purpose of the Act was to emphasize intermodal planning and increase the role of the Metropolitan Planning Organizations²³ (MPOs) in transportation planning and programming.

²³ ‘... a metropolitan planning organization shall be designated for each urbanized area with a population of more than 50,000 individuals - (A) by agreement between the Governor and units of general purpose local government that together represent at least 75 percent of the affected population (including the central city or cities as defined by the Bureau of the Census); or ‘(B) in accordance with procedures established by applicable State or local law.’ (TEA-21, Sec. 1203. Metropolitan planning, <http://wwwcf.fhwa.dot.gov/tea21/tea21.pdf> (01/16/02)).

In 1998, the Transportation Equity Act for the 21st Century (TEA-21) replaced ISTEA, reauthorizing some existing and establishing some new highway, highway safety, transit, and other surface transportation programs until 2003. TEA-21 continues and strengthens ISTEA's focus on the environment and provides over \$200 billion for surface transportation programs. However, the predominant use of this money is still directed towards rebuilding America's highways, which is not consistent with the goals of many environmental protection measures.

A major principle of TEA-21 is to encourage flexibility for state and local agencies to determine their own transportation investments and strategies. It defines a comprehensive transportation planning process for states and metropolitan areas, and provides sufficient flexibility to allow them to tailor their planning approaches to local conditions and to determine how Federal transportation funds are invested. A key link between Federal government objectives and local needs is the requirement for MPOs to produce a Long-Range Transportation Plan (LRTP – with a 20 year forecast period), and a 3 year Transportation Improvement Program (TIP). Both the LRTP and the TIP assure the MPOs fulfill their statutory obligations. When developing the LRTPs, TEA-21 requires each MPO to;

- (A) *support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity, and efficiency;*
- (B) *increase the safety and security of the transportation system for motorized and nonmotorized users;*
- (C) *increase the accessibility and mobility options available to people and for freight;*
- (D) *protect and enhance the environment, promote energy conservation, and improve quality of life;*
- (E) *enhance the integration and connectivity of the transportation system, across and between modes, for people and freight;*
- (F) *promote efficient system management and operation; and*
- (G) *emphasize the preservation of the existing transportation system.* (49 U.S.C. 1203 (f))

In addition, the MPO must achieve financial realism and;

'... provide citizens, affected public agencies, representatives of mass transportation authority employees, freight shippers, providers of freight transportation services, private providers of transportation, representatives of users of public transit, and other interested parties with a reasonable opportunity to comment on the plan in a way that the Secretary of Transportation considers appropriate.' (49 U.S.C. 5303 (f)(4))

This comprehensive planning approach aims to ensure greater public collaboration and that the top down, bottom up approach to TEA-21 is achieved in practice.

At the State level, the State DOTs are required to prepare a Statewide Long-Range Transportation Plan (SLRTP), Regional Plans, Short-Term Programs, and the State Transportation Improvement Program (STIP). These requirements mean that State DOT and MPO planning requirements are closely aligned, since it is the responsibility of the State DOT to ensure that the MPO's long-range plan and improvement programs are incorporated into their STIP and SLRTP.

To provide a context in which discussions of TEA-21 can be developed, Table 4 was created to display the main authorizations of the Act. The programs listed range in scale from \$30 million to \$30 billion, with the majority of funding located under highway construction programs. The slant in funding towards highways is a reflection of the scale of the highway system when compared with other modes of transportation; although, the level of funding provided to rehabilitate and build new transit systems is of a similar magnitude, possibly an indication of the success of the Livable Communities Initiative (LCI). By taking a holistic view of the programs displayed in Table 4, it is possible to see how TEA-21 was developed to affirm President Clinton's key priorities of improving safety, protecting public health and safety, and creating opportunity for all Americans.

President Clinton's pledge to rebuild America was the major driving force behind the continuation and expansion of the core highway programs, including the National Highway System (\$28.6 billion); Interstate Highway Maintenance (\$23.8 billion); Surface Transportation Program (\$33.3 billion); Bridges (\$20.4 billion); and Federal Lands Highways (\$4.1 billion). A detailed review of how these programs have been implemented is beyond the scope of this research. Nevertheless, it is hoped that the guidance of the revised infrastructure and investment strategies (Box 11), will mean infrastructure investment will not simply be a case of replacing old with new. It will be a more comprehensive process that may involve radically new ways of approaching the provision of mobility. For these programs, performance assessment will play an important role in ensuring that Federal policies are implemented.

Under transit and rail programs, there is an encouraging number of initiatives that can be associated with the goals of sustainable transportation. The focus has shifted away from the rehabilitation of existing infrastructure, towards the creation of environmentally sound, accessible transit and rail systems. This shift is perhaps a reflection of the fact that transit systems are underdeveloped when compared to the national highway system. For transit, the Rural Transportation Accessibility Program (\$24.3 billion) and the Clean Fuels Formula Grant Program (\$1 billion), will move transit towards the sustainability goals of equitable access and environmental protection. In addition, the capital investment grants will provide incentives to develop new transit options in areas where the community is not served. For rail, the scale of the funding allocated is significantly less than that provided for transit. Programs focus mainly on the deployment of technology, through the construction of MAGLEV, high speed, and low density rail lines.

The environmental programs present the elements of TEA-21 that are most closely aligned with the concepts of sustainable transportation. The Congestion Mitigation and Air

Quality (CMAQ) Improvement Program, is the largest of these programs and provides \$8.1 billion to help meet the requirements of the Clean Air Act. Funds are made available for areas that do not meet the National Ambient Air Quality Standards (nonattainment areas), as well as former nonattainment areas that are now in compliance (maintenance areas). And the funds can be directed towards transit improvements, travel demand management strategies, traffic flow improvements, and public fleet conversions to cleaner fuels, among others. The connection between TEA-21 and the Clean Air Act is discussed in detail in the following section.

The Transportation Enhancements Program (TE) is the second largest, with the potential of securing around \$3.3 billion for transportation projects to improve communities' cultural, aesthetic, and environmental qualities. All of which will enhance the quality of life for those fortunate to live in an area that receives funding.

Section 4.2, highlights the Transportation and Community and System Preservation (TCSP) Pilot Program as a good example of how the concepts of the LCI were incorporated into TEA-21. It can be seen from Table 4, that the TCSP program is of the order of \$120 million for the six years of the Act; approximately 0.05 of a percent of the total TEA-21 budget. However, it should be noted that the TCSP program was developed to identify, and experiment with, sustainable transportation initiatives and therefore is fundamentally different from traditional programs. The intention of the U.S. DOT is to extract the lessons learned from this program and disseminate them into the transportation planning process through other federal programs and planning guidance. Strengthening the guidance on decision-making across all areas and disciplines of the transportation sector to support the concepts of sustainability will be a major achievement.

Smaller programs, such as the National Scenic Byways, Bicycle and Pedestrian Paths, and Recreational Trails Programs, will begin to ensure that the diversity of the transportation system is maintained. However, the funding for these programs needs to be enhanced significantly if there are to be major improvements; for example, in the safety of bicyclists or the desire for people to walk instead of drive to their local amenities.

Table 4: TEA-21 Authorizations

Main TEA-21 Authorizations	1998 – 2003 (Billions of Dollars)
DRIVER & VEHICLE SAFETY PROGRAMS	2.7
HIGHWAY CONSTRUCTION PROGRAMS:	
National Highway System (NHS)	28.6
Interstate System/Interstate Maintenance (IM)	23.8
Surface Transportation Program (STP)	33.3
Bridge Replacement & Rehabilitation (BRR)	20.4
Federal Lands Highways (FLH)	4.1
Emergency Relief (ER)	0.6
TRANSIT PROGRAMS:	
Formula Grants	19.97
Rural Transportation Accessibility Program	24.3
Clean Fuels Formula Grant Program	1.0
Urbanized Area Formula Grant Program	18.03
Formula Grant Program for other than Urbanized Areas	1.18
Capital Investment Grants	
New Starts	8.18
Fixed Guideway Modernization	6.59
Bus	3.55
RAIL PROGRAMS:	
Magnetic Levitation Transportation Technology Deployment Program	0.06
High Speed Rail Development	0.14
Light Density Rail Line Pilot	0.11
Alaska Railroad	0.03
Railroad Rehabilitation and Improvement Financing	4.5
SPECIAL PROGRAMS:	
Access to Jobs & Reverse Commute Program	0.35
National Corridor Planning & Border Infrastructure Programs	0.7
Appalachian Development Highway System	2.25
High Priority Projects	9.4
Woodrow Wilson Memorial Bridge	0.9
ENVIRONMENTAL PROGRAMS:	
Congestion Mitigation & Air Quality (CMAQ) Improvement Program	8.1
Transportation Enhancements (TE)	<i>10% of STP funds</i>
Bicycle Transportation & Pedestrian Walkways	<i>Eligible for NHS funds</i>
Recreational Trails Program	0.27
National Scenic Byways Program	0.15
Transportation & Community & System Presentation (TCSP) Pilot Program	0.12
RESEARCH & TECHNOLOGY:	
Highways	
Surface Transportation Research	0.59
Technology Development	0.25
Training & Education	0.09
Transit	
National Transit Institute (NTI)	0.02
Rural Transit Assistance Program	0.03
General	
Bureau of Transportation Statistics (BTS)	0.19
University Transportation Centers	0.16
Intelligent Transportation Systems (ITS) Program	1.28

Finally, the role of research and technology will be one of the cornerstones in achieving a sustainable transportation sector. TEA-21 authorizes \$228 million for University Transportation Research Centers, and a further \$592 million for transportation research in general with \$250 million for technology deployment. In addition, \$1.3 billion is authorized

to develop and deploy advanced Intelligent Transportation Systems to improve safety, mobility, and freight shipping. The portfolio of research and technology options adopted by the U.S. DOT and the transportation sector in general, will be a critical factor in the sector's ability to become sustainable in every sense. In its present form, TEA-21 is unlikely to stimulate the appropriate technological innovation to meet all the objectives of sustainable development. For example, the \$228 million channeled towards universities is spread so thinly and earmarked so heavily, that it holds little prospect for a radical leap in technological innovation in the transportation sector.

National innovation and technological capacity are key pieces of the worldwide sustainability puzzle. Effective national innovation environments have the potential to develop technological capacity, which will feed economic growth and, with appropriate anthropocentric considerations (discussed below), increase the level of employment. In general, progress towards worldwide sustainability will lie in creating technologies that radically reduce harm to the environment, ensure a high level of occupational health and safety, and provide employment through both the manufacture and use of new products (Ashford, 2000). However, discussing innovation and technological capacity in general terms is of little benefit when developing policies and programs to achieve a sustainable transportation sector. The discussion must be deepened to include technological²⁴, organizational²⁵ and social²⁶ innovation and to acknowledge how the adoption, adaption and adaptation of new technology can occur²⁷. A focus on technological innovation, at the expense of organizational or social innovation, is likely to prevent the 'triple bottom line' – i.e. improvements in competitiveness (the efficiency of the economy), social cohesion and the environment – from being achieved. Equity forms an integral part of all three elements of the triple bottom line.

New transportation systems need to be designed using all three types of innovation from the beginning, throughout the sector, and in every function of a firm. In 1996 the OECD recognized the importance of the 'knowledge-based economy' and that only investing in one aspect of the innovation process – such as R&D, capital or human investment – will not be sufficient to reach the end goal of sustainability (OECD, 1996a).

It is also important to understand the mechanisms by which technological progress occurs. Rapid progress towards sustainability – i.e. achieving a 'Factor 10' improvement in

²⁴ *Technological innovation* – the first commercially successful application of a new technical idea (Ashford, 2000).

²⁵ *Organizational innovation* – refers to the larger organizational features of the firm and is concerned with organizational aspects of the firm's functions such R&D, marketing, environmental and government affairs, industrial relations, worker health and safety, and customer and community relations (Ashford, 2000).

²⁶ *Social innovation* – refers to changes in both the preferences of consumers, citizens, and workers for the types of products, services, environmental quality, leisure activities, and work they want – and changes in the processes by which they influence those changes (Ashford, 2000).

²⁷ Ashford (2000) highlights that the distinction between innovation and diffusion is sometimes difficult to establish. New technology is rarely adopted without some form of modification to suit a particular situation. If the adopted technology requires significant *adaptation*, then the final product might result in a new innovation. This is an important subtlety to understand when discussing the diffusion of technology.

efficiency in the use of energy, natural resources and other materials (International Factor 10 Club, 1997) – is not likely to occur under a regime of incremental or even rapid innovation²⁸. Instead, instruments need to be developed that will facilitate radical (also known as disruptive) innovation²⁹. For these instruments to be effective, the U.S. DOT and the transportation industry must have the *willingness, opportunity* and *capacity* to change (Ashford, 1994). One area of concern is that the automobile industry, for example, has significant influence over governmental decision-making, which means that ‘willingness’ for change is not likely to be forthcoming. The concentration of economic power in the U.S. provides a good example of how large corporations can take decisive steps to secure their industrial futures, by blocking government initiatives that might have stimulated disrupting technologies. An example of this can be seen in the Corporate Average Fuel Economy (CAFE) standards, which have remained constant for six years under the Republican-controlled Congress (Walsh, 2001). During this period, automakers opposed an increase in federal standards while they focused their efforts on developing the lucrative Sports Utility Vehicle (SUV) market. It is only recently that Ford broke ranks with its Detroit rivals, General Motors Corp. and DaimlerChrysler AG, and supported Secretary Mineta’s request for authority to readjust fuel economy standards. However, it can be argued that this move was taken so that Ford can obtain federal incentives that will assist the industry in selling the fuel-efficient automobiles which environmentalists and regulators are increasingly calling for. Nevertheless, this example shows how the automobile industry used its significant influence within the Republican Party, to prevent more stringent CAFE standards from materializing and forcing technological innovation within the industry.

Thus, ensuring the appropriate allocation of research and development funding for the future surface transportation act and creating the right environment for research and anthropocentric technological innovation is likely to be a complex and difficult process. However, if successful, the technical innovation process will undergo a revolution, putting sustainability, employment and human welfare at the forefront of industrial and economic growth.

In summary, TEA-21 has been structured to ensure the continued preservation of the surface transportation infrastructure, with the goals of ensuring safety, providing mobility, supporting the economy, and protecting the environment, firmly entrenched in its policies and guidelines. The discussion has attempted to provide a general overview of the major programs within the Act in order to identify its strengths and weaknesses with regard to achieving the final goal of a sustainable transportation sector. The results show an

²⁸ Incremental innovation generally involves the incremental improvement of a product or technology and is depicted by the shallow slope on the classic S-curve for innovation. Rapid innovation occurs when major leaps in the performance of a technology are made and this is depicted by the steep slope on the same S-curve for innovation.

²⁹ Radical innovation represents a leap from one technology to the next (e.g. the move from valves to transistors) and is likely to result in the formation of a completely new S-curve for innovation. It is important to realize that incremental and rapid innovation is likely to benefit an industry sector, whereas disruptive innovation – by its very nature – will result in the formation of a new industrial sector.

encouraging move towards sustainable practices, although there are areas where improvements are still to be made.

4.3.1 TEA-21 Funding

The Highway Trust Fund (HTF) is the source of funding for most of the programs under TEA-21. The HTF is composed of the Highway Account, which funds highway and intermodal programs, and the Mass Transit Account. Federal motor fuel taxes are the major source of income into the HTF and in 1997 accounted for approximately 60% of the Highway Account income (some \$13 billion)³⁰.

Highway and transit funds are guaranteed a minimum level of spending. The amounts guaranteed for highways are extracted from the HTF's Highway Account, and can only be used to support projects eligible for funding under Federal highway and highway safety programs. Whereas transit funding is guaranteed at a selected fixed amount over the TEA-21 period and can be used only for projects eligible under transit programs. The total amount guaranteed for highway and transit programs is estimated to be \$198 billion. The guarantee is essentially a floor, which defines the least amount of the authorizations that may be spent.

For each State, the TEA-21 specifies a certain share of the aggregate funding for the following programs: Interstate Maintenance (IM), National Highway System (NHS), Bridge, Congestion Mitigation and Air Quality (CMAQ) Improvement, Transportation and Transit Enhancements, Surface Transportation Program (STP), Metropolitan Planning, High Priority Projects, Appalachian Development Highway System, Recreational Trails, Clean Fuels, and the Minimum Guarantee funding itself. Other programs such as the Transportation and Community and System Preservation (TCSP) Program and the National Scenic Byways Program are supported by discretionary funding.

One problem with the discretionary programs is that Congress retains the right to direct funding from some of the programs to specific projects and grantees. This earmarking of funds limits the ability of the program to meet its objectives and creates challenges for those administering the projects which have not been created in full coordination with state, metropolitan and local planning processes. Interviews held with three State DOTs (refer to Section 5) highlighted the detrimental effect that earmarking is having on the TSCP program in particular.

Another area for consideration is the ability of the State DOTs and the MPOs to create successful funding applications. Inadequate institutional planning capability is likely to ensure that poor performing states will remain locked into a cycle of a deteriorating

³⁰ Federal Highways Administration, (1998) *Highway Trust Fund Primer*, Office of Policy Development, <http://www.fhwa.dot.gov/policy/primer98.pdf> (02/14/02). The 1997 FY Net Tax Receipt for the HTF was \$23.87 billion.

transportation infrastructure. The solution to this concern will not be easily remedied, however the role of the Bureau of Transportation Statistics (BTS) in the collection of system performance data, is likely to play an important part in the identification of poor performing regions or areas.

4.4 THE TEA-21 AND CAAA FRAMEWORK

This section provides a brief outline of the structure behind the U.S. Transportation Equity Act for the 21st Century (TEA-21) and the Clean Air Act Amendments of 1990 (CAAA). The two Acts are seen to have revolutionized transportation planning and an understanding of their history and how they interact is important if sustainable transportation principles and policies are to be integrated into the transportation planning process.

In 1990, the Clean Air Act was amended to increase the compliance with the National Ambient Air Quality Standards (NAAQS) and to encourage a strong linkage between transportation and air quality planning. In 1991, Congress adopted the Intermodal Surface Transportation Efficiency Act (ISTEA), which authorized the Congestion Mitigation and Air Quality (CMAQ) Program³¹ and provided \$6.1 billion in funding over a six-year period (1991-1997) for transportation and other related projects that contribute to air quality improvements and reduce congestion. The ISTEA, CAAA and CMAQ framework was intended to realign the focus of transportation planning toward a more inclusive, environmentally sensitive, and multimodal approach to addressing transportation problems.

The Clean Air Act is a broad federal law dealing with a range of air pollution problems. General concern by environmental agencies and the public that the nation's health was being put at risk by transportation pollution, led to the movement to create national air quality standards for transportation.

The following points highlight the core transportation aspects of the CAAA:

- **Air Quality Targets.** The CAAA puts in place a measurable and enforceable set of air quality standards and targets for six pollutants, including carbon monoxide, ground level ozone, and fine particulates.
- **Ownership of Decisions.** The CAAA provides the states and local governments with the flexibility to develop their own transportation programs to meet the air quality standards.
- **Commitments to standards.** Each state is required to prepare a State Implementation Plan (SIP), which provides legally binding commitments outlining the steps that will be taken to reach their air quality target by a specified date.

³¹ Jointly administered by the Federal Highways Administration (FHWA) and the Federal Transit Administration (FTA).

- **Responsibility and accountability.** Each state must show how it is progressing towards its state air quality plan. Federal government has an oversight role to monitor the “conformity” of the plans and investment programs.

Through the 1990s the role of national government began to change from top down, centralized decision-making towards increased state and local control of transportation (DOT, 2000a). In 1998, ISTEA was repackaged and reauthorized to form what is commonly known as TEA-21 (refer to Section 4.3 for further details). The new surface transportation Act retained and strengthened its connection with the CAAA to provide a policy framework that aimed to move U.S. cities and states toward integrated transportation and air quality planning, while improving the quality of decisions on transportation investments and strategies. Under these laws, air quality has become a major national transportation goal.

Together, TEA-21 and the CAAA provide a national approach to balance traditional transportation goals of congestion relief, mobility and accessibility, with the sustainability goals of economic development, environmental protection, and social equity. Box 12 presents the core objectives behind the integration of the two laws.

BOX 12: Main Aspects of the Integrated TEA-21 & CAAA Approach (Lyons, 2000)

The Policies are Reinforcing

TEA-21 and the CAAA define clear and complementary institutional roles and responsibilities for local, regional, and state planning agencies and transportation providers in the planning process.

The Two Laws Strengthen Urban Transportation Planning and Decision-Making

Federal leadership, combined with flexibility to accommodate different local conditions, goals, and priorities enables smart urban transportation planning to occur at the local and national levels.

Air Quality is Both a National And Local Transportation Goal

In combination, the two laws set a priority for improvement of air quality relative to other national and local concerns.

A Comprehensive, Coordinated Transportation Planning Process

TEA-21, supported by the CAAA, defines an ideal or model planning process, then monitors progress to ensure that the expected process occurs and air quality is improved. This combines a “top down” federally led process, with a “bottom-up” state and locally led process.

Responsibility and Accountability

The CAAA mandates that all states and metropolitan areas reach measurable and enforceable air quality targets. In addition, TEA-21 includes directions for transportation planners and decision-makers to follow to reach air quality and other goals. Federal agencies monitor the success of the planning process, and whether legal commitments to progress toward the air quality targets are being met. Both TEA-21 and the CAAA provide for accountability of responsible state and local agencies.

In addition to strengthening the TEA-21 and CAAA connection, the 1998 reauthorization also continued and enhanced the CMAQ program by providing over \$8.1 billion dollars in funds to State DOTs, MPOs, and transit agencies to invest in projects that reduce air pollutants from transportation-related sources over a period of six years (1998-2003).

The intent was not to use the CMAQ program as the sole source of funding to reduce congestion and improve air quality. Other funds under the Surface Transportation Program (STP) or the Federal Transit Administration (FTA) capital assistance programs, for example, may be used for this purpose as well. Notwithstanding this, the greatest air quality benefit is likely to accrue from the strong working partnerships between Federal, State and local authorities.

TEA-21 and the CAAA each involve formal federal oversight to ensure that expectations are met. If necessary, federal transportation funds can be withheld to provide incentives for compliance with the planning process and to initiate progress towards improved air quality.

The original intention of the CMAQ program was to reduce regulated emissions associated with carbon monoxide, ozone and particulate matter in nonattainment and maintenance areas, often through congestion mitigation. Reducing vehicle idle time and unproductive fuel consumption by reducing travel delays; also has the positive ancillary effect of reducing CO₂ – a major green house gas. Transportation accounts for approximately a third of CO₂ emissions in the U.S. and transportation emissions are rising faster than in any other emitting sector. Thus, even though reducing greenhouse gas emissions was not an explicit goal of the CMAQ program, the program has become one of the few initiatives that the U.S. DOT can use to address the problem of global climate change. This connection has provided the virtual DOT Center for Climate Change and Environmental Forecasting, with a direct link to the CMAQ programs and others that achieve similar goals. However, no direct provision was included in TEA-21 to address climate change issues.

TEA-21 and the CAAA framework provide a comprehensive tool for achieving the NAAQS. However, there is a concern that the lack of any statutory body with the authority to address the larger question of global climate change, makes the task of developing policies to achieve sustainable levels of greenhouse gas emissions daunting. In addition to the U.S. DOT developing policies to reduce congestion, the management of energy resources will also need to be addressed. Therefore, it seems logical to provide the Center for Climate Change and Environmental Forecasting with the authority and finance to monitor and enforce the State Implementation Plans (SIPs), and develop a transportation policy which focuses on reducing greenhouse gas emissions and energy usage.

Kemp (2001) provides a valuable discussion about utilizing modes of governance and process management as a means of altering policy instruments into climate friendly mechanisms. It is argued that for instruments to be effective they must join in with *ongoing dynamics* instead of trying to force changes. Thus, assuming that the Center for Climate Change and Environmental Forecasting is one such ongoing dynamic, it can be used as an instrument to make transportation policy development sensitive to the problems of global climate change. In essence, governmental authorities should act as an *alignment actor* and *facilitator* of change rather than a sponsor or regulator. Kemp also highlights that climate

protection policy can be pursued under the principles of the internalization of transportation costs and the precautionary principle.

While the points above have significant merit, it is also worth mentioning the potential problems of such an exercise. Forrester³² highlights a series of characteristics of complex systems, such as the U.S. transportation sector, which must be appreciated by those who attempt to transform these systems towards new paradigms of growth and development. The characteristics of complex systems are:

- Transfer of problems between sectors
- Tradeoffs between present and future
- Resistance to most policy changes
- Transfer burden to the intervener
- Very few high-leverage policies

Therefore, it can be assumed that if the Center for Climate Change and Environmental Forecasting is granted responsibility for transportation related climate change and energy issues, it is likely to be operating within a very difficult, complex and dynamic political environment. Great care must be taken to prevent the collapse of its goals and values due to external pressures and a failure to meet its goals. More precisely, policy adjustments must not be made to declining realities. It is believed that the Center for climate change can be successful in addressing greenhouse gas and energy concerns, however the public must understand and back the goals of the Center if it is to be successful. Forrester comments that it only takes 5% of the population to understand the problem for change to occur without significant resistance. This is due to the assumption that 95% of the population will follow the most active members of society.

³² Professor Jay W. Forrester, MIT, presented the Characteristics of Complex Systems during a lecture on *System Dynamics and Sustainability*, held at MIT on 18th January 2002, building E51-325.

5 STATE TRANSPORTATION PLANNING PRACTICES

Section 4.1 through to 4.4 provide an outline of the U.S. transportation planning framework established through TEA-21 and CAAA, and indicate how the planning process operates at national, state and local levels. While this overview is useful, without a deeper understanding of how the framework has been adopted by the 50 states, it is difficult to determine whether the planning process supports the principles of sustainable transportation.

Initial research into the planning practices of state DOTs and MPOs, revealed a wide variation in the transportation planning regimes that exist within the states. The different planning regimes are the result of diverse geographic, economic, demographic, and governmental characteristics, and are directly influenced by the nature of the state's existing transportation system and decision-making processes. Of the 50 states, three were identified as having innovative planning methods and/or financing programs, and these were examined in more detail. The states selected have either won awards for excellence³³ or were recommended by U.S. DOT for leading best practice transportation planning and programming initiatives within their state.

In addition to understanding planning environments within the three states, the State DOTs were questioned about their recommendations for the enhancement of TEA-21 for reauthorization in 2003.

The three states studied for this paper were Pennsylvania³⁴, Kentucky³⁵, and South Carolina³⁶. Appendices B1, B2 and B3 document the current planning environment in each state respectively, and identify areas where best practice was seen to occur. Each report in the Appendices concludes with the State DOT's view on Federal programs and how they support the objectives of sustainable transportation, and documents their recommendations for the improvement of TEA-21 legislation. The following discussion summarizes the key findings from these consultations.

5.1 STATE TRANSPORTATION PLANNING

The legislation in TEA-21 requires State DOTs and Metropolitan Planning Organizations (MPOs) to work effectively together in the development of their long- and short-range transportation planning and programming activities. In developing their plans, the MPOs are required to provide all relevant stakeholders in their planning areas with the opportunity for comment. The State DOTs subsequently develop their plans and programs in

³³ For example, Larry King (Pennsylvania State DOT) received AMPO's 1998 award for outstanding individual leadership in recognition of his role in building cooperative MPO/SDOT relations.

³⁴ Pennsylvania State DOT; contact – Tom Kotay.

³⁵ Kentucky Transportation Cabinet; contact – Mike Hancock.

³⁶ South Carolina DOT; contact – Mark Pleasant.

cooperation with the MPOs, so it is apparent that there is a strong link between local and state requirements for metropolitan areas.

For non-metropolitan areas the alignment between local and state objectives is not so clear. TEA-21 requires the State DOTs to *consult* with non-metropolitan areas in the development of their Statewide Long-Range Transportation Plan (SLRTP). The ambiguity of this requirement has caused much debate and FHWA have initiated a study to determine the *effectiveness* of the consultation processes within each of the states.

There are several points of concern that have arisen through discussion with State DOTs regarding the current legislation for transportation planning. Firstly, it is apparent that there is significant state diversity in the relationships between the State DOTs and the MPOs. Those State DOTs contacted for this research have all developed a highly cooperative working and decision-making relationship with the MPOs; however their representatives stated that this was not necessarily common practice in other states. Further research is needed to identify the full extent of this problem. Ensuring equitable cooperation between State DOTs and MPOs will be a significant step towards a more *integrated decision-making* environment.

Secondly, the requirement for the State DOTs to consult with non-metropolitan areas presents another concern where the diversity of consultation methods in the states makes it difficult to identify whether the non-metropolitan areas take an active role in the planning process.

Thirdly, and possibly most importantly, there is no formal guidance or legislation regarding the *integration* of land use and transportation planning. This is seen to be a prerequisite if the U.S. is to move towards a more sustainable transportation system. The use of land will play an important role in ensuring that the objectives of sustainable development are met.

By developing an *inclusive* transportation planning process, in which metropolitan and rural planning organizations take an active participatory role, it is more likely that a transportation system will be developed that suits the requirements of all its users. The two research projects reviewed in Section 6, provide some useful recommendations that could provide a fitting solution to this challenge. The first project undertaken by the University of Denver Intermodal Transportation Institute & the National Center for Intermodal Transportation, makes a series of recommendations that are designed to enhance the MPO transportation planning process, from the local planning level to improvements with congressional legislation (refer to Box 13, Section 6.1). If these recommendations are implemented, the MPO's ability to take an active role in the transportation planning process will be dramatically enhanced. The second project undertaken by a panel of the National Academy of Public Administration (NAPA), presented six principles for effective consultation (refer to Box 14, Section 6.2). If followed, these principles will allow the rural planning organizations (RPOs), authorities and local officials to take an active role in the transportation planning process.

In summary, by ensuring that the State DOT, the MPOs, RPOs, authorities and local officials are all *formally* part of the planning process and that they *effectively consult* the public when making decisions that will ultimately affect them, this will provide a comprehensive forum for discussions towards sustainable land use practices. Reform will come only when community outcomes drive the process.

5.2 DISCRETIONARY PROGRAMS

The consultations with the three state DOTs revealed significant support for the Transportation and Community and System Preservation (TCSP) Pilot Program and other programs such as the Transportation Enhancements Program, and the Congestion Mitigation and Air Quality Improvement Program (CMAQ), since they provide communities and local/metropolitan planners with the tools and resources needed to combat congestion and sprawl. For example, the most important value of the TCSP program is that it brings together communities, decision-makers and planners who would not normally work with each other under the existing planning environment. It was apparent that there is a willingness by the communities to work with authorities to study smart growth³⁷ issues and prepare grant applications for discretionary programs, reflecting the general population's growing enthusiasm to become part of the decision-making process.

However, congressional earmarking of the TCSP program and other discretionary funds has hindered the goal of improving land use by not permitting the development and identification of innovative new approaches. South Carolina DOT stated that earmarking has the potential to '*demoralize those communities that adopt, in good faith, the spirit and principles of programs such as TCSP*' (please refer to Appendix C for the SCDOT consultation report). While the states are aware that congressional earmarking will not be an easy issue to solve, they are all agreed that a reduction in earmarking would dramatically improve the programs and provide them with an incentive to invest significant resources into developing proposals for funding.

In addition to reducing congressional earmarking, an alternative way of disseminating sustainable transportation principles would be to install them in statewide and metro planning requirements. One way of doing this would be to seek best practice from programs such as the TCSP program, and to disseminate this through other programs and planning guidance. The FHWA is currently preparing a best practice tool kit for the TCSP program, which will provide a useful summary of the projects that support many of the principles of sustainable transportation.

³⁷ Smart Growth is a general term for land use practices intended to create more resource efficient and livable communities and to reduce urban sprawl. These practices help create more accessible land use patterns that reduce the amount of mobility required to reach goods and services. Smart Growth is usually implemented as a set of policies and programs by state/provincial, regional or local governments. To be effective it requires multi-jurisdictional coordination. Further information can be obtained from the Victoria Transportation Policy Institute, Canada, <http://www.vtpi.org/tm/tm38.htm> (03/01/02).

When compared with non-discretionary programs, the level of funding dedicated towards discretionary programs is only a small part of the total transportation budget. Therefore, any improvements at this level are likely to have a minor effect in moving the transportation sector towards sustainability.

5.2.1 Amalgamating Discretionary Program Agendas

The U.S. DOT was seen to have an obligation to assist the states in marrying the agendas of discretionary programs to bring the various agendas onto a common page and enable the states to work towards a sustainable transportation network and living/working environment. This will become more important as the public and other stakeholders become involved in transportation planning, since it is likely that they will call for a uniform planning framework which can be used to develop proposals for discretionary programs.

5.3 NON-DISCRETIONARY PROGRAMS

Non-Discretionary programs such as the National Highway System (NHS), the Surface Transportation Program (STP), and the Interstate Maintenance, and Bridge Replacement Program constitute the lion's share of federal-aid transportation programs. While there are no formal requirements for these programs to be delivered under the guidance of the sustainable transportation principles, there is sufficient flexibility for the states to develop their own innovative project delivery processes.

The discussions with the State DOTs focused on how the states are using these programs to change the "culture" of their project delivery processes. As the State DOTs work directly with the public, elected officials, resource agencies, and other groups, they are discovering the value of "context-sensitive" project development. Processes are being redrawn to reflect the emphasis on understanding the context within which individual projects are developed, and the realization that there is no longer a "cookbook" for every situation. Hence, the most appropriate place to incorporate sustainable transportation/ development concepts was highlighted as being the environmental clearance and project development stages.

5.4 SUSTAINABLE TRANSPORTATION PRACTICES

The three states consulted (Pennsylvania, Kentucky and South Carolina) were selected as a result of their innovative transportation planning and programming practices, which means they were already seen as having 'best practice' in the field of transportation planning. The following subsections highlight the key elements of their planning and programming environments, which are seen as essential requirements for enhancing the statewide transportation planning process. Examples of state best practice follow each point.

5.4.1 State DOT & MPO Partnerships

The State DOTs have created a planning environment in which the MPOs have a lead role in the development of the LRTPs and TIPs. In addition, the MPOs are provided with sufficient authority and human and financial resources to enable them to carry out their statutory duty. This also permits the MPOs in each of the states to undertake exhaustive consultation processes to ensure all stakeholders are able to take part in the planning process.

- **‘27 and 7’:** South Carolina DOT (SCDOT) has initiated a new program called ‘27 and 7’, in which it has leveraged Guide Shares (Federal) funding for state highway bonds that are advancing almost \$5 billion worth of projects for both MPOs and Council of Governments (COGs). ‘27 and 7’ is a funding option that is offered, not mandated, to the MPOs and COGs by the SCDOT. The concept is for the MPO or COGs to relinquish a proportion (up to half of their Guide Share) of their Federal funding for debt servicing and for money up front to accelerate and construct projects today that might otherwise take 20 years under the current planning regime. In order to accomplish this new and creative financing program, SCDOT has developed a strong partnership with the MPOs and COGs.

5.4.2 State DOT & Non-Metropolitan Partnerships

While TEA-21 requires the State DOTs to *consult* with non-metropolitan areas, all three states have gone one step further and have developed a comprehensive planning process in which their rural partners take an active role.

- ***Statewide Planning Process for Non-Metropolitan Areas*** (Kentucky Transportation Cabinet - KYTC). Beginning in 1995, Kentucky established a statewide planning process for non-metropolitan areas. This process focuses on 15 Area Development Districts (ADDs) and 12 Highway Districts. The ADDs work under contract with KYTC and receive state funds to support transportation planning activities. The ADD Transportation Committees include local and county officials, representatives of other interest groups, and private citizens. These ADD committees provide input and direction for all the regional planning activities relevant to the statewide transportation planning process, including the identification and prioritization of highway projects. These priorities are then considered when projects are selected for inclusion in the long-range plan, 6-year plan, and STIP.

5.4.3 Public Involvement in the Planning Process

All three states provide the general public with adequate opportunity to comment on their proposed transportation programs. In addition, each state is seeking ways to incorporate the public in the decision-making process, e.g. the TSCP program provides a good example of where communities play an active role in the development of a transportation project; however the states are seeking ways to extend the core themes of such programs into their planning process.

- **Publicly Owned Project (POP):** In Kentucky, the KYTC has moved away from what was called the “DAD” (Decide, Announce & Defend) philosophy to one known as the “POP” (Publicly Owned Project) philosophy, which adds considerable depth to the public consultation process.

5.4.4 Integration of Transportation & Land Use Planning, & Environmental Review

One of the most encouraging aspects of the states’ planning processes is the growing desire to link transportation and land use planning with environmental review.

- **SCDOT’s Streamlining Initiative for Transportation Planning:** SCDOT has begun to work with its resource agencies during the development of its LRTPs, in an effort to make them an active part of the planning and programming process. SCDOT plans to provide each resource agency with a list of proposed projects in their LRTP from which the agencies can identify an inventory of constraints that SCDOT might/will need to address in the future. This new planning approach is currently being tested through a pilot project involving two MPOs and two COGs, which are in the process of updating their LRTPs. A preliminary environmental screening of all the proposed projects will occur in-house between the MPOs and SCDOT, and the outcome will be sent to all resource agencies for comment. Any concerns the agencies might have with the proposed projects will be documented, for the first time, in the LRTP. It is hoped that this formal process will enable the SCDOT, MPOs, COGs and the resource agencies to share information at an early stage and to familiarize all partners with the issues that will need to be solved.
- **Urban Village Growth Boundaries** (Pennsylvania DOT - PennDOT): The ‘Urban and Village Growth Boundaries’ initiative has been developed by Pennsylvania and adopted by several MPOs, such as Lancaster County Planning Commission (LCPC), to ensure that transportation and land use developments only occur within the defined boundaries. The LCPC, in cooperation with municipalities, has developed urban growth boundaries to direct growth to areas that have the infrastructure – including transportation infrastructure – to accommodate it.

- **Transportation Projects/Land Use Planning Coordination Initiative** (PennDOT): Federal and statewide planning funds are being used to encourage stakeholders to interact. Some \$2 million was recently granted for a Transportation Projects/Land Use Planning Coordination Initiative, that puts \$400,000 of federal planning funds towards five state fiscal year budgets for the Office of Planning (2000 - 2005). A local match of 20% is required each year. One example of how the funds are being used can be found in a pilot project being undertaken by one of the MPOs. The traditional transportation and air quality modeling tools are being combined with land use and social economic data, to identify the impact of any major development plans even before the plans are approved at local municipal level.

As a caveat to the above examples of good practice, it is worth highlighting that an effective planning *process* does not necessarily mean that the final solutions will be successful when implemented. Therefore, care must be taken to ensure that a balanced approach of *process* and *action* oriented decision-making is achieved in practice.

5.5 NEW PARTNERSHIP INITIATIVES ON THE HORIZON

The Environmental Protection Agency (EPA) recently advised that it has realized the need to work with transportation agencies to create “win-win” situations wherever possible. The EPA would like to look into ways of working with State DOTs, so they can access the states’ resources to assist them in accomplishing their goals. In particular, Kentucky felt that this would enhance their planning capacity and ultimately improve the environment and the transportation network. Evidence of this new approach can be seen in an EPA brochure entitled ‘*Transportation Planning in the Northwest: Framework for Sustainability*’³⁸. In the brochure, the EPA in Region 10 states that it would like to ‘*work towards sustainable transportation solutions and to integrate land use planning, transportation planning, and environmental review so that the NEPA process is open to the full range of alternatives to solve transportation needs*’. The EPA plans to work with land use planning and transportation planning entities to explore ways of achieving a more integrated approach.

5.6 STATE DOT ISSUES FOR TEA-21 REAUTHORIZATION

During the consultations, each state was asked to highlight their main concerns with the coming reauthorization of TEA-21. The following paragraphs provide a summary of the points that were raised.

³⁸ For further information about this publication, contact the U.S. EPA, 1 (800) 424 4EPA, or go to the Region 10 website. <http://yosemite.epa.gov/R10/HOMEPAGE.NSF/webpage/INDEX> (01/19/02) - click on *Transportation Planning in the Northwest: Framework for Sustainability*. January 2000.

5.6.1 Streamlining Project Development

There was a general concern that considerable time and resources will need to be invested in streamlining project development, such as the timeliness and coordination of reviews of environmental clearance documents. The U.S. DOT has not provided any guidance on how the states should approach this issue and there is concern that any progress they make may be thwarted if federal guidance is issued too late.

5.6.2 Access Management Along Transportation Corridors

States have faced considerable difficulty in working through federal regulations and laws with respect to the preservation of rights of way. PennDOT, for example, would like to 'preserve alternatives' by buying up the right of way on land adjacent to core transportation corridors, but has been stopped by the FHWA who are concerned that this could prejudice the outcome of an Environmental Impact Statement (EIS). These problems should be addressed so that the new surface transportation act eliminates conflicts of interest.

5.6.3 Performance Assessment - Management and Monitoring Systems

There was a concern that many states are doing a poor job of informing their constituents and the Federal government of what and how they are doing. PennDOT felt that enhancing the requirements for the development of asset management and monitoring systems, would be a valuable way to collect and disseminate this type information.

5.6.4 U.S. DOT and Congressional Guidance – Planning Capacity

At the MPO and RPO level there is a growing need for the continued improvement of core competencies such as leadership, management skills, and planning capabilities. Any overarching principles defined by the U.S. DOT and Congress must relate to this basic need through the translational process that occurs at the state level. Since it is the role of the state legislator to interpret federal guidance to ensure that the local governments/authorities are undertaking activities appropriately, the U.S. DOT and Congress have an obligation to ensure their guiding principles are clear and precise and to set the boundaries within which the State DOT, MPOs and ADDs can work.

5.6.5 Flexibility of Federal Funding

There was a general call from the State DOTs for more flexibility in the existing funding options, so that money could be channeled towards maintenance work on items other than the interstate highway.

5.6.6 Public Involvement

Achieving adequate and effective public involvement is seen as being one of the major challenges that face State DOTs. It is believed that many of the issues that are raised during the development of the LRTP, e.g. the preservation of rights of way, might be avoided if public consultation were a more inclusive process. Involving the public and all relevant stakeholders requires significant experience and resources and the states would like Federal assistance to encourage innovative practices that aim to enhance public involvement in decision-making, and to capture best practice across the U.S for the benefit of all planning authorities.

6 RESEARCH PROJECTS & CONSULTATIONS

In addition to documenting the U.S. transportation planning framework and best practice transportation planning activities in three of the states, a review of research projects in the U.S. was undertaken. The review identified two projects that have a specific relevance to TEA-21 and transportation planning and programming.

The first project by the University of Denver Intermodal Transportation Institute & the National Center for Intermodal Transportation, makes a series of recommendations that are designed to enhance the MPO transportation planning process, from the local planning level up to congressional level. The second project undertaken by a panel of the National Academy of Public Administration (NAPA), examines the effectiveness of the consultations with non-metropolitan local officials in statewide transportation planning and programming processes. Both of these studies are documented in the following sections along with their findings and/or recommendations.

6.1 MPOs: AN ASSESSMENT OF THE TRANSPORTATION PLANNING PROCESS

It is likely that the requirement for the establishment of MPOs will remain in the next surface transportation act. Therefore, research undertaken by the University of Denver Intermodal Transportation Institute & the National Center for Intermodal Transportation to assess MPO transportation planning processes, provides a valuable source of information on the current status of metropolitan transportation planning. The rationale behind the importance given to the MPO planning function, is that a more effective planning process will enhance the MPOs' capacity to initiate and enact the principles of sustainable transportation. Box 13 provides an overview of the recommendations from the study. It is recommended that the proposals put forward in Box 13 be implemented for the reauthorization of TEA-21.

BOX 13: Recommendations for Improving MPO Planning Capacity (Dempsey, 2000)***MPOs should;***

- create a means of evaluating the leadership qualities of their candidates (both staff and locally elected officials) and encourage the leaders selected by virtue of this process to improve their leadership skills by taking advantage of available educational opportunities.
- employ and compensate their staffs in a manner that will promote a high level of technical competence and expertise and make professional education available in order to enhance proficiency.
- consider structural means of promoting a more regional approach among their members and aggressively promote public involvement in the shaping of regional priorities.
- work in a spirit of cooperation with their state DOTs with respect to all state and local projects and serve as forums for the coordination of regional land use and transportation plans for the state.
- engage in periodic self-assessment.

State DOTs should;

- coordinate project selection with MPOs and jointly promulgate guidelines and Long Range Plan [LRP] and Transportation Improvement Program [TIP] criteria.
- develop open and objective selection processes that more meaningfully include input from local jurisdictions, stakeholders and the public.
- promulgate rules and regulations that formalize their project prioritization and planning processes. Emphasis should be placed on collaborative planning in MPO regions relative to project selection, prioritization and timing.
- periodically evaluate the needs and equity of economic resource distribution across their regions.

State Legislatures should;

- strongly encourage the coordination of regional land use plans with transportation planning and consider the passage of growth management acts as is currently the practice in some States.
- further reassess size and composition of State transportation commissions upon completion of the census to more equitably apportion representation. Resulting commissions should be made clearly subject to adequate notice, public hearing, and open decisional process requirements.
- update enabling legislation, commensurate with the new policies favoring openness of process, enhanced public participation, and seamless intermodalism, and reemphasize the desirability of continuing, cooperative and comprehensive planning.

The Federal Highway Administration [FHWA] and the Federal Transit Administration [FTA] should;

- jointly promulgate rules implementing major federal transportation legislation within one year of such legislation's enactment, to reduce inconsistency between statutory and regulatory guidelines. Additionally, FHWA and FTA should collect, assess and analyze the certification and enhanced planning reviews to enable MPOs to assess and improve their respective practices.

US Congress should;

- ensure that MPOs continue to serve as an appropriate forum for state and local jurisdictions to resolve regional transportation problems. In light of findings concerning the importance of fairness and equity among local jurisdictions in MPO processes, Congress should consider, in conjunction with additional study, removing the requirement of approval by the central city for MPO designation or redesignation from the statutory criteria.

6.2 RURAL TRANSPORTATION CONSULTATION PROCESSES

The consultations with the three State DOTs highlighted the growing importance of including the rural planning organizations and counties in the transportation planning and

programming process. Each of the State DOTs described how they have created a planning environment in which their rural partners take an active role in the decision-making process. This development illustrates one of the key aspects of sustainable transportation, that of incorporating all the stakeholders in statewide transportation and land use planning.

In 1991, the Intermodal Surface Transportation Efficiency Act (ISTEA), significantly strengthened collaborative decision-making regarding metropolitan transportation plans and spending decisions. Requirements were added for intergovernmental consultations between state departments of transportation and local officials in non-metropolitan areas³⁹. In 1998, the Transportation Equity Act for the 21st Century (TEA-21) made non-metropolitan consultation requirements a significant issue. However, local officials felt that although TEA-21 enhanced consultation requirements modestly, it did not ensure adequate access to state decision-making. The subsequent debate ended with a mandate for the Secretary of Transportation to set up a study of the state-local consultation issue and report the conclusions to Congress.

A panel of the National Academy of Public Administration (NAPA) completed the Rural Transportation Consultation Processes research project in May 2000. Two of the main conclusions of the study were that consultations with local officials are crucial to making transportation delivery systems work well in the U.S., and that additional work will be needed to assess the effectiveness of State DOT consultations with non-metropolitan local officials in each state. It was apparent that neither the law nor the related federal regulations provided a definition of effectiveness, and there was no agreement between state and local officials about criteria for judging effectiveness. The May 2000 report set forth six principles (refer to Box 14) for effective consultation, which were developed during the study through a consultative process.

BOX 14: Principles of Effective Consultation (NAPA, 2000)

1. Provide a known and understood process that includes all the key officials responsible for providing rural transportation facilities and services.
2. Assist rural local officials, who request it, to acquire necessary levels of transportation planning and programming knowledge and the capabilities needed to participate effectively in consultations with the SDOT.
3. Promote free and effective exchange of information about the rural elements of both the long-range (20-year) state transportation plan and the short-range (3-year) statewide transportation improvement program.
4. Provide timely access to state decision-makers before decisions are locked in; and timely feedback to local officials about how their input was used and what changes it caused.
5. Promote satisfaction with the consultation process among local officials.
6. Influence the response to rural transportation needs, recognizing the specific decision-making context in the state.

³⁹ For clarification, Non-Metropolitan Area means the remainder of the state, not included within the jurisdictional boundaries of a recognized MPO. These areas often are referred to as “rural” areas, even though they may include small cities and towns.

In May 2001, a supplemental report was published by NAPA which aimed to begin to understand the effectiveness of the state processes by: (1) summarizing the process being used in each state, (2) putting each process summary in the context of its state's relevant characteristics, and (3) providing the views of local officials in the state on their state's process (NAPA 2001). The report is a valuable source of information and documents the current transportation planning processes that are occurring in each state, i.e. the planning framework within which the State DOT, MPOs and rural planning organizations or authorities operate. Much of the information provided in the report was used in Appendices B1, B2 and B3, to outline the planning framework of the three states consulted for this research. A shortcoming of the report is that it provides the information without analysis or comparisons across states. Hence, more work is required before Congress can be informed of the effectiveness of the consultation process.

Whilst it will be a while before the true effectiveness of consultations between State DOTs, MPOs and non-metropolitan areas is known, the key messages from the NAPA reports are that;

- it is essential that rural planning organizations, authorities and local officials are included in the transportation planning process,
- the principles outlined in Box 14, provide an effective framework which, if followed, will allow the rural planning organizations, authorities and local officials to take an active role in the transportation planning process.

6.3 LESSONS FROM THE UK TRANSPORTATION PLANNING FRAMEWORK

During the summer of 2001, a review of the UK transportation planning framework was undertaken to identify how the concepts of sustainable transportation were being adopted and implemented. Appendix C contains a copy of the final report of the review, from which the key points have been summarized in the following subsections.

6.3.1 Long-Term Financial Commitment

The UK Government has enhanced the local authorities' planning capabilities by providing a 5-year financial commitment to fund their Local Transportation Plans (LTPs). The 5-year LTPs are intimately linked with the Regional Transportation Strategies (RTS), which have a 15 to 20 year planning horizon, and identify the immediate 5-year regional transport priorities. The government ensures that national transportation interests are being considered by assessing the LTPs based on the effectiveness of their integration with the RTS.

6.3.2 Internalizing the Cost of Transport

One of the current challenges being tackled in England is the introduction of congestion charging measures in the large cities. The Transport Act 2000, enables local authorities to establish such measures, provided that revenue obtained from the scheme is channeled directly back into transportation projects. This provides the public with confidence that they will receive the benefits from the extra transportation costs. A recent survey in England, for the Commission for Integrated Transport (CfIT), highlighted the public's general acceptance of congestion pricing mechanisms, but only in the context of real improvements in public transportation. This acceptance is partly due to the severe congestion problems that are commonplace on the transportation network during peak times.

6.3.3 Independent Advisory Bodies

Valuable components of England's transportation planning process are bodies such as CfIT and the Commission for Sustainable Development (CSD), which have been created to provide the government with advice on transportation issues. The relative independence and diversity of membership on these bodies means that they are able to provide ministers with unbiased advice on whether their sustainable agenda is being met and whether the current strategy is taking them in the correct direction.

While the above provides good advice on how to achieve sustainable practices, it is important to understand the differences between the U.S. and England. Comparatively, England has a far greater population density than the U.S. and therefore is more aware of land use concerns. This high density was a major factor behind the development of the 'green belt' concept, which prevents significant urban sprawl from occurring in England. If the U.S. wishes to maintain its standard of life and natural habitats, then it too must consider the careful integration of transportation and land use.

7 CONCLUSIONS

This research identifies the link between sustainable development and sustainable transportation and highlights how activities within the transportation sector can have a dramatic effect on sustainability in general. It reviews and summarizes the *definitions, principles, challenges* and *recommendation for change* that have been developed around the concept of sustainable transportation, and presents the findings in a format that it is hoped will be of value to transportation decision-makers. The review of the extensive literature on the subject was used to assess the U.S. transportation planning framework established under TEA-21 and the CAAA, and to highlight best practice regarding transportation planning and programming within three states in the U.S.. Finally, this study reviews two U.S. research projects that are of direct relevance to sustainable transportation and TEA-21; and extracts several recommendations for sustainable transportation practices from the UK's transportation planning framework.

Having assessed such a wide range of issues, it is clear that there is no simple or unique solution to achieving the final goal of a sustainable transportation sector in the U.S.. Progress towards sustainable transportation, and hence mobility, will require a fundamental shift in thinking at all levels of planning and decision-making. It will require a move away from familiar working environments and the balkanized nature of governmental structures, towards new *integrated* structures and frameworks which develop and nurture relationships with new stakeholders and partners. In short, it will be difficult to achieve, but if successful will greatly enhance the nation's health, natural environment, social well being, mobility and economic vitality. This is a vision that should not be ignored simply because of the complexity of the issues.

The following two sections provide the main conclusions from this research. The first section (Conclusions from Part A) highlights the key outcomes from the discussions on sustainable development and sustainable transportation, and considers the results from the sustainable transportation policy review. The second section (Conclusions from Part B) provides a more precise series of conclusions. These revolve around TEA-21 and the CAAA, although there is a high degree of interconnectivity with those conclusions from Part A.

7.1 CONCLUSIONS FROM PART A

Initial discussions on the sustainability of the U.S. transportation sector concluded that the utilization of non-renewable energy supplies to cope with the predicted growth in transportation demand is not only unsustainable, since the resource is finite, but is also harmful to public health and the environment at the local/regional/global level, through emissions of particulate matter and other pollutants. This conclusion is important since it raises three key issues of *energy use, local air quality* and *greenhouse gases*. Addressing these three problems simultaneously, will develop solutions that will ensure the

transportation sector begins to live within the carrying capacity of the local and global environment.

An important question was raised in the first section of Part A, relating to the relative level of sustainability that each *sector* must achieve. This research has not presented a solution to this question; however, it is clear that the importance of the transportation sector in contributing to the achievement of human well being is significant. It is recommended that future research be undertaken to determine a] the total carrying capacity of the earth within which each sector (across all nations and continents) must operate, and b] the relative proportion that each sector can use of the available resources and sinks. It is clear that to consider the U.S. transportation sector in isolation from other sectors throughout the U.S. and the world, is not likely to eventuate in a sustainable future for the nation as a whole.

The discussion on the link between sustainable development and sustainable transportation resulted in the transportation sector being described as both a *consumption sump* and an *enabling mechanism* through which consumption levels are met. The term *consumption sump* was devised to highlight the fact that the transportation sector, in general, uses energy and materials with limited consideration to the eventual disposal or reuse of the byproducts and waste. This statement is made with an appreciation that other sectors, such as agriculture, manufacturing, and housing, are potentially no better at addressing these issues and might therefore also be labeled consumption sumps. The discussion highlighted the work of McDonough (1998) as a useful example of how the problem can be addressed – i.e. the development of products in close technical and biological loops, under the philosophy that waste from each cycle equals food for another human or natural process. The second issue is more complex and warrants a more detailed discussion.

Until recently only human-made stocks were considered as capital since natural capital was abundant throughout the world. However, we are now entering an era in which natural capital is becoming the limiting factor. Human economic activities can significantly reduce the capacity of natural capital to yield the flow of ecosystem goods and services upon which the very productivity of human-made capital depends. Hence, the limits to growth are now limits to *throughput*, i.e. limits to the flows of energy and materials required to keep people alive. These are limits not only to the ability of the earth to provide the resource streams of energy and materials necessary to meet predicted consumption levels, but also to the ability of the earth to absorb the pollution and waste streams in natural sinks such as forests and oceans.

The desire for developing countries to follow the ‘developed nation model’ and for developed nations to continue and even increase their rates of consumption, promises to create colossal demands for the consumption of natural resources. The supply of these resources has the potential to create severe environmental and health problems at the point of extraction, during its use and at its eventual disposal. Hence, when considering the transportation sector, we must not only consider the impacts of the modes of transportation, but also the implications that enhanced mobility brings. The term *enabling mechanism* was found to be a useful way of describing the transportation sector, since it holds both positive

and negative connotations for development. Positive in the sense that it enables mobility and trade between and within nations, which strengthens the socio-economic setting and allows people to ‘*meet their own needs*’. But negative in the sense that expected rates of resource utilization, enabled by the transportation sector, might eventually result in devastating health, environmental and economic consequences for the very same people that transportation has the potential to benefit.

The solutions to the *consumption sump* and *enabling mechanism* issues discussed above, will be found within the conceptual framework developed in Section 2.2.2. The framework was created to capture the activities and attributes that define the transportation sector, and formulating solutions within this framework should facilitate clear and concise discussions.

The conceptual framework consists of four main areas which cover the; transportation planning and decision-making process; operation of the existing transportation system; transportation modes (i.e. the physical mediums by which transportation can occur); and the use of the transportation system. The majority of conclusions and recommendations put forward in this research fall under the first area, since Part B focuses specifically on enhancing the transportation planning and programming process as defined by TEA-21 and the CAAA legislative framework. No specific set of solutions has been developed to address the issues of the transportation sector being a consumption sump and an enabling mechanism for unsustainability. However, the results from the Sustainable Transportation Policy Review (Section 3.2), provide a set of principles, which if followed, should gradually move the transportation sector towards a sustainable state and tackle the question of human consumption rates.

The purpose of the Sustainable Transportation Policy Review is to identify the international perception of what is believed to be the pathway towards sustainable transportation. The information displayed in Section 3 and Appendices A1 through to A4, has therefore been designed as a reference document on sustainable transportation for decision-makers and planners. The sheer volume of information within these sections and appendices does not make it practical to provide a thorough examination of the text, however the guidelines below should be of some value to the first time reader.

Section 3.1 Defining Sustainable Transportation

This section presents a comprehensive definition of sustainable transportation, based around the Three E’s of Environment, Economy and Equity and the use of the transportation system.

Section 3.2 Principles of Sustainable Transportation

Boxes 2 through to 5 display the principles that support the definition of sustainable transportation.

Section 3.3 Challenges of Sustainable Transportation

Boxes 6 through to 9 display the challenges that will need to be confronted when trying to implement the principles of sustainable transportation. These will provide a useful insight into specific problem areas.

Section 3.4 Recommendations for change

The number of instruments designed to achieve the goals of a sustainable transportation sector is immense, which is the reason why Section 3.4 only lists the categories identified in Appendix A4 (refer to Table 3). In addition, the application of all the recommendations identified is likely to result in a sub-optimal solution overall. Therefore, Appendix A4 should be seen as a useful resource of information, which can guide decision-makers towards possible solutions to the challenges highlighted in Section 3.3.

7.2 CONCLUSIONS FROM PART B

Sections 4.1 and 4.2 assess the legislative authority of the U.S. DOT and the Strategic Plan for 2000 to 2005, to identify whether the U.S. DOT has a) the authority, and b) the strategic objectives, to enable the Department to take a lead role in realizing the goals of sustainable development.

The analysis concludes that the language used in the legislative authorities is general enough to enable the U.S. DOT to act on the Environmental, Economic and Social Equity (the Three E's) aspects of the definition of sustainable transportation (Box 1). However, there is no specific language to provide the U.S. DOT with a mechanism to manage the *use* of the system, other than to control illegal activities. It can be concluded from this assessment, that the U.S. DOT has the ability to move the U.S. transportation *sector* towards a sustainable agenda through the provision of appropriate policies and programs. There is however, no direct legislative authority in place to enable the U.S. DOT to address the larger question of its impact on *sustainable development* on a global scale. To enable such action, there needs to be an entity in place which has sufficient authority and oversight to guide policies and programs across all governmental sectors. The seed for such an entity has been identified in the DOT's Center for Global Climate Change for Environmental Forecasting, and this is discussed in more detail later.

The U.S. DOT's Strategic Plan for 2000 to 2005 is likely to have a significant influence on how TEA-21 is developed prior to its reauthorization in 2003, and the comparison of its strategic goals with the definition of sustainable transportation identified a good correlation. As discussed above, the U.S. DOT does not have the statutory authority to

comprehensively manage the use of the system; hence there is no strategic goal with this aim. In addition, the strategic goals do not look beyond the 2005 time horizon, which means that there is no consideration of intergenerational equity. Whilst these two aspects are of considerable importance, the strong parallels between the U.S. DOT's strategic goals and the sustainable transportation definition is encouraging since it means the reauthorization of TEA-21 is likely to follow a sustainable agenda, even without external pressure from environmental groups (which will certainly occur). It is recommended that the next strategic plan should include specific goals of how generational *and* intergenerational equity will be achieved, and should recognize that how we *use* the transportation sector will play a major role in whether worldwide sustainable development is achieved.

The comparison also highlights the fact that the definition of sustainable transportation lacks any explicit mention of security – the fifth goal of the U.S. DOT Strategic Plan. A decision was made to not expand the definition, since if all the objectives of sustainable transportation are achieved, it can be implied that the system is secure.

As well as comparing the strategic goals with the definition of sustainable transportation, the Strategic Plan was assessed to identify any instruments or initiatives seen as being key drivers behind a move towards sustainability. Two items were identified.

The first refers to the implementation of the 16 Livable Communities programs, developed under the Livable Community Initiative (LCI), which resulted in successful cases of community involvement in the planning process, leveraging of resources for transit improvements, planning for travel outside of the project area, and institutionalization of the LCI concepts. The institutionalization of the LCI concepts can be identified in both the Strategic Plan and TEA-21. The most prominent example of their inclusion in the Strategic Plan can be seen in the 'Infrastructure and Investment Strategies' section (Box 11). These policies represent a significant step forward, since they are applicable to all types of infrastructure enhancement. Under TEA-21, the LCI concepts were used to create the Transportation and Community and System Preservation (TCSP) program, designed to identify, and experiment with, sustainable transportation initiatives. It is recommended that the LCI concepts and the principles of sustainable transportation (Section 3.2) be applied to other U.S. DOT initiatives, to harmonize Federal guidance throughout all the Department's activities.

The second instrument, suggested by the author as having significant potential to take a lead role in developing policies for sustainable transportation, is the U.S. DOT's Center for Climate Change and Environmental Forecasting (CCCEF). The review of the TEA-21 programs (Section 4.3) identifies how the CMAQ program has valuable ancillary benefits of reducing greenhouse gases and energy consumption, which tie in well with the objectives of the CCCEF. Yet there is no direct provision in TEA-21 to address climate change issues. Aligning the TEA-21-CAAA legislative framework with climate change through direct legislating and/or instruments such as the CMAQ program, presents a good opportunity to establish an entity that can begin to challenge the way we think about transportation planning.

The CCCEF's broad-based approach to sustainability as related to transportation, is its strength. The CCCEF not only has the potential to function as a ONE-DOT virtual unit to unite the nine administrations of the U.S. DOT (Figure 6), it could also bring together many agencies in the decision-making process. Since an appropriate organizational structure already exists, it is recommended that the CCCEF be used to champion the concept of sustainable transportation *and* sustainable development in coordination with similar entities/organizations in other governmental departments.

A more specific look at TEA-21's discretionary and non-discretionary programs, concluded that the core objective of TEA-21 is to preserve the surface transportation infrastructure, with the goals of ensuring safety, providing mobility, supporting the economy, and protecting the environment, firmly entrenched in its policies and guidelines. Section 4.3 provides a discussion of the major programs within the Act and identifies its strengths and weaknesses with regard to achieving the final goal of a sustainable transportation sector. The results show an encouraging move towards sustainable practices, although there are areas where improvements are still to be made.

Two sections of Part B (5 & 6) were devoted to the role of the State DOT and the Metropolitan and Rural Planning Organizations (MPOs and RPOs) in transportation planning and programming. The reason for this is that a major principle of TEA-21 is to encourage flexibility for state and local agencies to determine their own transportation investments and strategies. Discussions with three State DOTs highlighted several areas of concern regarding how the transportation planning process functions in practice. Firstly, it is apparent that there is significant state diversity in the relationships between the State DOTs and the MPOs. Those State DOTs contacted in this research have all developed a highly cooperative working and decision-making relationship with the MPOs; however their representatives stated that this was not necessarily common practice in other states. Further research is needed to identify the full extent of this problem. Ensuring equitable cooperation between State DOTs and MPOs will be a significant step towards a more *integrated decision-making* environment.

Secondly, the requirement for the State DOTs to consult with non-metropolitan areas presents another concern where the diversity of consultation methods in the states makes it difficult to identify whether the non-metropolitan areas take an active role in the planning process.

Thirdly, and possibly most importantly, there is no formal guidance or legislation regarding the *integration* of land use and transportation planning. This is seen to be a prerequisite if the U.S. is to move towards a more sustainable transportation system. The use of land will play an important role in ensuring that the objectives of sustainable development are met. It should also be acknowledged that transportation and land use planning decisions are almost always a local option, and any action taken at the federal level should recognize this fact.

In summary, by ensuring that the State DOT, the MPOs, RPOs, authorities and local officials are all *formally* part of the planning process and that they *effectively consult* the public when making decisions that will ultimately affect them, this will provide a comprehensive forum for discussions towards sustainable land use practices. Reform will come only when community outcomes drive the process. Highlighting the importance of *public education and participation* (Box 5: *Institutional Principles*). Boxes 13 and 14 (Section 6), present a series of recommendations that if followed will dramatically enhance the role of the MPO and RPO respectively, in the transportation planning process. Therefore, it is recommended that they be implemented for the reauthorization of TEA-21 in 2003.

By turning our attention to the transportation planning framework in the UK, it is possible to compare the U.S. and UK transportation planning processes and gain some valuable insights into other instruments aimed at achieving a sustainable transportation sector at a national level. Three items of specific interest are highlighted in Section 6.3. The first relates to the UK Government's decision to enhance local authorities' planning capabilities by providing a 5-year financial commitment to fund their local transportation plans. Funding approval is based upon the consistency between the local and regional transportation plans, which means that national objectives are met and local authorities obtain greater control in the allocation of capital resources. It is believed that this process is comparable to the U.S. transportation planning process, which requires the creation of both short- and long-range, financially viable, transportation plans through the active cooperation of State DOTs, MPOs and RPOs.

The second item which has caused much debate in the UK is the proposed introduction of congestion charging measures in the large cities. The Transport Act 2000, enables local authorities to establish such measures, provided that revenue obtained from the scheme is channeled *directly* back into transportation projects. This provides the public with confidence that they will receive the benefits from the extra transportation costs. A recent survey in England, for the Commission for Integrated Transport (CfIT), highlighted the public's general acceptance of congestion pricing mechanisms, but only in the context of real improvements in public transportation. This acceptance is partly due to the severe congestion problems that are commonplace on the transportation network during peak times. It is recommended that similar initiatives are begun in highly congested cities within U.S..

The third, and possibly most significant, component of the UK's transportation planning process are bodies such as CfIT and the Commission for Sustainable Development (CSD), which have been created to provide the government with advice on transportation issues. The relative independence and diversity of membership on these bodies means that they are able to provide ministers with unbiased advice on whether their sustainable agenda is being met and whether the current strategy is taking them in the correct direction. Whilst the CCCEF is believed to present an attractive mechanism through which sustainable transportation concerns can be addressed, it is not independent from political pressures. A

possible solution might be for the Volpe Center⁴⁰ to establish a Sustainable Commission, which draws together experts from a wide variety of fields to act as an independent advisor to the CCCEF. This would enable the CCCEF to use the Commission's independent advice as a leverage mechanism to support unpopular, but vital, proposals for change.

Finally, a topic that received modest consideration in this research is the role that technological innovation will play in achieving a state of sustainability. It is believed that an effective national innovation environment has the potential to develop technological capacity, which will feed economic growth and, with appropriate anthropocentric considerations, increase the level of employment. In general, progress towards worldwide sustainability lies in creating technologies that radically reduce harm to the environment, ensure a high level of occupational health and safety, and provide employment through both the manufacture and use of new products. Therefore, in addition to nurturing a technological innovation environment, the U.S DOT must also ensure that social and organizational innovation can occur, by allocating funding under TEA-21 and other U.S. DOT Acts to establish a new paradigm for the development of technology. This new paradigm must put sustainability, employment and human welfare at the forefront of industrial and economic growth. The key to this paradigm lies in whether the U.S. DOT has the *willingness*, *opportunity* and *capacity* to take a lead role and manage such a dramatic change in current innovation practices.

To conclude, this research has identified numerous areas where the U.S. DOT can take decisive action to move the transportation sector towards a more sustainable agenda. Although the research has shown that the current vision of the U.S. DOT closely follows the concepts of sustainable transportation, there are still fundamental problems to solve, such as the current use of non-renewable energy sources to fuel the transportation sector, to which solutions are not readily forthcoming. This paper calls on the U.S. DOT to establish instruments for decision-making that reach beyond the confines of the Department. Only by establishing real dialogs between other governmental Departments will the U.S. truly begin to address the issue of sustainable development, of which sustainable transportation is a major part.

7.3 SUMMARY OF MAJOR RECOMMENDATIONS

The following bullet points provide a summary of the major recommendations discussed in the conclusions.

⁴⁰ The Volpe Center is part of the U.S. Department of Transportation's Research and Special Programs Administration. The Volpe Center does not receive a direct appropriation from Congress. Instead, it is funded through a fee-for-service structure in which all of their costs are covered by sponsored project work. The Volpe Center is authorized to "*perform research, development, test, evaluation, analysis, and other related activities as the Secretary may direct for the Department and other Government agencies and, when approved by the Secretary or his designee, for State and local governments, other public authorities, private sources and foreign countries.*" <http://www.volpe.dot.gov/about/mission.html> (02/05/02).

At a National level:

- Future research should be undertaken to determine a) the total carrying capacity of the earth within which each sector (across all nations and continents) must operate in order to achieve sustainability, and b) the relative proportion that each sector can use of the available resources and sinks.

U.S. DOT:

- The U.S. DOT must address the three key issues of *energy use*, *local air quality* and *greenhouse gases* simultaneously, to ensure that the transportation sector begins to operate within the carrying capacity of the local and global environment.
- The Center for Climate Change and Environmental Forecasting should be used to champion the concept of sustainable transportation *and* sustainable development in coordination with similar entities/organizations in other governmental departments.
- The next U.S. DOT Strategic Plan should include specific goals for achieving generational *and* intergenerational equity, and should recognize that how we *use* the transportation sector will play a major role in whether worldwide sustainable development is achieved.
- Funding should be made available under TEA-21 and other U.S. DOT acts, to support research projects which focus on the development of *anthropocentric* based technology – i.e. technology which stems from combined research in social, organizational and technological innovation.
- The conceptual framework developed in Section 2.2.2, should be used to facilitate clear and concise discussions on the topic of sustainable transportation.
- The results from the Sustainable Transportation Policy Review (Section 3.2), should be introduced to all administrations within the U.S. DOT with the objectives of raising the awareness of sustainable transportation in all employees within the Department, and of harmonizing Federal guidance and legislation on how to achieve a sustainable transportation sector.
- The reauthorization of TEA-21 should ensure that State DOTs, MPOs, RPOs, local authorities and officials are all *formally* part of the transportation planning process and that together they *effectively consult* the public when making decisions that will ultimately affect them. In particular, Boxes 13 and 14 (Section 6), present a series of recommendations that if followed will dramatically enhance the role of the MPO and RPO respectively, in the transportation planning process.

The Volpe Center:

- The Volpe Center should establish a Sustainability Commission, which draws together experts from a wide variety of fields to act as an independent advisor to the Center for Climate Change and Environmental Forecasting. This will enable the Center to use the Commission's independent advice as a leverage mechanism to support unpopular, but vital, proposals for change.

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APPENDIX A1: SUSTAINABLE TRANSPORTATION DEFINITIONS

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Key to Main Tables

REF	I.D.	Title of Report / Study
1	Ontario, RT, 1995	Ontario Round Table on the Environment and the Economy in co-sponsorship with the National Round Table (November, 1995). <i>A Strategy for Sustainable Transportation in Ontario</i> .
2	World Bank, 1996	World Bank (1996), <i>Sustainable Transport: Priorities for Policy Reform</i> . http://www.worldbank.org/transport/polecon/tsr.htm (11/13/01).
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21	VTPI, 2001	Victoria Transport Policy Institute, online TDM Encyclopedia (15/10/01) Sustainable Transportation and TDM, <i>Sustainable Transportation and TDM Planning That Balances Economic, Social and Ecological Objectives</i> . http://www.vtpi.org/tdm/tdm67.htm (11/13/01).
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Sustainable Transportation: DEFINITIONS

Combined Categories	Environment	Economy	Social Equity	Government
Economy, Environment, and Social Well-being; Environment and Social Well-being; Economy and Social Well-being	Environmental Standards; Health & Environmental Quality; Ecological Limits; Global Phenomena	Financial Affordability; Ecological Economics; Sustainable Economics	Access & Safety; Equity	Decision-making

Combined Categories

- General
- Economy, Environment, and Social Well-being
- Environment and Social Well-being
- Economy and Social Well-being

General	BACKGROUND - Transport is central to development - without physical access to jobs, health, education and other amenities, quality of life suffers; without physical access to resources and markets, growth stagnates and poverty reduction cannot be sustained. However, inappropriately designed transport strategies and programs can result in networks and services that aggravate the conditions of the poor, harm the environment, ignore the changing needs of users and exceed the capacity of public finances.	World Bank, 1996
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	<p>The most frequently cited definition of sustainability was adopted by the World Commission on Environment and Development (the Brundtland Commission): "A sustainable condition for this planet is one in which there is stability for both social and physical systems, achieved through meeting the needs of the present without compromising the ability of future generations to meet their own needs." The Brundtland Commission definition was selected for this Initiative because it acknowledges that sustainability has social and community as well as physical dimensions, and is the most broadly accepted definition of "sustainability." This Agenda shares this comprehensive approach to sustainability, which is consistent with recent major research and the broad concerns and responsibilities of the participating agencies.</p>	<p>Volpe, 1999</p>
	<p>Sustainability... 'treating the world as if we intended to stay'. Gray, 1996.</p>	<p>TC, 2001</p>
	<p>There is no universally accepted definition of sustainability, sustainable development or sustainable transport (Beatley, 1995).</p>	<p>VTPI, 2001</p>
<p>Economy, Environment, and Social Well-being</p>	<p>To be effective transport policy must satisfy three main requirements. First, it must ensure that a continuing capability exists to support an improved standard of living. This corresponds to the concept of economic and financial sustainability. Second, it must generate the greatest possible improvement in the general quality of life, and not merely an increase in traded goods. This relates to the concept of environmental and ecological sustainability. Third, the benefits that transport produces must be equitably shared by all sections of the community. This we term social sustainability.</p>	<p>World Bank, 1996</p>
	<p>Sustainable development should satisfy economic, environmental and social needs in the present and future, and maintain the economic and environmental means to do so.</p>	<p>UK, RT, 1996</p>
	<p>Transportation systems interact with other built, social, and natural systems to produce broad effects on sustainability. Goals for transportation include safety, mobility, economic growth and trade, enhancement of communities and the natural environment, and national security. Transportation systems produce environmental, economic, and social equity effects, characterized as the "Three E's." Transportation systems can be considered "sustainable" to the extent that they contribute, in the short and long term, to national goals such as: reduced greenhouse gas emissions; healthy ecosystems; enhanced biodiversity; reduced air and water pollution; reduced dependence on finite fossil fuel supplies; and affordable access to economic and social opportunity.</p>	<p>Volpe, 1999</p>
	<p>"Sustainable mobility" is a term that can mean different things to different people. The World Business Council for Sustainable Development defines "sustainable mobility" as "the ability to meet the needs of society to move freely, gain access, communicate, trade, and establish relationships without sacrificing other essential human or ecological values today or in the future."</p>	<p>WBCSD, 2001</p>
	<p>For mobility to be sustainable, it must improve accessibility while avoiding disruptions in societal, environmental, and economic well-being that more than offset the benefits of the accessibility improvements. This means that any assessment of mobility's sustainability must include not only a judgment as to its effectiveness in improving accessibility but also a judgment as to the magnitude and consequence of any associated disruptions in social, environmental, or economic well-being.</p>	<p>WBCSD, 2001</p>
	<p>Sustainable transportation can be described as:</p> <ul style="list-style-type: none"> ▪ Moving people in cleaner and greener ways ▪ Moving goods in cleaner and greener ways; and, where appropriate ▪ Moving less. <p>Sustainable transportation encompasses:</p> <ul style="list-style-type: none"> ▪ Telecommunications to reduce or replace travel, or to make it more efficient. ▪ Cleaner and more efficient systems for moving (or moving less) goods. ▪ Land use planning and green development to bring people and their needs closer together. ▪ Sustainable personal transportation modes like transit, walking, cycling. ▪ New approaches to car travel including car sharing, car pooling, cleaner cars and fuels. ▪ New businesses and products for tomorrow's transportation needs. 	<p>MTE, 2001</p>

Environment and Social Well-being	Interest in sustainability originally reflected concerns about long-term risks of current resource consumption, reflecting the goals of “intergenerational equity” (i.e., being fair to future generations). But if future equity and environmental quality are concerns, it makes little sense to ignore equity and environmental impacts that occur during this generation in distant places. Thus, sustainability ultimately reflects the goals of equity, ecological integrity and human welfare, regardless of time or location.	VTPI, 1999
	Transportation 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.	OECD, 2000
	Our definition of sustainability follows Chichilnisky (1996) and Heal (1998), see Minken (1999). According to them, one of the two defining characteristics of sustainability as an objective is that it includes both the welfare of the present society and the society of the very distant future. The second defining characteristic of sustainability is that it implies conservation of natural resources. Put in other words: natural resources should be valued not only as something that may be consumed (in production or consumption), but also as stocks that benefit us even when not being consumed. The fundamental reason for this is that we are dependent on some basic qualities of our surrounding ecosystems for our quality of life and indeed to continue to exist. (See for example the Stadtentwicklungsplan 1994 of Vienna, pages 60-64). If our strategies now had negligible long run effects, sustainability would not be an issue. The concern about sustainability arises precisely because our actions now may constrain the opportunities of future generations and diminish their maximum attainable welfare. The aspects of our actions that are most likely to do so, are energy consumption, CO2-emissions, emissions of other pollutants with long term or irreversible effects, and the running down of non-renewable resources like various kinds of green areas and cultural sites inherited from the past. Some forms of long term investments are also highly relevant.	Prospects, 2001a
	Interest in sustainability originally reflected concerns about long-term risks of current resource consumption, and therefore “intergenerational equity” (i.e., being fair to future generations). But if future equity and environmental quality are concerns, it makes little sense to ignore equity and environmental impacts that occur during this generation. Thus, sustainability ultimately reflects the goals of equity, ecological integrity and human welfare, regardless of time or location.	VTPI, 2001
Economy and Social Well-being	Transportation of people and goods is among the means used by humans to influence societal and economic factors and to meet their needs and goals.	CST, 97
	Providing society with safe, economically viable and socially acceptable access to people, places, goods and services is a prerequisite for continued economic prosperity and sustainable development in OECD economies.	OECD, 2001b

Environment

- General
- Environmental Standards
- Health & Environmental Quality
- Ecological Limits
- Global Phenomena

General	Sustainable development should minimise activities that cause serious environmental damage, ensure that renewable resources are managed and used in ways which do not diminish the capacity of ecological systems to continue providing those resources, and ensure that non-renewables are managed and used in ways which account for future needs and the availability of alternative resources.	UK, RT, 1996
	A sustainable urban transportation system limits emissions and waste within the area's ability to absorb, is powered by renewable energy sources, recycles its components, and minimizes the use of land.	TAC, 96
	Environment refers to the surroundings of humans and other life forms that support them and limit their activity according to basic physical laws. Environmental factors affect present well-being and determine most of the legacy we leave our descendants.	CST, 97
	A sustainable urban transport and land-use system protects the environment, cultural heritage and ecosystems for the present generation	Prospects, 2001a
	Pollution prevention, Climate protection, Biodiversity, Precautionary action, Avoidance of irreversibility, Habitat preservation, Aesthetics	VTPI, 2001
Environmental Standards	Sustainable development should maintain high environmental quality standards throughout urban and rural areas.	UK, RT, 1996
Health & Environmental Quality	Public health and the environmental quality should be preserved. A sustainable transportation system ... is one that meets generally accepted objectives for health and environmental quality, e.g., those set forward by the World Health Organization for air pollutants and noise.	OECD, 2000
Ecological Limits	A sustainable transportation system is one that limits emissions and waste within the planet's ability to absorb them, minimizes consumption of non-renewable resources, reuses and recycles its components, and minimizes the use of land and the production of noise.	CST, 97
	Critical limit values for health and ecosystems should be respected. A sustainable transportation system is one that protects ecosystems by avoiding [excesses] of critical loads and levels for ecosystem integrity, e.g., those defined by the UNECE for acidification, eutrophication, and ground-level ozone.	OECD, 2000
Global Phenomena	Global irreversible effects should be avoided. A sustainable transportation system ... is one that does not aggravate adverse global phenomena, including climate change, stratospheric ozone depletion, and the spread of persistent organic pollutants.	OECD, 2000

Economy

- Financial Affordability
- Ecological Economics
- Sustainable Economics

General	Economy describes available resources and how the resources are organized to meet human needs and goals. Economic factors mostly comprise means of influencing environmental and societal factors.	CST, 97
	Sustainable Development can be interpreted in economic terms as 'development that lasts' (Pearce and Barbier, World Bank, 1996000) – i.e. a path along which the maximization of human well-being for today's generation does not lead to decline in future well-being.	OECD, 2001a
	Affordability, Cost-effectiveness, Cost internalization, Trade and business activity, Employment, Productivity, Tax burden	VTPI, 2001
	The sustainable transportation sector is an advancing industry cluster that includes all businesses, products, employment and economic ventures related to sustainable transportation.	MTE, 2001

Financial Affordability	A sustainable urban transportation system is financially affordable, operates at maximum efficiency, and supports a vibrant economy.	TAC, 96
	A sustainable transportation system is one that is affordable, operates efficiently, offers choice of transport mode, and supports a vibrant economy.	CST, 97
	Economic: mobility of persons and of goods necessary to achieve a prosperous economic development has to be provided, without overdrawing the financial possibilities of the public and private budgets.	Baltic 21, 1998
Ecological Economics	Ecological economics (a discipline concerned with valuing ecological resources) defines sustainability in terms of natural capital, the value of natural systems to provide goods and services, including clean air and water, and climatic stability. Preserving these services is equivalent to a business maintaining the value of its productive assets. Ecological economists argue that consumption should not deplete natural capital at a faster rate than it can be replaced by viable and durable human capital. This suggests, for example, that non-renewable resources such as petroleum should not be depleted without sufficient development of substitutes, such as renewable energy sources. Ecological economics attempts to account for non-market costs of economic activities which tend to be ignored in traditional economics or even considered positive economic events by indicators such as gross domestic product. This requires determining the economic value of non-market goods and services, such as the benefits that a wetland provides in terms of improving water quality and supporting fishing industries.	VTPI, 1999
Sustainable Economics	Sustainable economics maintains a distinction between growth (increased quantity) and development (increased quality). It focuses on social welfare outcomes rather than simply measuring material wealth, and questions common economic indicators such as Gross Domestic Product, which measure the quantity but not the quality of market activities. Unlike neoclassic economics, sustainable economics does not strive for ever increasing consumption, but rather for sufficiency.	VTPI, 1999
	Sustainable economics maintains a distinction between growth (increased quantity) and development (increased quality). Economic growth focuses primarily on market activities, while economic development also considers non-market social and ecological activities (Daly 1996). It focuses on social welfare outcomes, such as education and health, rather than relying on material wealth as an indicator of development. Unlike neoclassic economics, sustainable economics does not strive forever increasing consumption, but rather for sufficiency. As a result, it questions common economic indicators such as Gross Domestic Product (GDP), which measure the quantity but not the quality of market activities. For example, GDP counts medical costs and environmental cleanup as positive economic activity, but assign[s] no positive value to actions that prevent illness or environmental degradation. Economic development indicators attempt to take into account qualitative and non-market values (Cobb, Halstead and Rowe, 1998).	VTPI, 2001

Social Equity

- Access & Safety
- Equity

General	Society is a complex of human interactions and how they are organized. Humans have evolved to be mostly dependent in their societies. Thus the sustainability of societies is a necessary condition for meeting human needs. Societal factors are important for sustainability because they determine the present quality of life and because they can be a major component of the legacy to future generations.	CST, 97
	The concept of development has ... evolved to encompass trade-offs among the different objectives of sustainable development. This implies that sustainable development is a dynamic concept with a temporal aspect and a scale perspective. In itself sustainability has a long-term objective (because it primarily focuses on the needs of future generations), but this does not mean that there are no short-term implications. The same applies to the geographical scale. Sustainable development is primarily aimed at achieving a sustainable society on a global scale, but this does not mean that no action is needed on the local or regional scale.	Geerlings, 1999

Cont...	A sustainable urban transport and land use system provides access to goods and services in an efficient way for all inhabitants of the urban area, and does not endanger the opportunities of future generations to reach at least the same welfare level as those living now, including the welfare they derive from their natural environment and cultural heritage.	Prospects. 2001
	Equity, Human health, Education, Community, Quality of life, Public Participation	VTPI, 2001
Access & Safety	A sustainable urban transportation system provides equitable access for people and their goods and helps achieve a healthy and desirable quality of life, in each generation.	TAC, 96
	A sustainable transportation system is one that allows the basic access needs of individuals and societies to be met safely and in a manner consistent with human and ecosystem health, and with equity within and between generations.	CST, 97
	A sustainable transportation system is one that provides for safe, economically viable, and socially acceptable access to people, places, goods and services.	OECD, 2000
Equity	Sustainable development should provide the opportunity for all people to satisfy their needs equitably, both within and between nations as well as within and between generations.	UK, RT, 1996

Government

- Decision-making

Decision-making	Concern about sustainability can be considered a reaction to the tendency in decision-making to focus on easily measured goals and impacts, while ignoring those that are more difficult to measure. Sustainable decision-making can therefore be described as planning that considers goal and impacts regardless of how difficult they are to measure.	VTPI, 2001
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APPENDIX A2: SUSTAINABLE TRANSPORTATION PRINCIPLES

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Sustainable Transportation: PRINCIPLES

Environment	Economy	Social Equity	Institutional	Technological Innovation
Precautionary; Preventative; Pollution Prevention / Reduction; Regeneration; Substitutability; Assimilation; Avoiding Irreversibility; Preservation/Conservation; Protection of Natural & Physical Capital; Management of Renewable & Non-Renewable Resources; Renewable Energy; Performance of Fuels; Stewardship; Recycling; Operating within Ecological Limits	Polluter Pays; Cost Internalization; Cost-effectiveness; Economic Well-being; Affordability; Sustainable Economic Activity	Accessibility; Provision of Choice; Equity; Social Well-being; Social Responsibility	Integration; Long-term Planning; Transparency & Accountability; Monitoring Progress; International Co-operation Reduction of Automobile Dependency; Increasing Efficiency; Protection of Health & Safety; Appropriate Use of Land & Resources; Participation & Education; Public Health & Safety	Robustness; Prioritisation; Flexibility; Coherency, Consistency & Integrity; Transparency; Reliability and Trust

Environment

- Precautionary
- Preventative
- Pollution Prevention / Reduction
- Regeneration
- Substitutability
- Assimilation
- Avoiding Irreversibility
- Preservation / Conservation
- Protection of Natural & Physical Capital
- Management of Renewable & Non-Renewable Resources
- Renewable Energy
- Performance of Fuels
- Stewardship
- Recycling

- Operating within Ecological Limits

Precautionary	The Precautionary Principle recognises that where there are threats of serious or irreversible damage to the environment, the lack of full scientific certainty should not be used as a reason to delay taking cost-effective action to prevent or minimise such damage.	UK, RT, 1996
	Where there are threats of serious or irreversible damage to the environment, the department will not use a lack of full scientific certainty as a reason for postponing cost-effective measures to prevent environmental degradation.	TC, 2001
	Threats of exceeding critical thresholds in the regenerative capacity of the environment are subject to uncertainty. Accordingly, when designing policies for sustainable development, countries should apply precaution as appropriate in situations where there is lack of scientific certainty.	OECD, 2001a
	Sustainability supports the Precautionary Principle, which emphasizes the importance of incorporating risks in decision making and favoring policies that minimize such risks when possible.	VTPI, 2001
Preventative	The Preventative Principle recognises that it is better for society to avoid incurring the costs that result from development activities which seriously damage natural or physical capital.	UK, RT, 1996
Pollution Prevention / Reduction	Principle #8: Pollution Prevention. Transportation needs must be met without generating emissions that threaten public health, global climate, biological diversity or the integrity of essential ecological processes.	OECD, 1996
	Transportation needs must be met without generating emissions that threaten public health, global climate, biological diversity or the integrity of essential ecological processes.	Canadian RT, 1996
	Transport Canada will work to ensure that transportation needs are met in a way that avoids or minimizes the creation of pollutants and waste, and that reduces the overall risk to human health and the environment.	TC, 2001
Regeneration	With respect to the environment, transportation systems should produce no more emissions and waste than can be accommodated by the planet's restorative ability.	CST, 97
	Regeneration – i.e. renewable resources should be used efficiently and their use should not be permitted to exceed their long term rates of natural regeneration.	OECD, 2001a
	Regeneration: Renewable resources shall be used efficiently and their use shall not be permitted to exceed their long-term rates of natural regeneration.	OECD, 2001b
Substitutability	Environmental: The rate of use of non-renewable resources should not exceed the rate at which renewable substitutes are developed....	Baltic 21, 1998
	Substitutability – i.e. non renewable resources should be used efficiently, and their use limited to levels that can be offset by renewable resources or other forms of capital.	OECD, 2001a
	Substitutability: Non-renewable resources shall be used efficiently and their use limited to levels which can be offset by substitution by renewable resources or other forms of capital.	OECD, 2001b
Assimilation	Environmental: The rate of pollution emission should not exceed the assimilative capacity of the environment (see Daly 1990 and Kageson 1994).	Baltic 21, 1998
	Assimilation – i.e. releases of hazardous or polluting substances to the environment should not exceed its assimilative capacity, and concentrations should be kept below established critical levels necessary for the protection of human health and the environment. When assimilative capacity is effectively zero, zero release of such substances is required to avoid their accumulation in the environment.	OECD, 2001a
Avoiding Irreversibility	Avoiding Irreversibility: Irreversible adverse effects of human activities on ecosystems and on biogeochemical and hydrological cycles shall be avoided. The natural processes capable of maintaining or restoring the integrity of ecosystems should be safeguarded from adverse impacts of human activities. The differing levels of resilience and carrying capacity of ecosystems must be considered in order to conserve their populations of threatened, endangered and critical species.	OECD, 2001b

Preservation / Conservation	Transportation systems must make efficient use of land and other natural resources while ensuring the preservation of vital habitats and other requirements for maintaining biodiversity.	Canadian RT, 1996
	With respect to the environment, transportation systems should make use of land in a way that has little or no impact on the integrity of ecosystems.	CST, 97
	Biodiversity should be protected.	Baltic 21, 1998
	Sustainability tends to reflect a conservation ethic which minimizes resource consumption and waste. This requires changing current economic policies that encourage production and consumption. For example, many countries minimize energy prices in order to keep utilities and driving affordable, and to encourage manufacturing. That reflects a consumption ethic. A conservation ethic might increase energy prices (perhaps through a carbon tax) while implementing programs to weatherize buildings, increase vehicle fuel efficiency, improve alternative modes, and increase industrial efficiency so manufactures and consumers can meet their needs with less resource consumption.	VTPI, 1999
	Protection and Conservation: The department will apply sound environmental protection and conservation practices. It will support transportation systems that make efficient use of land and natural resources, preserve vital habitats and maintain biodiversity.	TC, 2001
	Conservation Ethic. Sustainability favors solutions that increase efficiency and reduce resource consumption.	VTPI, 2001
Protection of Natural & Physical Capital	Sustainable development should ensure that unique environmental resources, goods and services and irreplaceable cultural or historic features – i.e. critical natural and physical capital – are passed on to future generations intact.	UK, RT, 1996
Management of Renewable & Non-Renewable Resources	To ensure that renewable resources are managed and used in ways which do not diminish the capacity of ecological systems to continue providing those resources over time.	UK, RT, 1996
	To ensure that non-renewable natural resources are managed and used in ways which account for future needs and the availability of alternative resources.	UK, RT, 1996
	Non-renewable and renewable resources should be used sustainably.	OECD, 2000
Renewable Energy	With respect to the environment, transportation systems should use energy sources that are essentially renewable or inexhaustible.	CST, 97
Performance of Fuels	Energy Use. Improve quality of fuels to reduce their impacts on health and the environment. Reduce fossil fuel consumption and other transportation energy uses through improving efficiencies and demand management. Promote the use of alternative fuels and renewable energy.	OECD, 1996
Stewardship	Environmental Stewardship: The department will continually refine its environmental management system so that its internal operations support sustainable development. As both custodian and landlord, it will consider the potential environmental impacts of new initiatives, and will apply risk management and due diligence practices consistently to its real property assets.	TC, 2001
Recycling	With respect to the environment, transportation systems should use other resources that are renewable or inexhaustible, achieved in part through the reuse of items and the recycling of materials used in vehicles and infrastructure.	CST, 97
Operating within Ecological Limits	Sustainable development should operate within critical ecological limits.	UK, RT, 1996

Economy

- Polluter Pays
- Cost Internalization
- Cost-effectiveness
- Economic Well-being
- Affordability
- Sustainable Economic Activity

Polluter Pays Principle	The Polluter Pays Principle recognises that the costs of preventing or cleaning up pollution and waste should be borne by those responsible for causing the pollution and waste, and not by society at large.	UK, RT, 1996
	Apply the polluter-pays principle by internalising external costs so that each transport mode bears its current and future social and environmental costs.	Baltic 21, 1998
Cost Internalization	Implement fuller cost pricing for transportation modes to discourage the overuse of single occupant vehicles and encourage the use of more fuel-efficient technologies and transportation modes.	Ontario, RT, 1995
	Transportation decision makers must move as expeditiously as possible toward fuller cost accounting, reflecting the true social, economic and environmental costs, in order to ensure users pay an equitable share of costs.	Canadian RT, 1996
	Transport represents an imperfect market in which the costs borne by users of transport services and infrastructure neither reflect fully social, economic and, in particular, ecological costs of transport nor distribute these cost among users in an equitable way. This results in individual travel behavior and location decisions which increase the demand for transport above real needs and lead to an inefficient use of limited natural resources and to inevitable adverse ecological impacts. Therefore, there is a need to manage the demand for transport by applying policies which will create conditions for the users of transport such that their behaviors becomes compatible with principles of sustainability. ... [F]iscal policies and other economic measures should enhance efficiency in transport, discourage excessive use of cars and make car-users pay the economic and environmental costs of their travel.	UNCHS, 2000
	Cost Internalization: The department recognizes the merit of "full cost pricing," whereby the costs of transportation reflect, to the extent possible, their full economic, social and environmental impacts. The department will assess barriers to sustainable transportation practices to better understand the full impact of its decisions.	TC, 2001
	Pricing. For markets to support sustainable outcomes, prices should reflect the full costs and benefits to societies of the goods and services being produced. This may require the elimination of incentives to over-use natural resources and to degrade the environment, or the introduction of new incentives to improve the environment.	OECD, 2001a
	Market Principles. Market Principles include consumer choice, full-cost pricing and economic neutrality can support sustainable outcomes. This requires Market Reforms that eliminate incentives to over-use of natural resources and to degrade the environment.	VTPI, 2001
Cost-effectiveness	With respect to the economy, transportation systems should provide cost-effective service and capacity.	CST, 97
	Cost-effectiveness. Policies should aim at minimising their economic cost. This will require ensuring that the costs of each extra resource spent are equal across the range of possible interventions. Cost-effectiveness allows the minimisation of aggregate costs and the setting of more ambitious targets in the future.	OECD, 2001a
Economic Well-being	Principle #9: Economic Well-Being. Taxation and economic policies should work for, and not against, sustainable transportation, which should be seen as contributing to improvements in economic and community well-being. Market mechanisms should support fuller cost accounting, reflecting the true social, economic and environmental costs, both present and future, in order to ensure users pay an equitable share of costs.	OECD, 1996

Affordability	With respect to the economy, transportation systems should be financially affordable in each generation.	CST, 97
	Affordability: Transportation systems should be affordable. The department will promote sustained strategic investment in transportation through new partnerships, innovative financing and a clear identification of priorities. In seeking cost-effective solutions, it will promote options that include demand management and that foster an appropriate mix of modal alternatives.	TC, 2001
Sustainable Economic Activity	With respect to the economy, transportation systems should support vibrant, sustainable economic activity.	CST, 97

Social Equity

- Accessibility
- Provision of Choice
- Equity
- Social Well-being
- Social Responsibility

Accessibility	Principle #1: Access. People are entitled to reasonable access to other people, places, goods and services, as well as responsible information that empowers them towards sustainable transportation.	OECD, 1996
	People are entitled to reasonable access to other people, places, goods and services.	Canadian RT, 1996
	Social: Access to all activities necessary to participate in social life has to be guaranteed as far as possible.	Baltic 21, 1998
	Unlimited mobility and unrestrained choice of mode of travel cannot be ensured in any but the smallest settlements. Therefore, transport networks should be developed for the benefit of all sections of the community in such a way that indispensable access to employment opportunities, housing opportunities and services is ensured for all, while freedom of choice in route and mode of travel can be restrained for the sake of sustainability. Freedom of car traffic should be restrained, in particular, in the centers of large cities, in recreation zones and in other environmentally sensitive areas.	UNCHS, 2000
	Access and Choice: Transportation systems should provide people with reasonable access to other people, places, goods and services. The department will promote a more diverse transportation system, including access to innovative alternatives (i.e. information technologies).	TC, 2001
Provision of Choice	With respect to society, transportation systems should allow and support development at a human scale, and provide for a reasonable choice of transport modes, types of housing and community, and living styles.	CST, 97
Equity	Principle #2: Equity. Nation states and the transportation community must strive to ensure social, inter-regional and inter-generational equity, meeting the basic transportation-related needs of all people including women, the poor, the rural, and the disabled. Developed economies must work in partnership with developing economies in fostering practices of sustainable transportation.	OECD, 1996
	Nation states and the transportation community must strive to ensure social, inter-regional and inter-generational equity, meeting the basic transportation related needs of all people including women, the poor, the rural, and the disabled.	Canadian RT, 1996

Cont...	Transportation Equity. Horizontal equity implies that externalities of transportation should be reduced except where they are specifically justified. This includes reducing pollution emissions and accident risk from motor vehicle use, or compensating those who bear such external costs. Horizontal equity also implies that users should “get what they pay for and pay for what they get,” which could involve more road and parking fees, more accurate insurance pricing, and other pricing reforms. Vertical equity implies that access options should improve for people who are economically, socially and physically disadvantaged. This can include improved transit, ridesharing, cycling and walking conditions, and discounted prices for disadvantaged people.	VTPI, 1999
	Transportation Equity. Equity is a fundamental goal of sustainable development. Sustainable development reflects a desire to consider the impacts that our current decisions could have on future generations, called intergenerational equity. Sustainable transportation therefore requires that broad equity analysis be incorporating explicitly in transportation planning (Evaluating TDM Equity).	VTPI, 2001
	Consideration of Equity. Sustainability emphasizes that equity should be considered in all decision-making, including indirect and long-term equity impacts.	VTPI, 2001
Social Well-being	With respect to society, transportation systems should meet basic human needs for health, comfort, and convenience in ways that do not stress the social fabric.	CST, 97
	Community Livability. Community livability includes local environmental quality, the quality of community interactions and community cohesion (whether community residents work together and support each other, sometimes referred to as “civil society”), and the ability of a community to satisfy the basic needs of residents (such as food, shelter, education and medical services). Livability is considered a sustainability goal itself, and community livability can support other sustainability objectives, such as reducing need to travel and increasing the use of public transit, ridesharing, cycling and walking. Community livability is sensitive to the quality of the public realm (public spaces where people can interact), of which the street system is a major component. This suggests that creating a more attractive, interactive, pedestrian-friendly streetscape, and other policies that encourage non-motorized transport, may be important for sustainable development.	VTPI, 1999
	Quality of Life: Transportation is a key ingredient in the quality of life of Canadians. The department recognizes that transportation policies have a direct effect on people and that it must consider the characteristics of different communities and regions across the country.	TC, 2001
Social Responsibility	Principle #3: Individual and Community Responsibility. All individuals and communities have a responsibility to act as stewards of the natural environment, undertaking to make sustainable choices with regard to personal movement and consumption.	OECD, 1996
	All individuals have a responsibility to act as stewards of the natural environment, undertaking to make sustainable choices with regard to personal movement and consumption.	Canadian RT, 1996

Institutional

- Integration
- Long-term Planning
- Transparency & Accountability
- Monitoring Progress
- International Co-operation
- Reduction of Automobile Dependency
- Increasing Efficiency
- Protection of Health & Safety
- Appropriate Use of Land & Resources

- Participation & Education
- Public Health & Safety

Integration	Principle #6: Integrated Planning. Transportation decision makers have a responsibility to pursue more integrated approaches to planning.	OECD, 1996
	Transportation decision makers have responsibility to pursue more integrated approach to planning.	Canadian RT, 1996
	The Integration Principle recognises that the environmental requirements must be integrated into the definition and implementation of all areas of policy-making.	UK, RT, 1996
	[P]lanning must be carried out at sub-national and local scales and linked to national policies to provide the most appropriate framework for devising such strategies. Only in this framework is it possible to reconcile requirements for transport and the standards against the adverse effects of transport-infrastructure installation and operation. Indeed, the demand for transport and the ways in which it can be met depend to a large extent on how human settlements are managed. ... When devising transport strategies compatible with the objectives of sustainable development within human settlements, it is necessary to consider three issues simultaneously: (a) The indispensable level of transport provision to meet required social-economic development objectives. This analysis should include clearly establishing exactly what kind of transport facilities and services should be provided to bring about this development within the desired limits of resource use. (b) Developing and managing the transport sector while not simultaneously undermining the sustainability of other sectors of the economy. (c) Organizing and planning for the human settlements system and patterns of individual settlement development to sustain transport and reduce its costs; its impacts on human health; and its demand for non-renewable resources.	UNCHS, 2000
	Leadership and Integration: Transport Canada recognizes sustainable development as among the highest of departmental priorities and accepts its responsibility to become a leader in sustainable transportation. The department will set priorities and responsibilities, allocate resources, and apply tools to integrate sustainable development into its policies, programs and operations.	TC, 2001
	Policy Integration. Unsustainable practices may result from incoherent policies in different domains. Sectoral policies, in particular, are often introduced without due regard for the externalities being targeted by environmental policies, leading to inconsistencies and spill-over effects. Improving policy coherence requires better integration of economic, environmental, and social goals in different policies.	OECD, 2001a
	Integrated Decision-Making. Sustainability emphasizes integrated rather than reductionist decision-making. For example, it requires coordination between transportation, land use and social planning.	VTPI, 2001
Long-term Planning	To be managed and developed in compliance with the principles of sustainable development, appropriate transport planning requires the adoption of long-range strategies which should be established on an inter-sectoral basis as the issues involved pertain not only to regional-development but also to land-use, industrial, energy and fiscal planning.	UNCHS, 2000
	Long-term Planning Horizons. In the absence of an adequate framework for assessing the impact of policies on different types of resources, measures targeted at short-term objectives may be selected even if they have negative long term impacts. While trade-offs between different goals may prevail in the short term, in the long term man-made, natural, human and social capital will complement each other in supporting welfare improvements.	OECD, 2001a
	Comprehensive and Long-Term Planning. Sustainability requires planning that considers all impacts, including those that are indirect and long-term. This requires adequate information and evaluation tools that allow stakeholders and decision-makers to understand the effects of their decisions.	VTPI, 2001
Transparency & Accountability	Transparency and Accountability. A participatory approach is important to successfully meeting the challenge of sustainable development, as the criteria for sustainability cannot be defined in purely technical terms. This requires that the process through which decisions are reached is informed by the full range of possible consequences, and is accountable to the public.	OECD, 2001a

Cont...	Accountability: The department will annually measure and report its progress in achieving its sustainable development objectives and targets. To this end, it will develop and refine sustainable transportation indicators.	TC, 2001
	Transparency, Accountability and Public Involvement. Sustainability requires a clearly defined, transparent planning process, adequate opportunities for stakeholder to become informed about issues and be involved in decision-making, and good communication between professionals and the general public.	VTPI, 2001
Monitoring Progress	Any program designed to improve transport must identify measures of improvement and establish a means for monitoring progress. This requires the development of a means of monitoring impacts on resource use, social conditions and human health more sensitively than is currently achieved by simple economic analyses of transport programs.	UNCHS, 2000
International Co-operation	[S]ubstantial international co-operation is needed in promoting environmentally-friendly transport technologies.	UNCHS, 2000
	International Co-operation. With deepening international interdependency, spillovers become more pervasive. A narrow focus on national self-interest is not viable when countries are confronted with a range of environmental and social threats that have global implications.	OECD, 2001a
	Delivery of Public Goods. Many of the benefits from government interventions needed to promote sustainable development have the characteristics of public goods (basic research, information, health and education). Also, many of these public goods are global, as they will benefit several countries (e.g. information on the state of global ecosystems). Effective delivery of these public goods requires overcoming obstacles to co-ordination, through burden-sharing rules that recognize the different responsibilities and response capacities of individual countries.	OECD, 2001a
Reduction of Automobile Dependency	Shift from automobiles to transit. Establish decision-making bodies in large urban areas to evaluate, plan and deliver integrated transportation and urban development, as well as integration of transit systems and services. Implement transit priority measures to make transit time-competitive with automobile travel. Maintain sufficient funding to ensure adequate transit capacity; increase the acceptability of using funds from user pay sources to improve public transit and enhance user pay sources to improve public transit and enhance transit service in areas with sufficient population densities. Implement pricing and supply policies to control parking and encourage transfer to transit.	Ontario, RT, 1995
	Automobile Dependency. Sustainable transport plans usually require reduced automobile dependency (defined as high levels of automobile use, automobile oriented land use, and a lack of travel alternatives). Automobile dependency imposes a number of economic, social and environmental costs. However, some people argue that the benefits provided by automobiles far exceed these costs, that problems can be solved through technical improvements, that alternatives (such as public transit) are more harmful, and that automobile dependency is inevitable and so opposition is futile. Some researchers suggest that various market distortions contribute to excessive automobile dependency and vehicle designs that are more polluting and dangerous than optimal. This suggests that reducing automobile dependency can achieve a more sustainable transport system, and that reducing market distortions can help achieve this objective.	VTPI, 1999
	Reducing the Overuse of the Private Automobile to Meet Future Travel Needs. The detrimental effects of the activities of the transport sector on the biosphere, including consumption of energy resources, are mainly related to road transport. The economic efficiency and environmental quality of large cities are particularly affected by transport based on the massive use of cars and more recently, also by the use of motorcycles. Although individual transport has numerous advantages in flexibility, speed, privacy and comfort of travel, these advantages should be weighed against their impact on energy consumption and land use, including the role of individual transport plays in encouraging land-absorbing and energy-inefficient physical development patterns. In the conditions of large cities, the need for passenger accessibility and mobility should be largely met by public-transport, and non-motorized transport modes which consume less energy and emit fewer pollutants per passenger-kilometer than private modes. Additionally, these modes are more economical in their use of travel-way space and support higher urban-development densities.	UNCHS, 2000

Increasing Efficiency	Reduce costs by enhancing transport efficiency. The objective of sustainability calls for making the best use of existing transport networks. Traffic -management measures have brought significant although, often, short-lasting effects. Attention should be directed, therefore, to improvements in public -transport operation. Providing for priority in traffic of public -transport vehicles, at the expense of the free movement of individual transport, is fully justified by principles of equity and sustainability. Special attention should be given to the segregation of public transport from general traffic, and the provision of busways is one promising option. ... The objective of a public -transport development strategy is to optimize the effectiveness and efficiency of a multimodal public -transport network. This can be achieved by enhancing modal integration and by ensuring the co-operation of all transport operators. However, this should be done without introducing transport operators. However, this should be done without introducing impediments to competitiveness and the initiative of operators.	UNCHS, 2000
	Efficiency: Transport Canada will use policies, programs and innovative approaches to support the productivity and competitiveness of Canada's transportation system and its contribution to the national economy. The department will explore ways of promoting efficient travel behaviour and sustainable transportation options.	TC, 2001
Protection of Health & Safety	Principle #4: Health and Safety. Transportation systems should be designed and operated in a way that protects the health (physical, mental and social well-being) and safety of all people, and enhances the quality of life in communities.	OECD, 1996
	Transportation systems should be designed and operated in a way that protects the health (physical, mental and social well-being) and safety of all people, and enhances the quality of life in communities.	Canadian RT, 1996
	With respect to society, transportation systems should be safe for people and their property.	CST, 97
	Social: Air quality and noise should not exceed the health standards suggested by the WHO (World Health Organisation), accident risks should be minimised.	Baltic 21, 1998
	Safety and Health: Transportation systems should first be designed and operated in a way that protects the safety of all people. In addition to Transport Canada's commitment to prevent accidents, the department will strive to reduce the negative health impacts of transportation.	TC, 2001
Appropriate Use of Land & Resources	Principle #7: Land and Resource Use. Communities should be designed to encourage sustainable transportation and enhance access, as a contribution to providing comfortable and congenial environments for living. Transportation systems must make efficient use of land and other natural resources while ensuring the preservation of vital habitats and other requirements for maintaining biodiversity.	OECD, 1996
	Sub-national development planning should aim at the distribution of population and economic activities which prevents spatial concentration of the demand for transport to the point where the level of loading of the environment by transport-related pollution will endanger ecological sustainability. In the use of settlement land, single -purpose zoning patterns should be avoided, and, instead, urban areas should be structured in the form of medium-sized, relatively self-contained modules which will meet the needs of different social-economic groups and allow people's homes and places of work to be within walking distance. However, to achieve this, a substantial improvement in urban management institutions is indispensable.	UNCHS, 2000
Participation & Education	Education and Awareness. Design and implement a broad range of programs to ensure that the public understands the risks of climate change and the need to economize on the use of fossil fuels.	Ontario, RT, 1995
	Principle #5: Education and Public Participation. People and communities need to be fully engaged in the decision-making process about sustainable transportation, and empowered to participate. In order to do this, it is important that they be given adequate and appropriate resources and support, including information about the issues involved, as well as the benefits and costs of the array of potential alternatives.	OECD, 1996
	The Participation Principle recognises that an essential prerequisite for achieving sustainable development is to encourage widespread and informed public or physical capital.	UK, RT, 1996
	This Agenda [National Research Agenda for Transportation & Sustainable Communities] will depend on partnerships with public sector organizations, including: Metropolitan Planning Organizations; local governments; regional and state transportation, environmental, energy, and social service agencies; transportation providers; tribal governments; universities and research centers; the private sector; civic organizations; and advocacy groups.	Volpe, 1999

Cont...	To be implemented, strategies must have the support of the general public, which make public participation in their formulation essential and requires the raising of public awareness of the ecological impacts of transport. ... [E]nvironmental-friendly travel behavior should be encouraged by raising awareness of transport related environmental impacts and providing education on energy-efficient driving habits.	UNCHS, 2000
	Consultation and Public Participation: The department will inform and engage employees, stakeholders and communities in its decision-making process as appropriate, and encourage them to participate in achieving the goal of sustainable transportation.	TC, 2001
Public Health & Safety	To enhance public health and safety and reduce accidents.	UK, RT, 1996
	Reduce traffic accidents. Crash prevention, crash protection, TDM.	VTPI, 1999

Technological Innovation

- Robustness
- Prioritisation
- Flexibility
- Coherency, Consistency & Integrity
- Transparency
- Reliability and Trust

Robustness	Robustness: Mega-technological innovations will be implemented in a global economy. A technology policy on transportation and sustainable development, especially a technology policy which has to deal with high risks, long-term trajectories and the international arena, has to be based on strategies which are robust enough to cope with major differences in evaluation. In general terms the programme and strategy has to be robust, even when external environment varies.	Geerlings, 1999
Prioritisation	Prioritisation: The varied nature of the interactions between different policy actions, and the danger that actions which are beneficial in one respect are more than disproportionately damaging or costly in another, suggests that a strategy for transport technology and the environment needs to cover the most important dimensions of effects. Although many of the environmental issues and their solutions find a broad measure of agreement, there still remain important areas of impacts where debate continues. It [is argued] that not only aspects of the global warming issue but also aspects of quality-of-life and issues of material resource usage require priority for policy making.	Geerlings, 1999
Flexibility	Flexibility: Flexibility has to be considered as the potential to adapt to changes in the programme when there are significant changes in the environment. The strategy adopted must be capable of adjustment to reflect changes in social evaluation. Particular attention should be made to identifying technological policies that in general do not involve substantial sacrifices in one environmental compartment in order to yield benefits in another.	Geerlings, 1999
Coherency, Consistency & Integrity	Coherency, Consistency, Integrity: Long-term technological trajectories include high risks for the partners involved in the R&D process. To stimulate cooperation between the participants, there has to be a consistent research programme which reflects unambiguous objectives and the expectations that the pre-stated objectives of the programme will be met. A coherent policy will contribute to reaching a long-term objective. Integration with related policy areas will stimulate the application of these results in other sectors.	Geerlings, 1999

Transparency	Transparency: A technology development project with many actors involved is dealing with a poly-centric perspective. Consequently, the research programme will be broken down into a great diversity of sub-programmes with different goals and objectives. A transparent research programme and research policy will stimulate the actors involved to contribute to this goal.	Geerlings, 1999
Reliability and Trust	Reliability and Trust: Mega-technological innovations are developed by strategic consortia consisting of participants with different backgrounds and interests. Strategic cooperation and the idea that it is a common attempt to solve the problem does not only require the formal commitment of the different participants but also the confidence that the objective is challenging for all partners at the same time. Stimulating a ‘belief system’ will stimulate the cooperation within a consortium.	Geerlings, 1999

Program For Change (US only)

Strategic Research to Support Sustainable Transportation	Strategic Research: Organize a center within DOT to analyze environmental trends related to transportation, coordinate DOT research and policies related to those trends, tie these activities to the Department’s Strategic Plan, and share research information with the public and DOT’s partners and stakeholders.	Volpe, 1999
Case Studies to Promote Sustainable Communities	Case Studies: Support regional, state, and local analytical case studies, demonstrations, pilots, and evaluations of innovative transportation and land development strategies that ensure mobility and accessibility, while making communities more sustainable, particularly with consideration of potentially irreversible environmental effects.	Volpe, 1999
Outreach for Transportation & Sustainability	Outreach: Expand in-service and university curricula for planning and transportation professionals, develop educational materials for the general public, and disseminate findings to business and government decision makers on the roles transportation and land development play in sustainability.	Volpe, 1999

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APPENDIX A3: SUSTAINABLE TRANSPORTATION CHALLENGES

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Sustainable Transportation: CHALLENGES

Environment	Economy	Social Equity	Institutional
Emissions; Freshwater; Biodiversity; Energy; Environmental Management;	Economic Reform; Globalization of Production & Trade; Financial Restrictions	Access & Affordability; Access & Equity; Access & Choice; Adaption of personal-use motor vehicles to meet accessibility needs	New decision-making Processes; Measuring Progress Through Indicators; Institutional Capability; International Governance; Demand Management; Efficient Transportation; Competition for Resource and Access to Infrastructure; Alternative Modes; Automobile Dependency; Land Use; Congestion; Maintenance; Education about Sustainable Transportation Issues; Promotion of Technology

General

- Meeting the Challenge

Meeting the Challenge	The challenge for a sustainable transport strategy will 'be to answer, as far as possible, how society intends to provide the means and opportunity to meet economic, environmental and social needs efficiently and equitably, while minimising avoidable or unnecessary adverse impacts and their associated costs, over relevant space and time scales'.	UK, RT, 1996
	Challenges: Avoid exceeding air quality and noise standards, critical levels and loads for acidification, eutrophication and tropospheric ozone, prevent habitat fragmentation and minimise transport-related land use, run-off and waste, and reduce risks associated with maritime transport of hazardous substances.	OECD, 2001b
	Challenges: Address the various links between environmental and social conditions and trends, and the social impacts of environmental policies, in order to enhance human health, environmental equity, employment, access to information, public participation in decision-making, access to justice in environmental matters and environmental education, thus contributing to enhancing the quality of life.	OECD, 2001b
	The need for mobility will increase in the future. The challenge is to develop strategies that accommodate future mobility needs while controlling and mitigating potential harmful side effects, i.e., to create "sustainable mobility."	WBCSD, 2001
	1 st Grand Challenge: Ensure that our transportation systems continue to play their essential role in economic development and, through the mobility they provide, serve essential human needs, and enhance the quality of life.	WBCSD, 2001

Environment

- Emissions
- Freshwater
- Biodiversity
- Energy
- Environmental Management

Emissions	Reducing air emissions. A major challenge of sustainable transportation is to control or prevent air pollution and other air emissions from transportation, such as greenhouse gases, nitrogen oxides, volatile organic compounds, particulate matter and other air contaminants. This involves both short-term measures and the analysis and planning necessary to implement international agreements and new Canada-wide Standards for clean air. Transportation activities are a leading source of air emissions, contributing to climate change, smog and air pollution. If the Kyoto Protocol on climate change is ratified, Canada must reduce emissions of greenhouse gases to 6 per cent below 1990 levels by 2008–2012. This target will require partnerships with the transport sector and other orders of government, and actions by individual Canadians. The Canada-wide Standards on particulate matter and ozone, as well as Canada-United States agreements, are also expected to require significant reductions in the emissions of smog-forming pollutants. Surveys indicate that Canadians are particularly concerned about the health impacts of air pollution, which include respiratory infection, reduced lung function, asthma attacks and premature death. Air pollution problems are projected to increase due to the warmer temperatures predicted with climate change. Climate change could also cause greater fluctuations in weather conditions, crop production patterns, and water shortages.	TC, 2001
	Challenges: A. Significantly reduce global greenhouse gas emissions, with developed countries taking the lead, and protect and enhance greenhouse gas sinks and reservoirs in order to stabilize concentrations in the atmosphere over the long term at a level that would prevent dangerous anthropogenic interference with the climate system. B. Meet all obligations under the UNFCCC and work through international processes to take forward its objectives; for a large majority of OECD countries this means seeking entry into force of the Kyoto Protocol by 2002, with timely ratification processes, and with the broadest possible support of the international community. C. Further develop new technologies, market approaches and other innovative solutions to address climate change, in particular with a view to combining actions for energy savings, and efficient and low greenhouse gas-emitting technologies.	OECD, 2001b
	Challenges: Significantly reduce the environmental and health effects of transport, particularly regarding air pollution and climate change, by ensuring that efficiency gains from technological developments and demand side management achieve lasting environmental quality improvements.	OECD, 2001b
	5 th Grand Challenge: Drastically reduce carbon emissions from the transportation sector, which may require phasing carbon out of transportation fuels by transitioning from petroleum-based fuels to a portfolio of other energy sources.	WBCSD, 2001
Freshwater	Reducing pollution of water. Another challenge of sustainable transportation is to prevent or control the discharge of effluents and wastes that contaminate rivers, lakes, oceans, harbours and beaches, and to prevent the introduction of non-native aquatic species through the discharge of ships' ballast water. This includes measures to prevent, prepare for, and respond to accidental spills, and measures to reduce or eliminate routine discharges of effluent and waste. It also includes the creation of incentives for sound environmental practices. Transportation activities contribute to water pollution through the release of liquid effluents and waste. Transportation activities also create a risk of accidents that can release fuels or hazardous materials into the environment. Mitigating these impacts is important, in order to protect the integrity of aquatic and terrestrial ecosystems, avoid human exposure to hazardous substances, and preserve human enjoyment of the environment.	TC, 2001

Cont...	Challenges: A. Manage the use of freshwater resources and associated watersheds so as to maintain adequate supply of freshwater of suitable quality for human use and to support aquatic and other ecosystems. B. Protect, restore and prevent deterioration of all bodies of surface water and groundwater to ensure the achievement of water quality objectives in OECD countries.	OECD, 2001b
Biodiversity	Challenges: A. Maintain, restore and enhance the diversity of landscapes, ecosystems, species and genetic material. B. Significantly reduce threats to ecosystems and their species from habitat loss and fragmentation, changes in land use patterns, pollution, introduction of invasive species, and over-exploitation or extinction of wild species, etc.	OECD, 2001b
Energy	Energy. We will need to develop and deliver clean and renewable energy sources to power a new breed of vehicles. This is largely a technological problem.	TAC, 96
	Combustion of low-cost oil provides more than 99 per cent of the energy for motorized transportation and many of the environmental problems that result from transportation. Harnessing renewable alternatives will be a major challenge.	CST, 97
	Challenges: Redesign and modify energy supply and use systems [so] as to reduce the negative environmental effects of energy production and use, in particular the emission of greenhouse gases and other air pollutants.	OECD, 2001b
Environmental Management	Improving environmental management for Transport Canada operations and lands. Another challenge for sustainable transportation, for which Transport Canada has a direct responsibility, is to improve the department's own environmental practices and take action to mitigate the environmental impacts of the department's operations. The challenge is also to promote and facilitate the adoption of improved environmental management by those operating on Transport Canada lands. The federal government, as one of the largest organizations in the country, can provide leadership by example in environmental management. Transport Canada has developed an environmental management system (or EMS) which allows organizations to understand the nature of their environmental impacts and act accordingly. By showing leadership on environmental management, Transport Canada can reduce its own environmental impacts and lead by example for others in the transportation sector. Additionally, by the nature of its size, the federal government can support emerging environmental technologies in the marketplace, for example, by purchasing alternative fuel vehicles for its fleet.	TC, 2001

Economy

- Economic Reform
- Globalization of Production & Trade
- Financial Restrictions

Economic Reform	Visions of Sustainable Transportation: Economic Reform. This vision relies on creating a more optimal transportation market by reforming transport prices and investment practices. It includes full-cost pricing (i.e., charging motorists directly for the marginal costs they impose), congestion pricing, tax shifting and least-cost planning.	VTPI, 1999
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Globalization of Production & Trade	Globalization of production and trade. Domestic and international trade liberalization is resulting in the movement of larger volumes of goods (particularly intermediate goods) over longer distances than was the case in the past. Korea, Taiwan (China), Malaysia and Thailand have based their rapid growth on the export of their manufactured goods by participating in globally integrated production and assembly chains. Even in low-income developing countries (excluding Sub-Saharan Africa), manufactured goods account for over 50 percent of exports. Competition for increasingly mobile production and assembly processes is hindered in many countries by inefficient administrative arrangements and regulations that govern freight and passenger transport. Transport infrastructure bottlenecks are emerging as a constraint on growth in some rapidly growing countries, such as China. Economic reform and political realignment in Eastern Europe and the FSU, and emerging free trade areas and customs unions in Latin America, will also generate needs for transport investment and harmonization of regulations to facilitate new trade and transport patterns.	World Bank, 1996
Financial Restrictions	Financial: Budget restrictions limiting the overall expenditure on the strategy, financial restrictions on specific measures, and limitations on the flexibility with which revenues can be used to finance the full range of measures.	Prospects, 2001a

Social Equity

- Access & Affordability
- Access & Equity
- Access & Choice
- Adaption of personal-use motor vehicles to meet accessibility needs

Access & Affordability	Increasing access and affordability. Increasing the access of the rural poor to markets and amenities requires a further expansion of secondary and tertiary transport networks and more public transport services. Thirty-three percent of China's population and 75 percent of Ethiopia's population still do not have access to all-weather transport. Walking over 10 km/day each way to farms, schools and clinics is not unusual in rural areas, particularly in Sub-Saharan Africa but also in parts of Asia and Latin America. Commuting time (whether walking or on public transport) also accounts for a large part of the time budget of the urban poor. Commuting by public transport is also very costly to the poor (taking 14 percent of the income of the poor in Manila compared with only 7 percent of the income of the non-poor).	World Bank, 1996
Access & Equity	Equity in Access. An increasing reliance on privately owned motor vehicles for transport means that those without access to such a vehicle may find themselves seriously disadvantaged in their ability to get to jobs and services. The limitations of conventional public transport in cities increasingly tailored to the private vehicle only serve to accentuate this risk. Particularly vulnerable are groups such as the elderly, the poor, people with disabilities, and youth. These people [elderly] may be healthy and independent for several decades after they retire and may lead active lives requiring considerable mobility. Many will continue to use automobiles, though safety issues must be considered in licensing them. More generally, many older people as they age will increasingly experience physical, financial, and other barriers in using the transport system, in moving around their communities, and in accessing the services and facilities they need. So there are different categories of users among the elderly, but almost all would benefit from a well-developed public transport network as a primary or backup system.	WBCSD, 2001
Access & Choice	3 rd Grand Challenge: Reinvent the concept of public transport — provide accessibility for those lacking personal motor vehicles in both the developed and developing worlds; provide a reasonable alternative choice for those who do have access to personal motor vehicles.	WBCSD, 2001

Adaption of personal-use motor vehicle to meet accessibility needs	2 nd Grand Challenge: Adapt the personal-use motor vehicle to the future accessibility needs/requirements of the populations of the developed and developing worlds (capacity, performance, emissions, fuel use, materials requirements, ownership structure, etc.).	WBCSD, 2001
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Institutional

- New decision-making Processes
- Measuring Progress Through Indicators
- Institutional Capability
- International Governance
- Demand Management
- Efficient Transportation
- Competition for Resource and Access to Infrastructure
- Alternative Modes
- Automobile Dependency
- Land Use
- Congestion
- Maintenance
- Promotion of Technology
- Education about Sustainable Transportation Issues
- Promotion of Technology

New decision-making Processes	Decision Making. We must invent new decision making processes for governments, corporations and individuals. This is an institutional problem which permeates all aspects of the issue from lack of harmonized government policies - to resistance by industry - to individual choices about how and where people live, work and travel. This will be the most difficult barrier to overcome.	TAC, 96
	More than for most other areas of human endeavour, decision-making about transportation—by governments, corporations, and individuals — has become locked into modes that reinforce the present unsustainable arrangements and trends. Overcoming the institutional barriers that prevent good decision-making for transportation may be a greater challenge than overcoming the technological barriers that stand in the way of reducing the use of fossil fuels.	CST, 97

Cont...	Transportation Decision-Making. Sustainable transportation planning may require a paradigm shift: a fundamental change in the way people think about and solve problems. It requires more comprehensive analysis of impacts (including consideration of indirect and cumulative impacts), consideration of a broader range of solutions than usually occurs, and public involvement in determining evaluation criteria and the options to be considered. Conventional planning reflects reductionist decision-making, in which problems are assigned to a specialized organization with narrowly defined responsibilities. Solutions tend to reflect current practices and institutional convenience. Although conventional transport planning may be effective when the range of options is relatively narrow and their impacts are limited and predictable, it tends to fail when there is a wide range of options, when problems are interrelated, and when choices depend on basic values. Sustainable transportation planning requires more objective language. Traffic engineers traditionally describe any increase in road or parking facility capacity as an “improvement,” although from many perspectives (pedestrians, residents, aesthetics, and environmental quality) it may represent degradation. Sustainable transport planning avoids language biased in favor of automobile travel, as described in the box on the next page.	VTPI, 1999
	Developing tools for better decisions. Decision-makers need to understand the environmental impacts of their decisions. Whether it is building a new road, or signing an international agreement, a clear understanding of the environmental impacts is a necessity. Often there are trade-offs to be made between social, economic and environmental benefits. To make better decisions we need to develop better data, information, analyses and tools. Better information leads to better decisions. Given the importance of transportation to the economy, society and environment, it is essential that government and stakeholders have access to accurate and reliable data and analysis. It is also important that governments cooperate and consult effectively with stakeholders to achieve harmonized approaches to transportation issues, with a broad degree of public support.	TC, 2001
	4 th Grand Challenge: Reinvent the process of planning, developing, and managing mobility infrastructure.	WBCSD, 2001
	Transportation Decision-Making. Sustainable transportation planning requires a paradigm shift: a fundamental change in the way people think about and solve problems (Litman, 1999). It requires more comprehensive analysis of impacts, consideration of indirect and cumulative impacts (Louis Berger & Associates, 1998), consideration of demand management solutions, and public involvement in transportation decision-making.	VTPI, 2001
Measuring Progress Through Indicators	Changing standards for evaluating transport performance. Growing personal incomes and rapidly changing markets generate demand for a greater variety and a higher quality of transport services than is currently available in most developing and transitional economies. There has been an increase in the priority attached to “moving people rather than vehicles,” ensuring greater safety in transport, fewer adverse effects on health, greater attention to amenities and aesthetic issues, and fewer adverse impacts on the environment and ecology created by improperly designed and executed transport development strategies.	World Bank, 1996
	Challenges: A. Use environmental indicators and related targets to measure progress in achieving environmental sustainability and in implementing this Strategy. B. Support national policies in stimulating greater accountability, with respect to their national objectives and international commitments (global and regional).	OECD, 2001b
Institutional Capability	Federal activities supporting the range of sustainability issues related to transportation are fragmented, and that a more strategic interagency systems approach to transportation, sustainability, and global climate change is urgently needed to complement current vehicle technology and fuels research.	Volpe, 1999
	Legal and institutional: lack of legal powers to implement a particular measure, and legal responsibilities which are split between agencies, limiting the ability of the city authority to implement the affected measure;	Prospects, 2001a
	Looking ahead 30 years, the mobility future is likely to depend on significant questions about institutional capacity in both the developed and developing nations. Three matters seem especially likely to affect the sustainability of mobility systems: Can governments and the private sector build and manage the transportation infrastructure required to meet surging worldwide demand for mobility? Can policy-makers and citizens effectively debate and resolve trade-offs between demand for mobility and demands for environmental protection, energy conservation, and safety? Can nations appropriately harmonize their regulation of transportation — on the one hand to assure that environmental and safety goals are met, and on the other, to permit effective, efficient, citizen-responsive provision of mobility capacity by private and public entities?	WBCSD, 2001

International Governance	Challenges: A. Ensure coherence within, and strengthen, international environmental governance. B. Improve management of the environmental effects of globalisation, and ensure that environmental aspects are taken into account in international governance related to trade and investment, in particular in the World Trade Organisation (WTO) and international financial institutions.	OECD, 2001b
Demand Management	Visions of Sustainable Transportation: Demand Management. This vision involves changing travel behavior, including shifts in travel time, route, mode and destination. It involves a number of specific components that increase traveler choice and encourage more economically efficient travel patterns.	VTPI, 1999
Efficient Transportation	Promoting efficient transportation. Another challenge of sustainable transportation is to implement measures that improve the efficiency of the different modes of transport, as well as of the transportation system as a whole. While there is no single means of achieving efficient transportation, measures could include: encouraging more integration between transportation modes to increase competitiveness and reduce environmental impacts; promoting the development and funding of strategic transportation infrastructure; encouraging people to use more environmentally efficient modes; encouraging users to explore all transportation options available and choose the most efficient mode, particularly for shipping; and promoting advanced technologies that enhance system operations. Inefficient movement of people and goods contributes to increased congestion, energy use and higher costs. When users choose the most efficient means and mode of transport, they achieve the same results with fewer or more effective trips. This in turn can enhance Canada's overall competitiveness and reduce environmental impacts.	TC, 2001
Competition for Resource and Access to Infrastructure	6 th Grand Challenge: Resolve the competition for resources and access to infrastructure between personal and freight transportation in the urbanized areas of the developed and developing world.	WBCSD, 2001
Alternative Modes	Visions of Sustainable Transportation: Alternative Modes. These involve improvements to public transit (which can include heavy rail, trolley, express bus, conventional fixed-route bus, minibus, demand-response paratransit, personal rapid transit, jitney, vanpool and taxi) and ridesharing, non-motorized transport, and telecommuting, including road design features that give priority to these modes.	VTPI, 1999
Automobile Dependency	Automobile-based transportation will continue to be the preferred means of personal mobility in the urbanized regions of the developed world. To preserve the automobile as a sustainable means of transportation, policies governing its use will have to undergo significant modification. Automobile management techniques such as travel-demand management, the use of variable pricing, and car sharing have shown a potential for somewhat reducing our reliance on automobiles. While individually the impact of auto management measures may be small, collectively they can be a useful element in an overall strategy for sustainable mobility.	WBCSD, 2001
	Automobile Dependency. Automobile dependency is defined as high levels of automobile use, automobile oriented land use, and a lack of travel alternatives (Newman & Kenworthy, 1999). Automobile dependency imposes a number of economic, social and environmental costs (Litman, 2000), and results in part due to distortions in transportation and land use markets (Market Principles) (TRB, 1997). Sustainable transportation requires reducing these distortions and encouraging the development of a more balanced transportation system (Evaluating Transportation Choice). Transportation Market Reforms that correct market distortions which cause excessive automobile use and automobile oriented land use patterns can increase Economic Development while also achieving social and environmental objectives.	VTPI, 2001
Land Use	Visions of Sustainable Transportation: Land Use/Community Design Changes. These involve changing land use patterns to reduce travel distances and increase mode choice, for example by locating more services and jobs near residential neighborhoods, and by creating neighborhoods that are more suitable for public transit, walking and cycling.	VTPI, 1999
	Environmental concerns will seriously constrain future highway construction in urban and environmentally sensitive areas of the developed countries.	WBCSD, 2001

Cont...	Land Use. Transportation patterns can be affected significantly by land use patterns (Land Use Impacts on Transportation). In particular, low density development, hierarchical street patterns, generous road and parking capacity, and automobile oriented site design tends to increase automobile dependency, leading to high levels of per capita motor vehicle mileage and a reduction in the quality of travel alternatives (transit, walking and cycling). Many experts conclude that sustainable transportation requires more accessible land use (Smart Growth; Newman and Kenworthy, 1999).	VTPI, 2001
Congestion	Rapid motorization. Cities are major engines of growth in most developing countries. As a result, urban populations are expanding at a very high rate (over 6 percent per annum). At comparable levels of income, developed countries had few motorized vehicles. However, stimulated by growing per capita income in urban areas, ownership of motor vehicles is increasing in developing countries at a faster rate than the proportion of central urban space devoted to roads. As in developed countries, the increased dependence on automobiles is reducing the diversity and availability of public transport services for the non-motoring public, particularly the poor. It has also generated three transport-related problems that are qualitatively different from their counterparts in developed economies. First, roads in cities, such as São Paulo or Seoul, are much more congested at lower rates of car ownership than in OECD countries. Second, the slow-moving traffic, combined with an ill-maintained vehicle stock, is making the megacities in developing countries, such as Mexico, Bangkok or Tehran, the most polluted in the world. Third, sprawling, land-consuming urban structures are emerging that make the journey to work, particularly for some of the very poor, excessively long and costly. With vehicle growth rates of 15 to 20 percent per annum in many cities in developing countries these problems will emerge rapidly in other cities if they do not already exist under “business-as-usual” policies.	World Bank, 1996
	7 th Grand Challenge: Anticipate congestion in intercity transportation and develop a portfolio of mobility options for people and freight.	WBCSD, 2001
Maintenance	Confronting the maintenance crisis. Over a two decade period (1964-84), US\$45 billion worth of road infrastructure assets were lost in eighty-five developing countries owing to inadequate maintenance. Every dollar of essential maintenance postponed increases vehicle operating costs in the current period by more than 3 dollars as well as increasing the road agency costs in the long run.	World Bank, 1996
Education about Sustainable Transportation Issues	Improving education and awareness of sustainable transportation. A key challenge is to make Canadians more aware of the environmental impacts of their transportation choices. Building awareness among the general public about sustainable transportation in Canada is not an easy task. It involves raising awareness about the issues themselves, as well as promoting concrete actions that individuals can take to reduce the negative impacts of transportation and improve their quality of life. Partnerships with other federal departments, provinces and territories, industry groups, and non-governmental organizations are necessary in developing and delivering consistent messages that promote sustainable transportation options. Behaviour change is the ultimate goal of improving public awareness of sustainable transportation. Individuals need to understand the impacts of their transportation behaviour in order to make choices that reduce the adverse impacts of transportation on the environment.	TC, 2001
	Political and cultural aspects: lack of political or public acceptance of a measure, restrictions imposed by pressure groups, and cultural attributes, such as attitudes to enforcement, which influence the effectiveness of measures.	Prospects, 2001a
Promotion of Technology	[M]ajor innovations have lead to a reinforcement of the overall trend towards faster and more flexible forms of transport, and officially-recognized greater negative external effects. The challenge at this present juncture is, therefore, to determine how innovations can be developed and implemented which simultaneously both provide for the demands dictated by the need for transport, and contribute to the necessity for a more sustainable transport system.	Geerlings, 1999
	Visions of Sustainable Transportation: Technical. This vision relies on technological innovation to solve specific sustainability problems, create wealth and increase mobility. New production techniques (e.g., nuclear power, recycled materials), alternative fuel and super-efficient vehicles, Intelligent Transportation Systems (ITS), and increased highway capacity are typical components of this vision.	VTPI, 1999

Cont...	Promoting adoption of sustainable transportation technology. Developing and promoting the use of new and innovative technologies that reduce the environmental impacts of transportation while meeting the needs of passengers and shippers, is an important challenge for sustainable transportation. In the long term, technology holds the promise of providing Canadians with transportation options that are safe, efficient and environmentally friendly. In addition, new technology can reduce the costs of meeting environmental objectives and provide a basis for improvements in productivity and new markets for Canadian products and services. Important technology already exists; properly adapted and promoted, it can be very effective in promoting sustainable transportation.	TC, 2001
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APPENDIX A4: RECOMMENDATIONS FOR CHANGE

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Sustainable Transportation: RECOMMENDATIONS / OBJECTIVES / POLICY

Environment	Economy	Social Equity	Science & Technology
Environmental Carrying Capacity; Environmental Quality Standards; Emissions; Protection of Natural & Physical Capital; Management of Non-Renewable Resources; Management of Renewable Resources; Environmental Protection; Transportation Noise & Vibration; Protection of Ecosystems; Health Threatening Impacts; Reduction of Solid Waste	Internalize Transportation Costs; Stable Fiscal Environment; Social & Economic Implications; Financial Mechanisms; Economic Efficiency; Contribution to Economic Growth; Market Reforms; Use of Competitive Market Structures; Appropriate Investments;	Access & Choice; Services & Goods; Flexible Working Hours; Equity and Social Inclusion; Equity for The Poor	Research & Innovation; Technology Policy; Use of Existing Technology; Promotion of New Technology; Transfer of Technology; Strategy for Technological Innovation

Institutional		
Government Decision-Making Processes; Policy Packages / Frameworks; Policy Integration; Regional Transport Planning; Future Transport Policy; Tools For Decision-Making; Government Support for Initiatives; Support for Public Transport; Strategic Planning & System Management Capabilities; Transport Regulations; Assessment of Long-term Trends; Monitoring & Evaluation; Assessment of Programs / Problems; Public / Private Partnerships; Goals, Performance & Outcomes; Conventions (general); Linkages with the Global Economy; Partnerships with Developing Countries; International Cooperation; Project Appraisal; Expansion of Options; Reduction of Congestion; Reduction of Car and Lorry Growth; Increasing Accessibility to Freight Transportation;	Automobile Usage; Transit; Rail; Bus; Cycling; Walking; Non-Motorized Transport; Ridesharing; HOV; Reduction of Commute; Travel Demand Management (TDM); Update of TDM Knowledge; Connections; Efficiency of Goods Distribution; Promotion of Efficient Transport; Traffic Management; Optimization of the Existing System; Safety; Long-term Planning Horizons; Implementation Plan; Land Use & Transportation Planning; Livable Streets and Neighborhoods; Location Efficient Planning; Least-Cost Planning;	Smart Growth; New Urbanism; Reduction of Impervious Surface; Road Maintenance; Job Creation; Impacts of tourism; Teleworking; Park and Ride; Parking; Road Pricing; Value Capture and Business Taxes; Taxes; Charging; Fares; Developer Contributions; Company Travel Plans; New Road Construction; Public Transport Service Levels; Promotion of Responsible Behaviour; Public Awareness Programs; Public Realm; Enhancement of Appropriate Infrastructure

General

General Principle other critical national goals for sustainability — to improve the quality of the environment, maintain a vigorous economy, and foster social equity — are also of critical importance.	Volpe, 1999
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Environment

- Environmental Carrying Capacity
- Environmental Quality Standards
- Emissions
- Protection of Natural & Physical Capital
- Management of Non-Renewable Resources
- Management of Renewable Resources
- Environmental Protection
- Transportation Noise & Vibration
- Protection of Ecosystems
- Health Threatening Impacts
- Reduction of Solid Waste

Environmental Carrying Capacity	To ensure that transport infrastructure and travel use does not exceed the capacity of the environment to withstand their impact.	UK, RT, 1996
Environmental Quality Standards	To establish environmental quality standards based on critical ecological limits and precautionary public health requirements.	UK, RT, 1996
	Guideline 3: Define health and environmental quality objectives based on health and environmental criteria, standards, and sustainability requirements. Guideline 4: Set quantified, sector-specific targets derived from the environmental and health quality objectives, and set target dates and milestones.	OECD, 2000
	Contribute to the long-term environmental sustainability of the transport sector by setting targets to meet environmental quality objectives, in particular WHO air quality and noise guidelines.	OECD, 2001b
Emissions	Reduced emissions from freight transport. Enhance intermodal freight transfer facilities and services and encourage the development of new intermodal technologies and service levels. Cleaner, more fuel efficient automobiles. Develop a Memorandum of Understanding with automotive manufacturers to increase the availability of fuel-efficient models, recognizing the linkage between gasoline prices and consumer demand for more fuel-efficient vehicles. Implement mandatory vehicle inspection and maintenance programs in large urban areas to ensure the proper operation of emission control equipment. Maintain incentives for the use of cleaner alternative fuels and explore ways to promote further the development and use of alternative fueled vehicles.	Ontario, RT, 1995

Cont...	Consistent with the developing national priorities on sustainability and global climate change, the Team's immediate priority is to develop a research agenda to address cumulative and potentially irreversible consequences of transportation, including emissions of greenhouse gases (GHG). Transportation research related to climate change will ensure mobility and accessibility and will be considered in the broad context of sustainability. Potential climate change strategies, whether they involve fuel and vehicle technologies, road pricing, or land development, will be considered not only for their ability to reduce greenhouse gases, but also in balance with needs for economic growth and social equity.	Volpe, 1999
	Criteria emission controls. Reduce climate change emissions. CAFE standards, emission taxes, TDM, alternative fuels. Reduce harmful vehicle air and water emissions. Emission standards, TDM, I/M programs.	VTPI, 1999
	Appropriate national emission standards of new vehicles and ceilings for emissions from vehicles in use should be established, and systematic control of emission levels by vehicles in use should be introduced. ... Developed Countries: Introduction of emission standards for carbon dioxide and for other not-yet-controlled toxic emissions should be considered. Transport-related noise should be reduced and appropriate noise-reduction standards for the construction of vehicles and infrastructure should be introduced.	UNCHS, 2000
	[N]ational Governments may ... wish to consider, as appropriate, specific policies to limit emissions, including: Inspection and maintenance programmes; Standards and regulations, especially in highly polluted areas; Restrictions on or emissions standards for the import of second-hand vehicles; Investigation of the possibility of utilizing economic incentives and disincentives to promote the use of cleaner technologies. ... Governments may also consider adopting aggressive initiatives at the national level to phase out the use of leaded gasoline as soon as possible.	UNESC, 2000
	Reducing air emissions. Commitment 5.1. Transport Canada will continue to lead the transportation component of the federal action plan on climate change. In particular, it will work with Natural Resources Canada, other departments and stakeholders to launch in 2001 the five transportation measures in the government's Action Plan 2000. Commitment 5.2. Transport Canada will work with the International Civil Aviation Organization (ICAO) to develop new aircraft emissions standards and operational practices that address concerns about local air quality and global climate change, from 2000/2001 - 2003/2004. Commitment 5.3. Transport Canada will work with Environment Canada to form an Inter-departmental Working Group to: examine rail emissions standards and current air emissions from locomotive engines; evaluate the existing Memorandum of Understanding between Environment Canada and the Railway Association of Canada; assess current US regulations; and develop a strategy to reduce air emissions from railway equipment, by 2001/2002. Commitment 5.4. Transport Canada will review the Motor Vehicle Safety Act (MVSA) to determine the appropriateness of including authority to regulate fuel efficiency data and data submission requirements in the MVSA, by 2001/2002.	TC, 2001
	Climate Change. Use a comprehensive approach to climate mitigation. Develop policies to guide mitigation over the long-term, for stabilising concentration at levels that avoid dangerous interference with the climate system.	OECD, 2001a
	2] Reduce energy use in transport, distribution systems and housing, and thereby reduce contribution to global climatic change (CO2 emissions). 3] Reduce regional pollution by reducing emissions of NOx and SO2. 4] Reduce local damage and health problems caused by emissions of NMVOC and PM 10.	Prospects, 2001a
	Decrease - "Conventional" Emissions. Transportation vehicles are major sources of local, urban, and regional air pollution. The substances emitted by transport vehicles that contribute to this pollution include sulfur dioxide (SO2), lead, carbon monoxide (CO), volatile organic compounds (VOCs), particulate matter, and nitrogen oxides (NOx). These substances are commonly referred to as "conventional" transport emissions to distinguish them from emissions of greenhouse gases, though there is some overlap.	WBCSD, 2001
	Decrease - Greenhouse Gas Emissions. The pollutants discussed above [conventional emissions] are generally considered a local, urban, or regional problem. Other emissions have a global impact. Carbon dioxide (CO2) is produced by the combustion of fossil fuels. In the concentrations typically encountered in urban and rural environments it has no known health effects. CO2 is called a "greenhouse gas" because it is one of the atmospheric chemicals that contribute to the greenhouse effect that warms the planet.	WBCSD, 2001
Protection of Natural & Physical Capital	5] Protect cultural heritage sites, natural habitats, green areas, agricultural land and recreational areas.	Prospects, 2001a

Management of Non-Renewable Resources	1] Reduce use of non-renewable resources and overutilisation of renewables.	Prospects, 2001a
	Decrease - Use of Non-renewable, Carbon-based Energy. Every vehicle requires energy. In order to supply that energy — the energy to transport people and freight worldwide by land, sea, and air — more than one liter of petroleum is consumed each day, on average, for each of the world's six billion inhabitants. In the industrialized countries, transportation consumes more than half the petroleum used for all purposes. In developing countries the share is less than half, but it has been rising and is expected to reach at least half within a decade.	WBCSD, 2001
Management of Renewable Resources	Managing Natural Resources. Improve the knowledge base for decision-making. Make markets better serve conservation aims. Reduce waste flows. Increase co-operation with developing countries in building their capacity to manage natural resources.	OECD, 2001a
Environmental Protection	Ensure that urban transportation decisions protect and enhance the environment.	TAC, 96
	Environmental Protection and Waste Reduction. Minimise transportation-related emissions of air pollutants and discharges of contaminants to surface (fresh and salt water), ground water and soils. Minimise the generation of waste through each phase of the life-cycle of transportation vehicles, vessels and infrastructure. Reduce, reuse and recycle. Recognise that traffic noise is a significant nuisance for people and animal life, and set decibel level standards accordingly. Ensure that the rate of use of renewable resources does not exceed rates of regeneration, and non-renewable resource use is minimised. Ensure emergency management systems are in place in order to respond to spills, hazardous substances releases and other transportation-related accidents.	OECD, 1996
	Improving environmental management for Transport Canada operations and lands. Commitment 4.1. Transport Canada will meet six new targets for its EMS [Environmental Management System] that focus on priority areas in the department's operations, by 2003/2004. Commitment 4.2. Transport Canada will implement an environmental monitoring program for all its properties, including those operated by third parties, by 2003/2004. This will ensure compliance with regulations and identify best practices and existing or potential liabilities. Commitment 4.3. Transport Canada will work with the Canadian Environmental Assessment Agency to close gaps in the Canadian Port Authority (CPA) Environmental Assessment Regulations under the Canadian Environmental Assessment Act (CEAA), and to enable other entities that manage Transport Canada lands, such as National Airports System Airport Authorities (NAS AAs), to be brought under the Act, by 2001/2002. Commitment 4.4. Transport Canada will develop, as a pilot project, a natural resource inventory (NRI) for the Churchill Airport in accordance with the proposed endangered species legislation, by 2001/2002. Based on this work, Transport Canada will develop a guide by 2003/2004, for use at other departmentally owned and operated airports.	TC, 2001
	Reducing pollution of water. Commitment 6.1. Transport Canada will identify third party discharges of effluent and waste at Canadian ports by 2001/2002. Commitment 6.2. Transport Canada will facilitate the development of standards for waste handling at Canadian ports by 2002/2003. Commitment 6.3. Transport Canada will, in cooperation with Fisheries and Oceans Canada and Environment Canada, improve the effectiveness of its existing ocean discharge monitoring and inspection regimes, by examining existing aerial surveillance activities in Atlantic waters and, if necessary, increasing aerial surveillance activities, by 2002/2003. Commitment 6.4. Transport Canada will work with the marine industry, other government departments and interested stakeholders, through the Canadian Marine Advisory Council (CMAC), the International Maritime Organization (IMO) and the International Joint Commission (IJC), to develop new regulations and standards for ballast water management and other issues related to nuisance aquatic species, by 2002/2003. Commitment 6.5. Transport Canada will develop regulatory programs to incorporate international regulations on marine pollution and air emissions from ships through the International Convention for the Prevention of Pollution from Ships (MARPOL) Annexes III (prohibiting the release of packaged dangerous goods), V (restricting the release of garbage) and VI (setting the standards on SOx, NOx, and ozone-depleting substances), beginning in 2001/2002. Commitment 6.6. Transport Canada will, in cooperation with Fisheries and Oceans Canada (Canadian Coast Guard), explore whether implementing a performance standards program for environmentally sound ship operations, and incentives for green ship operations, would have a positive impact on reducing pollution of water and air, by 2002/2003.	TC, 2001

Transportation Noise & Vibration	With respect to society, transportation systems should produce no more noise than is acceptable by communities.	CST, 97
	9] Reduce the number of people exposed to noise, and reduce vibration from transport.	Prospects, 2001a
	Decrease - Transportation Noise. Cars and trucks are major sources of noise pollution in most cities. Most developed countries have had vehicle noise emission regulations since the 1970s. Technological progress in engines and exhaust systems has made these vehicles considerably quieter. For example, the EU allowable noise level of a modern truck is approximately equivalent to that of the typical car in 1970. Nonetheless, the noise created by motorized transportation remains a significant impact on urban residents' health and quality of life. Noise is often cited as the main nuisance in urban areas, and traffic noise is the worst offender (a German study suggests that 65% of the population is adversely affected by road traffic noise, with 25% seriously affected). As an indication, residential property values are measurably lower near noise-producing main roads, highways, and railroad tracks.	WBCSD, 2001
Protection of Ecosystems	7] Reduce the settlement and bio-diversity fragmentation by infrastructure. 8] Reduce activity with environmental consequences in areas with particular vulnerability.	Prospects, 2001a
	Decrease - Impacts on Land, Water, and Ecosystems. Roads, bridges, airports, harbors, and the vehicles that use them have profound effects on habitats and ecosystem communities of natural species. Transportation infrastructures in developed countries are vast in scale and extent. For example, the road network in the United States consists of tens of thousands of kilometers of lightly traveled roads (paved and unpaved) cutting through agricultural and wilderness areas, dense networks of residential streets and arteries in urban and suburban areas, and heavily traveled highways that can extend uninterrupted for hundreds of kilometers. This extensive system is a source of numerous environmental disturbances. Some of these occur during construction and some during use. Examples are runoff of surface materials, changes in local hydrology, the fragmentation of habitats, and the introduction and proliferation of invasive species.	WBCSD, 2001
Health Threatening Impacts	Address health threatening impacts as a first priority through: Safety initiatives, particularly in road transport, using benchmarked safety programs; and Cleaner fuel standards to eliminate lead and sulphur emissions, combined with fuel supply and pricing policies encouraging the use of cleaner fuels.	World Bank, 1996
Reduction of Solid Waste	Decrease - Transportation-related Solid Waste. Vehicles — especially automobiles and light trucks — are major users of materials such as steel, iron, aluminum, glass, and plastics. The extent to which these materials are reused varies significantly by region. In the United States, for example, more than 95% of ferrous material in all deregistered motor vehicles is reprocessed, with at least 75% of the vehicle mass extracted for reuse. This high percentage is driven by the strength of the steel minimill industry and the ready market for its products. In other countries, the percentage is lower. A substantial number of used vehicles is shipped abroad from Europe (to North Africa and Eastern Europe) and from Japan (to Southeast Asia).	WBCSD, 2001

Economy

- Internalize Transportation Costs
- Stable Fiscal Environment
- Social & Economic Implications
- Financial Mechanisms
- Economic Efficiency
- Contribution to Economic Growth

- Market Reforms
- Use of Competitive Market Structures
- Appropriate Investments

Internalize Transportation Costs	Fuller-Cost Accounting. Identify and recognise public supports and subsidies (hidden or otherwise) to all modes of transport and make transportation decisions accordingly. Reflect the full social, economic and environmental costs (including long term costs) of each mode of transport or transport related practice as accurately as possible in market prices. Ensure users and others benefiting from transport systems pay a fuller share of all costs, while respecting equity concerns.	OECD, 1996
	To ensure that users pay the full social and environmental costs of their transport decisions, without making industry uncompetitive or preventing those on low incomes from meeting their transport needs.	UK, RT, 1996
	Horizontal Equity - User pay principle. Cost-based pricing, internalize externalities, reduce externalities. Vertical Equity - Progressive pricing. Low prices/taxes for “basic” driving, transit.	VTPI, 1999
	Developed Countries: Users of motorized individual transport modes should pay the full economic and environmental costs of their travel, and appropriate pollution and congestion pricing should be developed for this purpose. The use of energy-efficient and low-polluting vehicles and fuels should be encouraged by taxation policies, regulatory and other economic incentive instruments. ... Developing Countries: The growth of car and motorcycle ownership should not be directly or indirectly subsidized. Import tariffs, taxation policies and fuel-pricing policies should be used to prevent, in particular, growth in the number of energy-inefficient, highly polluting types of vehicles.	UNCHS, 2000
	National Governments may ... wish to consider adopting measures to [p]romote the incorporation of purchase cost into operating costs of private vehicles, so that the vehicle purchase cost does not greatly influence the choice of mode per trip. Such measures could include those aimed at affecting costs related to parking, fuel, insurance and road use.	UNESC, 2000
	The use of the price system to encourage individual agents to take full costs of environmental degradation into account in their decisions. Take account of externalities and market failures through greater use of environmental-related taxes and tradeable permits. Correct policy failures through reforms of environmentally damaging support programmes. Improve the effectiveness of other measures. Address the possible effects of more ambitious environmental policies on employment and income distribution, and assist redeployment of workers affected by these policy reforms through labour market measures and other interventions that increase flexibility and well-functioning labour markets.	OECD, 2001a
	Work towards an effective and full internalisation of environmental costs of transportation through the use of effective instruments such as taxation, charges, reform of environmentally harmful subsidies and other incentive-based approaches.	OECD, 2001b
Stable Fiscal Environment	Stable fiscal environment — a dedicated source of funding to support operation of the transportation system, and adequate capital to ensure a steady program of improvements and expansion of transportation infrastructure.	WBCSD, 2001
Social & Economic Implications	Guideline 6: Assess the social and economic implications of the vision, and ensure that they are consistent with social and economic sustainability.	TAC, 96
Financial Mechanisms	Increase efficiency in the use, provision, financing and management of transport infrastructure by: Introducing direct charges for infrastructure, that closely reflect costs, including the opportunity cost of non-marketed effects; Actively exploring the potential for corporatizing infrastructure agencies; or Introducing proxy “user charge” based earmarking of taxation to provide a cost-effective framework for infrastructure maintenance where there is a maintenance crisis and no direct user charges.	World Bank, 1996
	Create better ways to pay for future urban transportation systems. New methods are needed. This along with the first principle on land use are the two bookends that hold the vision together. The Council is developing a new model which calls for funding which is stable and predictable, dedicated, transparent, increasingly derived from users in proportion to benefits received, and justified by measurable performance indicators.	TAC, 96
	Private financing may offer alternate sources of capital for highway infrastructure.	WBCSD, 2001

Economic Efficiency	Economic efficiency. This is further specified to be economic efficiency in the transport markets, the housing market, the labour market, and possibly some composite commodity markets, as well as economic efficiency in infrastructure and housing provision. This objective concerns the utility that the inhabitants of the city can get from taking part in these markets, and is measurable at the aggregate level as an appropriately specified welfare function, or at the level of each of the markets as consumer and producer surpluses. As for all the other sub-objectives, it may be an objective that is set for the present situation, or for some future situation, or both.	Prospects, 2001a
Contribution to Economic Growth	Contribution to economic growth. It will be an important objective for most cities that land use and transport policies should support economic growth. The SACTRA Report on "Transport and the Economy" (SACTRA 1999) identifies mechanisms by which transport improvements theoretically might lead to increased economic activity and thereby possibly to sustained economic growth. However, the empirical identification of such effects is a field of research that is poorly developed, and evidence is limited. Thus it might be difficult to measure goal achievement with respect to this objective. Any city is part of wider systems - perhaps world wide systems - of production and trade. Whether these systems are sustainable is an important question that cannot be fully addressed in our project. We will have to make assumptions about it when we develop scenarios in task 12. These assumptions imply a certain city specific growth rate that may be influenced by urban transport and land use strategies, but probably for the most part only in a minor way.	Prospects, 2001a
Market Reforms	Establish an enabling framework for competition by: Creating or strengthening regulatory institutions and performance standards for transport to ensure fair competition, to avoid predation and cartellization and to protect the public interest; Unbundling and restructuring agency responsibilities to enhance the potential for the sale, lease or subcontracting of transport infrastructure provision, operation and maintenance; and Increasing the capacity for creating private/public partnerships by more clearly defining and fairly sharing the liabilities, risks and returns in BOT and concession contracts for transport infrastructure.	World Bank, 1996
	Comprehensive Market Reforms. (http://www.vtpi.org/tdm/tdm29.htm). Transportation Market reforms include various policy changes that result in more efficient and fair transportation pricing, e.g. Full cost pricing, Revenue-Neutral Tax Shifts, Neutral Tax Policies, Improved Transportation Pricing Methods, Conventional parking pricing, and Neutral Planning and Investment Policies. Most comprehensive market reforms require federal or state/provincial legislation. Some tax reforms (such as tighter controls over personal use of business vehicles) can be implemented by government agency administrative action. Parking Pricing and Road Pricing can be implemented at the local or regional level. Parking Pricing, Parking Cash Out and Distance-Based Insurance can be implemented by businesses.	VTPI, 2001
Use of Competitive Market Structures	Increase the utilization of competitive market structures in transport services by: Encouraging the private operation of road, rail freight, air and maritime fleets; Discouraging cargo reservation and flag discrimination in the absence of a comprehensive assessment of net benefits to the country; and Developing better franchising and concessioning arrangements to ensure competition "for the market."	World Bank, 1996
Appropriate Investments	To ensure that transport infrastructure investments are based on the Best Practical Environmental and Social Option.	UK, RT, 1996

Social Equity

- Access & Choice
- Flexible Working Hours
- Equity and Social Inclusion
- Equity for The Poor

Access & Choice	Target the transport problems of the poor (particularly the urban poor) by: Improving their physical access to jobs and amenities, and reducing “excessive” time spent walking; Reducing barriers to the “informal” supply of transport (subject to “reasonable” and enforceable levels of safety); Enabling greater use of non-motorized transport by (i) improving right-of-way and interchange infrastructure, and (ii) eliminating fiscal and financing impediments to vehicle ownership; and Eliminating gender biases by integrating the transportation needs of women in the mainstream of transport policy and planning.	World Bank, 1996
	Complementarity of Options. Improve access by providing environmentally sound transportation options best adapted to the specific circumstances, giving people attractive choices as to how they meet their access needs. Demand Management. Reduce the need for travel while protecting social and economic needs for access by changing urban form, promoting new communications technologies, and developing more efficient packaging and delivery of goods etc.	OECD, 1996
	To increase the choice, and encourage the use, of economically, environmentally and socially efficient transport modes for car users and freight operators.	UK, RT, 1996
	To provide access to goods, resources and services, while reducing the need to travel, so that economic, environmental and social needs can be met efficiently and in an integrated manner.	UK, RT, 1996
	Design and operate transportation systems which can be used by the physically challenged. An aging population makes this more important than ever.	TAC, 96
	Create an environment in which automobiles can play a more balanced role. The idea is to use a carrot rather than a stick, to reduce single occupant auto trips. We need to provide travelers with real choices (through land use change) with walking, cycling, transit and high occupant vehicle options. We need to design and operate roads as multi-modal, multi-use public facilities and not as places to process cars.	TAC, 96
	Mobility for non-drivers. Provide adequate walking, cycling, rideshare, transit services; multi-modal community/land use. Improve mobility within neighborhoods. Neotraditional street planning, traffic calming, pedestrian/cycle planning, mixed land use.	VTPI, 1999
	Insure adequate transport services, provide mobility choices, reduce traffic congestion and barriers. Adequate road capacity, transit services, TDM, walking and cycling improvement, livable communities, delivery services.	VTPI, 1999
	Access Management. (http://www.vtpi.org/tdm/tdm1.htm). Access Management is a term used by transportation professionals for coordination between roadway design and land use to improve transportation. It is defined as, “the process that provides access to land development while simultaneously preserving the flow of traffic on the surrounding road system in terms of safety, capacity, and speed.” Access Management involves changing zoning laws, planning practices and design standards to limit the number of driveways on arterials and highways, construct medians to control turning movements, encourage clustered development, and create more pedestrian-oriented street designs. Access Management is promoted by transportation professional organizations, such as the Institute of Transportation Engineers (www.ite.org), the Transportation Research Board (www.accessmanagement.gov) and the American Association of State Highway and Transportation Officials (www.aashto.org). Access Management programs are usually implemented by transportation agencies. A particular staff or group may be assigned to develop Access Management guidelines and standards, and to implement Access Management activities.	VTPI, 2001
	Increase - Access to means of Mobility. Distance impedes accessibility, and mobility is the ability to overcome distance. As we have noted above, mobility is not the only way to gain access to goods and services — telecommunications is another — but mobility is surely an important way for people to achieve accessibility. Increasing access to flexible, affordable means of mobility can be achieved through improvements in any or all of these [car, two wheeled motorized vehicle, bicycle, etc.] various dimensions. Reducing the cost of various types of motorized vehicles is one such avenue of improvement. Improving the flexibility and reach of public transport systems is another. Developing new transportation devices that combine flexibility with low cost is a third.	WBCSD, 2001

Flexible Working Hours	Flexible working hours are designed to reduce demand for peak travel and the resulting congestion. True flexible hours working provides the employee with flexibility in hours of arrival and departure, while specifying a required core time and number of hours per week or month. In many cases they were introduced by employers to retain employees rather than for transport policy purposes, and the scale of their operation, and impact, is thus not well understood. Studies of flexible working hours and staggered hours suggest that the overall economic benefits have been small, but they can have significant benefits for participants. In some cases they have enabled peak public transport services to be withdrawn, thus saving operating costs (DoT, 1977), but in the main they have simply transferred travel to slightly less congested times. It had been feared that flexible working hours would discourage car sharing and public transport use. In practice, US experience suggests the reverse; some car users switch either to car sharing or to public transport because they can adjust their working hours to match the schedules imposed. A study in Boston found that flexible working hours in one major office led to a 7% reduction in drive alone car use, and 6% and 5% increases in car sharing and bus use respectively. (Ott et al, 1980). Brewer (1998) provides a more recent summary.	Prospects, 2001b
Equity and Social Inclusion	Equity and social inclusion. Social inclusion <i>in as far as our kind of planning is concerned about it</i> , consists of two sub-objectives: 1] accessibility for those without a car. 2] accessibility for mobility impaired. Important as they are, policies to provide affordable housing to everybody, to secure minimum levels of consumption, schooling etc. for everybody, and to counteract racism and other forms of social exclusion, are seen as lying outside the scope of the project and the kind of planning to be addressed in the guidebooks. Equity, on the other hand, consists of; 3] “fair shares/level playing field” – each mode and operator should neither pay way more nor way less than it gets from the government; 4] “compensation to losers” – inequitable effects of our strategies should be counteracted as far as possible; 5; “economise on tax payers’ money” - funds used for transport and land development purposes have alternative uses. The reason why the last objective is grouped under equity, is that public funds could be used instead for schooling, health care etc., which would have obvious equity implications. As far as this is the case, and only as far as this is the case, we also include the wider aspects of social inclusion and equity in our objectives. The sub-objective of compensation to losers includes compensation to those who are affected by negative impacts on the environment and safety.	Prospects, 2001a
Equity for The Poor	Protect the poor against the adverse effects of changes in general transport policies/programs by: Minimizing the amount of resettlement and where unavoidable mitigating the effects of resettlement by ensuring that people displaced by transport projects are resettled expeditiously and fairly; Mitigating the effects of redundancy in overstuffed transport enterprises and agencies by ensuring that constructive re-employment and severance financing arrangements are in place; and Developing efficient subsidy schemes for “social service” public transport by defining public service obligations and establishing fiscally sustainable contractual compensation arrangements.	World Bank, 1996

Science & Technology

- Research & Innovation
- Technology Policy
- Use of Existing Technology
- Promotion of New Technology
- Transfer of Technology
- Strategy for Technological Innovation

Research & Innovation	Research and Technological Innovation. Promote research and development of innovative alternative technologies and types of organisations that improve access and help protect the environment. The emphasis should be on providing a wide range of transportation options with a view to achieving the best environmental solution for a particular circumstance. Promote research and development on better adapting economic instruments to environmental challenges, in particular addressing long-term concerns, irreversibility of changes and threshold effects (“switching”) of the global ecosystem.	OECD, 1996
	Research and development on new vehicles and new energy sources, able to replace petroleum fuels, reduce the level of pollutant emissions and increase energy efficiency in transport, should be expended.	UNCHS, 2000
Technology Policy	Future Transportation Vehicle and Fuel Systems. Review the long-term sustainability of advanced vehicle/fuel systems, and ensure timely interagency consideration of key implementation issues.	Volpe, 1999
	Guideline 5: Identify strategies to achieve EST (Environmentally Sustainable Transport) and combinations of measures to ensure technological enhancement and changes in transport activity.	OECD, 2000
	The use of technology policies to help de-couple environmental degradation from economic growth. Provide permanent incentives to innovate and diffuse technologies that support sustainable development objectives, by expanding the use of market-based approaches in environmental policy. When market-based instruments are not appropriate, use performance standards in preference to measures that prescribe and support specific technologies. Support long-term basic research through funding and efforts to build capacity. Increase research on ecosystems, the value of the services they provide, the long-term impact of humans on the environment, and the employment effects of new technologies. Address unintended environmental and social consequences of technology, by separating technology promotion responsibilities from those on health, safety, and environmental protection within governments. Support applied research activities when they are clearly in the public interest and unlikely to be provided by the private sector.	OECD, 2001a
Use of Existing Technology	Ensure the use of best available technology (BAT) both for the transport vehicles and for the management and communication tools in transport.	Baltic 21, 1998
	Encourage the uptake of clean technologies for vehicles and fuels through targeted incentives.	OECD, 2001b
	Innovative policies and technologies have shown promise in alleviating many of the harmful side effects of motorization. In particular, the technology of Intelligent Transportation Systems (ITS) may increase the efficiency and productivity of the transportation system without requiring politically untenable new highway construction.	WBCSD, 2001
Promotion of New Technology	Analyse barriers to market penetration by environmentally friendly technologies and develop approaches on how to overcome this.	OECD, 2001b

Cont...	<p>Promoting adoption of sustainable transportation technology. Commitment 3.1. Transport Canada will prepare and implement a five-year multi-modal intelligent transportation systems (ITS) research and development plan to support private-sector innovation and technology development, by 2000/2001. Selected research projects will be conducted in partnership with academia and private industry partners, such as ITS Canada and the NAFTA Technology Working Group. Commitment 3.2. Transport Canada's Transportation Development Centre (TDC) will undertake, in cooperation with the federal Program of Energy Research & Development (PERD), research and development of new information and communication technologies to improve transportation systems, by 2003/2004. These technologies (sensors, communications, control, vehicle or vessel, location identification, navigation, data storage, and processing and display) will be applied to urban transportation, intermodal freight and air transport efficiency. Commitment 3.3. Transport Canada's TDC will undertake, in cooperation with PERD, research and development to aid the development of lightweight and low-emission vehicles using fuel cells, electric and hybrid drives and their supporting infrastructures, by 2003/2004. Commitment 3.4. Transport Canada will promote public awareness of advanced technology vehicles (ATVs) through: tests, inspections, evaluations, and reports on 10-15 advanced technology vehicles, detailing the ability of ATVs to comply with existing vehicle regulations (annually, starting in 2001/2002); the creation of a Green Vehicle program, identifying top 'green' vehicles for sale in Canada (by 2002/2003); a website that identifies 'green' vehicles for sale in Canada (by 2002/2003); and an assessment of the market penetration and potential of ATVs and barriers to their diffusion (by 2002/2003).</p> <p>Receptivity to innovation — a willingness to introduce new technology and experiment with new service enhancing innovations.</p>	TC, 2001
Transfer of Technology	Cooperation at the international level helps efforts to promote the transfer of technology from industrialized countries to developing countries in the transport sector. This is particularly relevant as new technologies emerge that have less adverse impacts on the environment. International cooperation has a special role to play in the transport sector given its importance in intra-regional, interregional and international trade and as a potential driving force for economic development.	WBCSD, 2001
Strategy for Technological Innovation	<p>STEP 1 – Identification of sustainably-sound heuristics: Given the complexity and the lack of insight into the question of what extent effects contribute to a 'more' or 'less' sustainable development, the notion cannot be realised in the shape of a set of firm measures for sustainability-criteria. Instead, the notion of sustainable development can be better understood as a path of investigation for risk minimisation where it concerns the sustainability-related characteristics. This- risk-evading attitude can be defined by explicitly declaring to what extent technological innovation contributes to a decrease in global pollution and/or the use of raw materials. What is of vital concern at this point is the important of clearly specifying the heuristics. Heuristics can, in this context, be understood to be a search window or a path in which technologies can be stimulated to develop (ex-ante approach), but it can also serve as a testing-framework for innovations.</p> <p>STEP 2 – Defining the relevant communities: [A]ttention should be given to the question of how specific technologies are developed. Because of the great diversity [with regards to the correct composition of the strategic consortium and the right aggregation level] it is preferable to speak of various communities. A) Identification of the Level Playing Field. B) Composition of Strategic Consortium. C) Responsibilities of different actors. D) Embodied in- or not in opposition to – the existing policy framework.</p> <p>STEP 3 – Inventory of present and future trends (including weak-signals): Mega-technology innovations and their application in a specific social sector, involve an international area of application and cover an extensive period of time. However, the locality in which innovations are finally implemented experiences strong dynamics; this certainly also applies specifically to the transport sector. Therefore, while it is important to proceed with a certain persistence in the technological area concerned, it is also important to aspire to flexibility.</p> <p>STEP 4 – Assessment of technological potentials and limitations: Technological assessment covers four main areas, namely: a) characteristics of the R&D or industry activity, b) environmental impact, c) costs, and d) barriers to development or implementation.</p> <p>STEP 5 – Identification of the Fields of Common Interests: The construction of the strategic consortium is a necessary, but not sufficient, condition for success. An important role is also reserved for the identification of 'social interests', whereby partners find each other and which lead to a social effort to realise a project.</p>	UNESC, 2000 Geerlings, 1999

<p>Cont...</p>	<p>STEP 6 – Application of instruments: The instruments that are traditionally applied can be classified as follows: Direct Regulation – using legislation and issuing rules, for instance based on the setting of standards; Indirect Regulation – employing economic incentives in the form of tax legislation and the granting of subsidies; and Self-Regulation – Internalising by communication, counseling, etc..</p>	<p>Cont...</p>
	<p>STEP 7 – Determination of the Window of Technological Opportunity: This concept does not refer to a static aim, but instead to an aim that is dynamic, complex and even changeable. Furthermore, the concept includes process management in order to attain the targets. Hence, it is necessary to consider the government’s role and the application of instruments while steering the technological sustainability-directed mega-innovation.</p>	

Institutional

- Government Decision-Making Processes
- Policy Packages / Frameworks
- Policy Integration
- Future Transport Policy
- Regional Transport Planning
- Tools For Decision-Making
- Government Support For Initiatives
- Support for Public Transport
- Strategic Planning & System Management Capabilities
- Transport Regulations
- Assessment of Long-term Trends
- Monitoring & Evaluation
- Assessment of Programs / Problems
- Public / Private Partnerships
- Goals, Performance & Outcomes
- Conventions (general)
- Linkages with the Global Economy
- Partnerships with Developing Countries
- International Cooperation
- Project Appraisal
- Expansion of Options
- Reduction of Congestion
- Reduction of Car and Lorry Growth
- Increasing Accessibility to Freight Transportation
- Automobile Usage
- Transit
- Rail
- Bus
- Cycling
- Walking
- Non-Motorized Transport
- Ridesharing
- HOV
- Reduction of Commute
- Travel Demand Management (TDM)
- Update of TDM Knowledge
- Connections
- Efficiency of Goods Distribution
- Promotion of Efficient Transport
- Traffic Management
- Optimization of the Existing System
- Safety
- Long-term Planning Horizons
- Implementation Plan
- Land Use & Transportation Planning
- Livable Streets and Neighborhoods
- Location Efficient Planning
- Least-Cost Planning
- Smart Growth
- New Urbanism
- Reduction of Impervious Surface
- Road Maintenance
- Job Creation
- Impacts of tourism
- Teleworking
- Park and Ride
- Parking
- Road Pricing
- Value Capture and Business Taxes
- Taxes
- Charging
- Fares
- Developer Contributions
- Company Travel Plans
- New Road Construction
- Public Transport Service Levels
- Promotion of Responsible Behaviour
- Public Awareness Programs
- Public Realm
- Enhancement of Appropriate Infrastructure

Government Decision-Making Processes	Redefining The Role Of Governments In The Transport Sector. The change of focus in transport policy towards a market-based approach implies a radical change in the role of government. The private sector can increasingly take on the responsibility for providing, operating and financing transport services, and even some transport infrastructure through concession arrangements. Thus, the role of the government as supplier or quantitative regulator will be reduced, but the importance of its functions as the enabler of competition and the custodian of environmental and social interests will increase. Cost-benefit analysis is becoming important as a method for allocating public resources economically (both for investment and purchase of social services). But setting efficient charges for the use of publicly provided infrastructure, maintaining the competitive environment in the sector and increasing community and user participation in decisionmaking, particularly in those areas where markets do not function adequately, will become more important.	World Bank, 1996
	Decision Making Processes. Make transportation-related decisions in an open and inclusive process. Inform the public about transportation options and impacts, and encourage them to participate in decision making so that the needs of different communities (i.e. rural versus. urban; cyclists versus. drivers, etc.) can be understood and accounted for. Ensure public and private sector stakeholders co-ordinate their transportation planning, development and delivery activities for the different transport modes to achieve integrated solutions. These transportation decisions should also be integrated with environment, health, energy, financial, and urban land-use decisions. Anticipate environmental or social impacts of transportation-related decisions by improving impact assessment and using life-cycle analysis rather than trying to react to them after the effects have occurred. This will result in considerable cost savings since transportation decisions often involve costly, long-term infrastructure investments. Consider both the global and local social, economic and environmental effects of decisions, and minimise negative effects.	OECD, 1996
	The reform of governments' decision-making processes to allow more integrative approaches to the full range of consequences of their policies. Improve capacity for policy integration at all levels of government. Improve transparency and public participation at all levels.	OECD, 2001a
	Enlightened political leadership — a commitment to achieving sustainable mobility at the highest levels of local political leadership.	WBCSD, 2001
	Institutional Reforms. (http://www.vtpi.org/tdm/tdm32.htm). Institutional Reforms are changes in policies and practices within organizations involved in transportation policy and planning decisions. Some institutional reforms require legislative or administrative action by policy makers and organizational executives. This may involves establishing goals, objectives and policies that support TDM, establishing a TDM Program or office within existing transportation agencies, budgeting adequate resources (money, staff time, etc.), educating transportation professionals about TDM, and overcoming identified obstacles. Least-Cost Planning can be implemented in conjunction with Institutional Reforms. Some reforms can be implemented within transportation agencies. Agencies can educate planners and other decision-makers about alternatives, and change the way projects are evaluated to account for a wider range of objectives and impacts. Agencies can develop internal TDM programs.	VTPI, 2001
Policy Packages / Frameworks	Develop an environmentally sensitive strategic framework by: Better integrating the provision of circulation space and transport capacity with land-use development, particularly in rapidly growing areas; Developing local standards for the provision of non-motorized transport; Developing of strategies that enable urban mass rapid transit projects to be incorporated, in a cost-effective way, in the long-term development of growing conurbations; Establishing road user charges that reflect externalities (road damage, air and noise pollution, congestion and safety); where fuel taxation is used as a proxy, Western European levels are a more appropriate benchmark than US levels for developing countries on the threshold of rapid motorization; Establishing a general urban transport fund to which revenues from the fuel surcharge are assigned to support expenditures on the most sustainable means of improving urban transport system performance; Ensuring that urban public transport fare, service and finance policies reflect the need to maintain public transport facilities while avoiding excessive shift to private automobiles; and Being sensitive to member country obligations under international environmental agreements, such as the International Maritime Organization Convention on Maritime Pollution (MARPOL), in preparing lending operations in the relevant sector.	World Bank, 1996
	Develop the necessary institutional and legal framework to integrate transport and land-use planning (spatial planning, physical planning) so as to reduce or mitigate transport demand in the medium and long term. ... Promote the use of cleaner and more fuel-efficient transportation technologies by use of fiscal instruments and legal standards.	Baltic 21, 1988

Cont...	Fiscal policies and other economic instruments should increase the share within the transport modes with high energy-efficiency and low emissions.	UNCHS, 2000
	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.	OECD, 2000
Policy Integration	Ensure that sustainable transport supports attainment of sustainable development in other sectors by being efficient and timely.	Baltic 21, 1988
	Planning. Transport Canada will extend the mandate of its internal Sustainable Development Strategy Committee beyond the year 2000. The Committee will meet regularly to oversee and coordinate implementation of the strategy, to ensure the department's sustainable development principles are applied to new policy and program initiatives and operations, and to foster better coordination of sustainable development activities across Transport Canada. Implementation and Operation. Transport Canada will conduct training in sustainable development to help key managers and staff increase their knowledge of sustainable development. A pilot course will be implemented by 2001/2002, and, if successful, a full course will be implemented by 2002/2003. The department will integrate sustainable development principles into existing training courses, including Transport Canada's orientation course and other courses dealing with safety and management training, by 2002/2003. The department will increase efforts to help all employees understand the importance of sustainable development, by including sustainable development articles in departmental newsletters in 2001/2002.	TC, 2001
	Develop and implement multi-modal strategies based on the Environmentally Sustainable Transport (EST) guidelines, emphasising policy integration among sectors.	OECD, 2001b
	Interagency cooperation — close coordination among various administrative units in charge of transportation and physical interconnections between light rail, metros, and buses.	WBCSD, 2001
Future Transport Policy	The basic concept of future transport policy should be a limitation of road traffic. Limitations and long term decrease targets in transport activities should be stated to reduce CO2-emission and the noise level, to protect habitats, nature and landscape and to improve urban liveability. On state, district, and local level according targets should be fixed.	Baltic 21, 1998
Regional Transport Planning	At the regional level, a number of options are available to promote sustainability in the transport sector, including the coordination of policies and measures for establishing guidelines and/or standards for emissions, infrastructure development projects, particularly those with a regional focus, and projects pertaining to sea shipping and the airline industry. The regional commissions should continue to play an active role in coordination and cooperation on transport, with a stress on its role as a key factor in achieving sustainable development. ... Cooperation at the regional level on improving data collection, compilation and analytical capabilities and methodologies in the transport sector may be beneficial for many regions. This is especially important in areas where cross-boundary pollution is a problem and opportunities exist to cooperate on measures and standards.	UNESC, 2000
Tools For Decision-Making	Developing tools for better decisions. Commitment 2.1. Transport Canada will identify its sustainable development data requirements, and develop a strategy and implementation plan to address existing data gaps, by 2001/2002. Commitment 2.2. Transport Canada will evaluate the impact of internalizing the social and environmental costs of the various transport modes, and develop a departmental position on cost internalization, by 2003/2004. The department will also develop analytical models to determine and allocate full costs (including infrastructure, safety and environmental costs) for road, rail, marine and air modes, and their users, by 2002/2003. Commitment 2.3. Transport Canada will work in close cooperation with the Centre for Sustainable Transportation (CST), Environment Canada and other federal departments and organizations (i.e. National Round Table on the Environment and the Economy and the Transportation Association of Canada) to develop a set of indicators to assess Canada's progress towards sustainable transportation, by 2003/2004. Commitment 2.4. Transport Canada will approve a policy for conducting Strategic Environmental Assessments (SEA), and establish an internal awareness program to familiarize staff with the policy, by 2001/2002. The department will also undertake a research project to develop specific SEA tools to better assess the environmental impacts of its surface policies and programs, by 2001/2002.	TC, 2001

Government Support For Initiatives	Policy. Transport Canada recognizes that the support of the department's senior management is critical. The department will ensure that those senior managers responsible for implementing specific actions in this strategy include these commitments in their annual accountability accords.	TC, 2001
Support for Public Transport	The development of efficient, environment-compatible, high-capacity public –transport modes deserves governmental support which should be granted if it does not undermine the achievement of other important social and economic objectives.	UNCHS, 2000
	Supportive policy environment — an explicit policy to support public transportation. This policy may be accompanied by limiting the use of automobiles in the city center and traffic-calming measures in residential areas.	WBCSD, 2001
Strategic Planning & System Management Capabilities	Develop the necessary strategic planning and system management capabilities to complement the market by: Creating or strengthening the public strategic planning capabilities necessary to complement and underpin a more competitive transport network; and Establishing processes for effective participation of affected users and communities in decision-making on the design, management and maintenance of transport infrastructure and publicly sustained services.	World Bank, 1996
	Emphasis should be given to training in transport-management skills, so as to build up planning and operating capacities.	UNCHS, 2000
Transport Regulations	ST [Sustainable Transportation] development would demand fuel economy standards that could either be implemented similar to the exhaust emission standards - which means that all cars have to meet e.g. a standard of 4 or less litres per 100 km in the EU driving Cycle - or as fleet average standards comparable to the so-called CAFE regulations in the United States. (CAFE: Corporate Average Fuel Economy. The effect of these regulations has been very strong in the 70s but fuel economy stopped to improve afterwards because the standards were not strict further more.)	Baltic 21, 1998
	Regulatory restrictions on car use have been used in several cities as an alternative way of reducing car use. Two main methods are in use: permits and number plate restrictions. Feasibility studies have suggested that permit systems could prove expensive in terms of the resources required to issue and check the validity of applications (GLC, 1979), and there will inevitably be an element of rough justice in the way that they are allocated.	Prospects, 2001b
Assessment of Long-term Trends	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'.	OECD, 2000
Monitoring & Evaluation	Monitoring of the environmental impact of transport should be improved, and studies on the quantitative evaluation of this impact, with regard to various transport modes, should be promoted.	UNCHS, 2000
	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.	OECD, 2000
	National Governments may ... wish to consider adopting measures to [w]ork towards establishing comprehensive transport databases for use by policy makers. ... The availability of information related to the transport sector is important for decision makers undertaking policies and measures related to sustainable development at the national level, as well as for coordination and cooperation efforts at the regional and international levels. Thus, efforts to assist in capacity -building, improving capabilities to collect, compile and assess and analyse transport-related data according to the most advanced methodologies and using up-to-date information technologies, would be a step forward. There now exist real possibilities for coordination and cooperation given the recent improvements in information technology and the widespread use of the Internet. But basic transport - related information is often unavailable, especially in developing countries. Training and upgrading of capabilities in transport information and information technology as well as capacity-building at the institutional level are areas that merit serious attention by the international community.	UNESCO, 2000

Cont...	Checking and Corrective Action. Transport Canada will develop a database to monitor the status of strategy commitments, targets and deliverables by 2001/2002. An annual report on implementation of the strategy will be presented to Transport Canada's senior management committee. A status report on all sustainable development commitments, targets and indicators will be included in the department's annual Departmental Performance Report. Management Review. Transport Canada will conduct a review of its sustainable development strategy every three years — the next taking place in 2002/2003. Transport Canada will extend the mandate of its external National Advisory Group beyond 2000. The Group will meet annually to provide strategic direction on the department's sustainable development priorities, review progress of strategy implementation, and make recommendations pertaining to review findings.	TC, 2001
	Continual improvement is key to the success of any sustainable development strategy. To do this, the department must review and evaluate its progress to determine whether its strategy is on track, whether activities are achieving the intended results, and where corrective action is needed. Accordingly, Transport Canada will assess and measure its performance in three ways: First, did the department do what it said it would do? Transport Canada will measure progress in implementing the 29 commitments in this strategy. Second, are these actions addressing the 7 challenges identified in the strategy? The department will monitor progress against selected indicators for each of the seven challenges. Third, is Canada making progress on sustainable transportation? This is a longer-term effort; through commitment 2.3 the department is developing a series of indicators to monitor Canada's progress on sustainable transportation.	TC, 2001
	Taking into account national conditions - Measure; total distances travelled (passenger km and ton km by transport mode), Fuel use efficiency by mode of transport, Emissions from different modes of transport, Frequency of exceeding air quality standards for major transport related air pollutants and hazardous trace pollutants, Proportion of population exposed to noise at levels harmful to human health, Habitat loss and fragmentation resulting from transport infrastructure.	OECD, 2001b
Assessment of Programs / Problems	Improve the approach and criteria for addressing the transport problems of the rural poor by: Emphasizing access (for example, by ensuring that facilities are durable and do not collapse or wash out) rather than high performance standards (for example, speed) in rural transport networks; Supporting cost-effective, labor-intensive methods for subsidiary level road construction and maintenance; and Ensuring community participation in decision-making on local transport investment and maintenance, establishing extension services to provide necessary technical advice and training, and supporting the development of rural funds.	World Bank, 1996
	Case Studies. Review existing case studies, increase awareness, and fill gaps by supporting new analytical case studies, demonstrations, pilots, and evaluation of innovative transportation, land development, and other strategies that make communities more sustainable, in particular with respect to potentially irreversible environmental effects.	Volpe, 1999
	Developed Countries: Research should be carried out on environmentally sensitive cost/benefit analysis techniques for transport infrastructure investments.	UNCHS, 2000
	Better assess the strategic environmental impacts of transport inducing infrastructure investment projects, policies, plans and programmes.	OECD, 2001b
Public / Private Partnerships	Wide public/private partnership in the provision of public -transport services should be encouraged.	UNCHS, 2000
	National Governments may ... wish to consider adopting measures to [e]ncourage the involvement of the private sector in appropriate areas of transport to promote efficiency and thus reduce emissions. ... Private/public partnerships. The private sector has traditionally been involved in the transport sector, and its role is increasing as restructuring is undertaken in both industrialized and developing countries. It may be appropriate for the international community to encourage partnerships among the private sector, Governments and civil society so that all actors in the transport sector work together to achieve sustainable development. Private/public partnerships can be instrumental in facilitating a transfer of cleaner technologies from industrialized countries to developing countries.	UNESC, 2000
Goals, Performance & Outcomes	Focusing on Goals, Performance and Outcomes. Sustainability requires that planning be based on goals and outcomes, such as improved social welfare, ecological health and access. It does not limit analysis to financial impacts and market activities. It also accounts for non-market activities and impacts.	VTPI, 2001

Conventions (general)	The international community has an important role to play in promoting and enhancing the effectiveness of policies and measures undertaken to achieve sustainable development in the transport sector. Cooperation at the international level has already emerged in a number of international arrangements, conventions and protocols, and is especially important in the areas of maritime transport and air transport. These mechanisms should be continued and strengthened where needed.	UNESC, 2000
	Support the further development and implementation of existing international conventions and other commitments on transport, environment and health.	OECD, 2001b
Linkages with the Global Economy	The strengthening of the contribution of the international trade and investment systems to sustainable development world-wide. Strengthen coherence among trade, investment, environment, and social policies. Support opportunities and capacities for developing countries to grow in a way that reinforces environmental protection and social development.	OECD, 2001a
Partnerships with Developing Countries	Partnerships with Developing Countries. Developed and developing economies should form strategic partnerships in order to create and implement new approaches to sustainable transportation. Specific initiatives with respect to access to information, impact assessment and evaluation, clean and resource efficient technology, and financial resources should be strongly supported.	OECD, 1996
International Cooperation	International co-operation can be influential in making transport in human settlements compatible with the sustainability goal. It should encompass the following: (a) Control of transboundary air pollution resulting from transport. (b) Consolidation of environment-protecting standards for production of transport (c) Facilitation of environment-friendly transport technologies. (d) Establishment of financial mechanisms enabling developing countries to build environmentally friendly public -transport systems on fair financial terms	UNCHS, 2000
	Financing. Since the implementation of strategies to promote sustainable development goals in the transport sector are unaffordable in many developing countries, the international community may wish to consider special measures to ensure that adequate financing is available for the transfer of cleaner technologies, the promotion of energy efficiency, improving the effectiveness of mass transit, the elimination of leaded gasoline and/or other issues deemed a high priority by the international community. Special funding arrangements might be considered, whereby transport measures and programmes to promote sustainable development could be established or incorporated as part of existing funding mechanisms. This would address a pressing need in current arrangements since established funds often overlook the transport sector or give it low priority.	UNESC, 2000
	Elaboration of a comprehensive, international action programme aimed at sustainable development in the transport sector. Consideration could be given to the elaboration of an international action programme, involving international organizations, governments and major groups, that could promote sustainable development in the transport sector. Such a programme could be built on such initiatives as the Global Initiative on Transport Emissions (see annex). It could incorporate the options discussed in the present report, specifically financing, transport information and private/public partnerships, in a coordinated way that would promote cooperation among industrialized and developed countries to reduce adverse environmental impacts from the transport sector while promoting socio -economic development. The programme of work could focus on regional and national training workshops on transport information; round-table meetings at the regional level to promote partnerships between vehicle and fuel manufacturers and consumers in developing countries and countries with economies in transition; and funding of sustainable development projects, with a focus on small and medium-sized businesses.	UNESC, 2000
Project Appraisal	Integrate environmental and economic elements in project appraisal through: Encouraging the preparation of implementable strategies for national or local transport that take into account environmental and economic considerations; Encouraging more systematic estimation of the impact that transport programs and projects have on safety and air pollution (including a monetary valuation in economic rate-of-return calculations); Assisting efforts to utilize the most cost-effective rather than the most technologically advanced solutions to environmental problems; Ensuring that effects on non-motorized transport are included in road and rail project design and evaluation; and Protecting against the adverse environmental impact of road and other transport network induced developments on forests, wetlands and other natural habitats, as well as on cultural heritage sites by requiring the correct framework for protection to be in place before project implementation.	World Bank, 1996
Expansion of Options	Expanded Program and Policy Options. Expand the set of recognized potential strategies and scenarios to make transportation systems more sustainable—particularly with respect to potentially irreversible environmental effects, and to develop improved methods for characterizing the expected combined effects of different strategies.	Volpe, 1999

Reduction of Congestion	Decrease - Congestion. Personal mobility can be improved on an individual basis and in a rather short period of time. For example, if income is no longer a constraint, people who walked or bicycled can choose to travel using faster modes, such as automobiles and motorized two wheelers. As a result of increased demand for personal mobility, infrastructure demand can increase rapidly. But infrastructure can only be provided collectively at a larger scale, and this takes time. The inertial nature of transportation facility development and urban structure adjustments makes it difficult to keep up with a population's rapid shifts to motor vehicles, and this results in serious system imbalance and enormous congestion.	WBCSD, 2001
Reduction of Car and Lorry Growth	To reduce the growth in car and lorry traffic to sustainable levels.	UK, RT, 1996
	Lorry routes and bans are primarily designed to reduce the environmental intrusion of heavy lorries, rather than to improve their operating conditions. Routes can be mandatory, but are more frequently advisory, and thus avoid serious reductions in freight access. Bans can be area-wide (for example in the cells between lorry routes) or limited to particular roads, or applied solely to short lengths of road forming a screenline or cordon. They can be complete, or limited to certain times and certain sizes of vehicle, or with exemptions for access. Such exemptions avoid problems of lost accessibility, but are difficult to enforce. CCTV is being increasingly used as an enforcement presence (IHT, 1997). Generally, restrictions on lorries are likely to result in reduced efficiency, and will require increased enforcement costs. Conversely they should, if well designed, improve the environment and safety. There have been relatively few studies of such measures, although that for the Windsor cordon demonstrated that any environmental benefits may be more than offset by increased operating costs, and by environmental losses on the diversion routes (Christie <i>et al</i> , 1978).	Prospects, 2001b
Increasing Accessibility to Freight Transportation	Increase - Inexpensive Freight Transportation. As urban populations grow, there is greater need to move raw and semifinished materials from where they are found and processed, and to ship finished goods to market. Cities cannot exist without these freight systems, and people in rural areas cannot find markets for their goods without them either. However, the volume of freight and freight moving vehicles is becoming so great in many areas of the world that they are major competitors for scarce infrastructure capacity and also major sources of air pollution. The growth of e-commerce depends upon an ability to deliver electronically ordered goods quickly and efficiently. Just-in-time manufacturing has similar requirements. Many of the world's existing freight transportation systems were built in different eras to meet requirements that were very different from those of today.	WBCSD, 2001
Automobile Usage	Developed Countries: In line with the improvement in public transport, restrictions on car traffic should be imposed in congested and environmentally-sensitive areas.	UNCHS, 2000
	Physical restrictions on car use have been proposed more generally as ways of reducing car use in urban areas. Possibilities include extensive pedestrian areas and traffic calming, and also the use of bus lanes to reduce capacity at junctions and give clear priority to buses.	Prospects, 2001b
Transit	Provide higher quality transit service to increase its attractiveness relative to the private auto. The Canadian Urban Transit Association and its members are doing a lot of good work in this area. Current transit performance is higher than in the U.S. but lower than in Western Europe. Area wide harmonization of schedules, fares and information will be important for success.	TAC, 96
	The role of public transport in making urban transport compatible with the requirements of sustainable development should be fully recognized and be adequately reflected in urban transport plans and development programs. High-occupancy public –transport vehicles should be given preferential treatment in traffic -management policies. ... Developing Countries: Development of affordable, reliable and efficient public transport should be given top priority in urban transport plans and development programs. Coordinated transport and land-use planning should make provision for gradual improvements to public –transport systems, so as to enable them to respond to a fast-growing demand for transport. Travelway space should be allocated to public transport and segregation of public transport from general traffic should be promoted in heavily loaded traffic corridors.	UNCHS, 2000
	The influence of public transport as an instrument of sustainable mobility is expected to decline if cities spread out and their populations continue to disperse. However, public transport will remain essential for the future mobility and economic viability of large metropolitan regions in the industrialized world.	WBCSD, 2001

Cont...	Transit Improvements. (http://www.vtpi.org/tdm/tdm47.htm). Public Transit includes various types of services and vehicles that provide mobility to the public. There are many ways to improve and promote public transit; Additional routes, expanded coverage, increased service frequency and hours of operation; Reduced and more convenient fares (such as discounts for frequent users); HOV Priority (bus or HOV lanes, queue-jumper lanes, bus-priority traffic signals, and other measures that reduce delay to transit vehicles); Comfort improvements, including bus shelters and better seats, Universal Design of vehicles, stations and pedestrian facilities to accommodate people with disabilities and other special needs; Improved Security for transit users and pedestrians; Improved rider information and marketing programs; Services targeting particular travel needs, such as express commuter buses, special event service, and paratransit for people with disabilities; Various types of Shuttle Services; and Park & Ride facilities. Transit service improvements are usually implemented by transit agencies, often with support from other government agencies and businesses. Major transit investments sometimes require voter approval. Some improvements, such as HOV lanes and Park-and-Ride facilities, are provided by roadway agencies. Improved amenities for transit users on vehicles and at waiting areas can increase/improve transit service and attract riders (Project for Public Spaces, 1999).	VTPI, 2001
	Transit Oriented Development. (http://www.vtpi.org/tdm/tdm45.htm). Transit Oriented Development (TOD) refers to residential and commercial areas designed to maximize access by Transit and Nonmotorized transportation. A TOD neighborhood has a center with a rail or bus station, surrounded by relatively high-density development, with progressively lower-density spreading outwards. It includes these design features (Morris, 1996); The neighborhood is designed for Cycling and Walking, with adequate facilities and attractive street conditions; Streets have Traffic Calming features to control vehicle traffic speeds; Mixed-use development that includes shops, schools and other public services, and a variety of housing types and prices, within each neighborhood; and Parking Management to reduce the amount of land devoted to parking compared with conventional development, and to take advantage of the parking cost savings associated with reduced automobile use. Transit Oriented Development can consist of new suburban neighborhoods designed around public transit stations, or incremental changes to existing urban neighborhoods that have public transit. Bernick and Cervero (1997) and PBQD (1996) describe Transit Oriented Development planning practices. Morris (1996) describes specific changes to zoning laws and policies to encourage TOD.	VTPI, 2001
Rail	Conventional rail provision includes significant upgrades to existing infrastructure, as well as the provision of new lines and stations. The transfer from car will reduce congestion, provided that overall demand does not increase. It will also contribute positively to the environment, while the reopening of closed lines and stations, and even new infrastructure, if carefully designed, should have little negative environmental impact. Reduced car use will also contribute positively to safety.	Prospects, 2001b
	Light rail has become a widely proposed alternative to conventional rail provision since the 1980s, with 69 new systems worldwide being built since 1980 (Babalik, 2000). Its impacts on the economy, the environment, safety, accessibility, and equity are thus likely to be similar to those of conventional rail, with a few exceptions. Light rail may potentially have adverse impacts on travel times for other modes if capacity for other traffic has to be reduced. Light rail schemes have been targeted at producing a mode shift from car use. To some extent this has been successful (Oscar Faber, 1996), with 12-15% of Manchester Metrolink patronage coming from car users, but the majority of patronage has come from bus services and from the rail services which the scheme replaced.	Prospects, 2001b
	Guided bus provides a lower cost alternative to light rail while having the advantages of dedicated rights of way. While totally separate rights of way can be provided, as in Adelaide, most current proposals envisage providing guideways solely where buses need to bypass congestion, as in Leeds. The impact of guided bus is uncertain, as few schemes have been implemented. It should have less adverse impact on congestion than light rail, by requiring less space, but its positive impacts depend critically on its ability to attract patronage. If it is perceived by car users as a slightly improved bus it will be unlikely to contribute significantly to the reduction of congestion, environmental impact and accidents, and will perform much as bus priority measures do. If it is seen as a higher quality service approaching that of rail, its impact will be much greater.	Prospects, 2001b

Bus	Bus priorities enable buses to bypass congested traffic and hence to experience reduced and more reliable journey times. The most common measures are with-flow bus lanes; others include bus gates or bus only sections, exemption from banned turns, selective detection at signals, and UTC timings weighted to favour buses. Contra-flow bus lanes and bus access to pedestrian areas are designed specifically to reduce the adverse impact on buses of certain traffic management measures. Bus priorities are usually designed to keep loss of capacity to other traffic to a minimum. The main disadvantages are to frontage access, if parking is restricted, and to the environment, since queues will be longer, and traffic diversions may be induced (NATO, 1976), although it may be possible for traffic management systems to relocate queues to places where these disbenefits can be minimised.	Prospects, 2001b
	Bus service management measures can be designed to improve the reliability of bus services and reduce operating costs, using fleet management procedures, and enhance their quality of service using real-time information.	Prospects, 2001b
	Bus partnerships (known as Quality Bus Partnerships in the UK) are agreements between city authorities and bus operators to enhance bus services (TAS, 1997). The aim is to achieve faster services that will attract more passengers.	Prospects, 2001b
Cycling	Increase opportunities for cycling as an optional mode of travel. "Opportunity" is the key word here. Many cycling options exist, even in Canada's cold climate, but better infrastructure is required.	TAC, 96
	Cycle routes provide dedicated infrastructure for cyclists, and hence extend the range of cycle Priorities. As well as making cycling safer, they have been designed to attract more people to cycle in preference to driving, hence achieving the benefits of reduced car use.	Prospects, 2001b
	Cycle lanes and other priorities, whereby a part of the highway is specifically allocated to cyclists and whereby cyclists receive priority at junctions, serve the same function as cycle routes (section 4.3). Experience with them is similar (Tolley, 1993). They can reduce accidents for cyclists (although the evidence is conflicting (Elvik et al, 1997)), but have to be fast as well as safe if cyclists are to use them (Kolbenstvedt et al, 2000).	Prospects, 2001b
	Cycle parking provision, to increase availability and security, may also be beneficial.	Prospects, 2001b
Walking	Promote walking as the preferred mode for person trips. Notice that walking is listed first of all the modes. Here we seek a return to pedestrian friendly streetscapes in lively neighborhoods.	TAC, 96
	Pedestrian routes are increasingly seen as an important part of overall strategies to encourage walking. Pedestrian areas provide a dramatic improvement in the environment for pedestrians, in increasing safety, and have proved very successful in enhancing retail vitality in many town and city centres.	Prospects, 2001b
	Pedestrian crossing facilities are primarily a safety measure but may also reduce travel time for pedestrians.	Prospects, 2001b
	Tactile footways are a means of providing warning and, in some instances, orientation information to blind and partially-sighted pedestrians. There are a number of different designs of tactile paving which rely on different raised patterns to convey different messages (DETR, 2000). Tactile paving is most commonly used at road crossings, so as to identify where there is a dropped curb and/or a controlled pedestrian crossing point, but it is also used at bus stops and along the edges of railway and metro platforms. More recently it has been used to provide orientation across open pedestrianised areas. Two issues which appear to be important are the need for standardisation of different designs so that they provide a consistent message and the need to strike a balance between providing sufficient information to be helpful, without it being overwhelming and confusing.	Prospects, 2001b
Non-Motorized Transport	Increase active transport. Improve walking and cycling conditions, traffic calming, encourage non-motorized transport, TDM.	VTPI, 1999
	Cycling and walking should be recognized as important components of urban traffic: safe cycleways and footways should be provided, while the attractiveness of these modes of travel should be enhanced by ensuring proximity of work-places and services to residential quarters.	UNCHS, 2000

Cont...	Walking and Cycling Improvements. (http://www.vtpi.org/tdm/tdm25.htm). Nonmotorized transportation includes walking, cycling, skating, scootering and wheelchair travel. These modes provide both recreation (they are an end in themselves) and transportation (they provide access to goods and activities), although users may consider a particular trip to serve both (users choose a nonmotorized mode, although it takes longer, because they enjoy the activity). Pedestrian and cycling improvements are usually implemented by local governments, sometimes with funding and technical support of regional or state/provincial transportation agencies. It usually begins with a pedestrian and bicycle plan to identify problems and prioritize projects (Litman, et al., 2000). Implementation may require special funds, either shifting funds within existing transportation, a new budget allocation, or grants.	VTPI, 2001
Ridesharing	Car sharing (or “car pooling”) involves encouraging drivers to share the use of their car. It thus offers a means of reducing car traffic while retaining many of the advantages of private car travel. Several experiments have aimed to encourage drivers to share their cars with others or to ‘car pool’ by taking it in turns to drive. Unfortunately, experience suggests that the numbers sharing voluntarily, even with incentives, are unlikely to exceed 5% of car users, and that their passengers are as likely to transfer from bus use as from other cars (Bonsall et al, 1981; Pozueta, 1999). Such schemes are thus likely to have a minimal impact in urban areas although, at the margin, they may offer some reduction in congestion. Such schemes are highly likely to be more successful when linked to other policies such as Company Travel Plans.	Prospects, 2001b
	Car clubs involve shared use of vehicles through membership of a car-sharing organisation (there is some confusion between this and car sharing in the terminology in the current literature).	Prospects, 2001b
	Ridesharing. (http://www.vtpi.org/tdm/tdm34.htm). Ridesharing refers to carpooling and vanpooling (the term is sometimes also applied to public transit, particularly commuter express bus). Carpooling uses participants’ own automobiles. Vanpooling uses vans that are usually owned by an organization (such as a business, non-profit, or government agency) and made available specifically for commuting. Rideshare programs can be implemented by an individual employer as part of a Commute Trip Reduction program, by a Transportation Management Association or a Campus Trip Management program, a transit agency, or by a regional transportation agency. Marketing can inform potential ridesharers about the service. Vanpooling requires more organizational structure to address vehicle ownership, expense recovery and liability issues. Taxi Improvements can include regulatory changes that allow shared taxi ridesharing.	VTPI, 2001
HOV	High occupancy vehicle lanes extend the use of with-flow (and potentially contra-flow) bus lanes to other vehicles which make more effective use of scarce road space. These can include car sharers, taxis and commercial vehicles.	Prospects, 2001b
	HOV Priority. (http://www.vtpi.org/tdm/tdm19.htm). High Occupant Vehicles (HOVs) include transit buses, vanpools and carpools. They are also called Rideshare Vehicles. Two, three or four occupants (indicated as 2+, 3+ or 4+) may be required to be considered an HOV, depending on circumstances. This is opposed to Single Occupant Vehicle (SOV) travel. HOV priority is a major component of many regional TDM programs. HOV facilities can be implemented by adding new road capacity designated for HOVs. Sometimes, existing lanes are converted to HOV use (called “take a lane”). HOV lanes can be separated from regular traffic using signs, markings, painted buffer or physical barriers. HOV lanes can be 24 hour or designated for peak hours only, and some use reversible lanes. HOV programs are most successful as part of an integrated regional transportation strategy that includes other improvements and incentives for transit and rideshare use.	VTPI, 2001
Reduction of Commute	Commute Trip Reduction. (http://www.vtpi.org/tdm/tdm9.htm). Commute Trip Reduction (CTR) (also called Employee Trip Reduction or Vehicle Trip Reduction) programs give commuters resources and incentives to reduce their automobile trips. Commute Trip Reduction programs may be encouraged or required by local, regional or state/provincial policies. For ease of administration, mandatory CTR laws often apply only to large employers (those with at least 50 or 100 at a worksite), although this limits their effectiveness since the majority of employees in most areas work for smaller companies. Smaller employers can form a Transportation Management Association to provide CTR services in a particular commercial district or mall. Many transportation planning and transit agencies provide support for CTR programs. Developers may implement CTR programs in exchange for reduced parking requirements. To establish a Commute Trip Reduction program, a business usually develops corporate goals and objectives, policies and procedures, and services and benefits. Sustainability objectives have several implications for transport planning.	VTPI, 2001

Travel Demand Management (TDM)	Decrease the demand or at least mitigate the increase of demand for motorised transport of people and goods, e.g. by establishing transport avoiding spatial structures, by applying fiscal incentives and other policy instruments to promote regional access rather than long distances, shift transport demand from unfavourable transport modes (in terms of environmental, social and economic impact) to those with less negative impact on man and nature.	Baltic 21, 1998
Update of TDM Knowledge	Land Development and Travel Behavior. Update and refine our knowledge of the interrelationships between land development, locational choice, travel behavior, and other factors affecting travel, such as pricing and incentives. To integrate this information into planning models and tools, decision making processes, and programs to support sustainability.	Volpe, 1999
Connections	Promote inter-modal and inter-line connections.	TAC, 96
	Terminals and interchanges provide a means of extending the coverage of public transport services, by reducing the time taken to interchange between bus services or between bus and rail. They also provide a focus for city centre bus services, and reduce the congestion of on-street stops and terminals.	Prospects, 2001b
Efficiency of Goods Distribution	Improve the efficiency of the urban goods distribution systems. This will be difficult because even basic data [is] lacking, and because of the fragmented and highly competitive nature of the trucking industry. More off street loading zones are a first step.	TAC, 96
	Freight mobility and affordability, facility siting options. Adequate road/rail/air freight capacity, efficient land use, freight priority, TDM.	VTPI, 1999
	Trucks - Potential solutions for the problems generated by trucks demonstrate the financial, political, and technological hurdles to sustainable mobility throughout the freight system. More heavy-haul rail lines can be built, connecting more intermodal freight facilities, so that cargoes can move on railways, trucks, or ocean tankers as appropriate. Second, new routes for trucks — either isolated express lanes or entirely new roads — can be built. And third, quieter, more fuel-efficient, less-polluting trucks can be brought to market. Any one of these solutions would require substantial investments of money to achieve. Quite apart from the investment required, community and public concerns related to potential loss of land will need to be addressed, particularly where scarce urban space is involved. In many parts of the developing world, national freight networks are relatively immature, although more severe problems of a paucity of urban land and a lack of financing pose high hurdles.	WBCSD, 2001
	Transshipment facilities aim to provide a means of transferring goods from the larger vehicles needed for efficient line haul to smaller, less environmentally intrusive vehicles for distribution in town centres. Some proposals have also envisaged trolleying of goods over short distances and, at the other extreme, underground freight distribution. Experience to date in the UK suggests that such facilities are unlikely to be attractive to freight operators, and hence to be cost effective, at least until much greater restrictions on existing practices can be justified (Collis, 1988).	Prospects, 2001b
Promotion of Efficient Transport	Give priority to modes of transport that meet needs in the most eco-efficient manner in every specific case, which may include a general shift from road transport to sea and train transport, if appropriate.	Baltic 21, 1998
	Transportation facility and service efficiency. Planning and management for efficiency, efficient pricing, TDM.	VTPI, 1999
	Developed Countries: The efficiency of public transport should be increased, and new public –transport systems, able to attract car users, should be developed. ... Developing Countries: Particular attention should be attached to effective traffic management, to efficient operation of public transport and to proper maintenance of the transport infrastructure.	UNCHS, 2000

Cont...	<p>Promoting efficient transportation. Commitment 7.1. Transport Canada will complete a comprehensive two-part, forward-looking study related to modal integration in support of Canada's competitive position in a North American global market place, by 20012/20023. The study will explore potential public and private sector approaches to facilitate modal integration and address such issues as: efficiency gains in supply logistics, seamless transfer of goods, single way bill from origin to destination, sensitivity of commodities to shifts between transport systems and ITS, and IT and other technological considerations. Commitment 7.2. Transport Canada will develop and incorporate sustainable development criteria into its infrastructure funding agreements and programs, including the Airports Capital Assistance Program (ACAP), federally co-funded highway agreements and projects, and support for passenger rail, by 2002/2003. Commitment 7.3. Transport Canada will work with provinces, municipalities and others to increase awareness of best practices in sustainable urban transportation, including: creating a website of best practices, in 2002/2003; launching a national awards program to recognize leaders, in 2002/2003; and sponsoring a national conference on urban transportation issues, in 2003/2004.</p>	TC, 2001
	<p>Enhancement of bus and rail vehicles generally fall into two categories. Firstly, there are features to make the vehicles more <i>accessible</i> and user-friendly, in particular to people with impaired mobility. Secondly, adapted engine designs and propulsion mechanisms to accommodate the use of <i>alternative fuels</i> and electric traction have been pursued in order to <i>reduce the environmental impacts</i>, in particular on local air quality, relative to traditional, eg diesel fuelled, vehicles.</p>	Prospects, 2001b
Traffic Management	<p>National Governments may ... wish to consider adopting measures to [i]nitiate training programmes for drivers of trucks and fleet operators [and to] [e]ncourage the use of information technology in the transport sector, where appropriate.</p>	UNESC, 2000
	<p>Conventional traffic management includes a wide range of largely urban measures, and the reader is referred to other texts, especially IHT (1997), for more detail. In general, measures such as one way streets, redesign of junctions, banned turns and controls on on-street parking have been shown to have beneficial impacts on travel time and on accidents, and typically to repay the costs of implementation within a matter of months (Duff, 1963). It is, however, necessary to bear in mind their possible adverse impacts. If such measures cause some traffic to reroute, journey lengths may increase and, in the extreme, this could more than offset the benefits of any increase in speed. The economic user-benefits are particularly sensitive to this process.</p>	Prospects, 2001b
	<p>Urban traffic control (UTC) systems are a specialist form of traffic management which integrate and co-ordinate traffic signal control over a wide area (for more detail see IHT, 1997). They use the signal settings to optimise a given objective function such as minimising travel time or stops. UTC systems are either fixed time, using programs such as TRANSYT, or real time, such as SCOOT. The former costs less to implement, but settings are related to past traffic data, and become outdated as patterns change; the latter uses extensive detectors to measure current traffic patterns, and adjusts signal settings accordingly (Wood, 1993).</p>	Prospects, 2001b
	<p>Intelligent transport systems use new technology to improve the performance of the road network, They include developments in motorway access control (ramp metering), automatic incident detection (AID), image processing of CCTV, selective vehicle priority, queue management techniques and many other experimental measures. Many of these measures can be linked in with UTC, generally termed UTMC (Urban Traffic Management and Control (Fox et al, 1995, Routledge et al, 1996). It also includes the extension of UTC to provide priorities for buses, and their <u>integration with information systems such as dynamic route guidance.</u></p>	Prospects, 2001b
	<p>Real-time driver information systems and route guidance are a type of Intelligent Transport System application. Information from equipped vehicles or traffic sensors is used to provide radio or in-vehicle display messages (such as Trafficmaster) of delays, or to indicate preferred routes to avoid congestion. Dynamic route guidance systems can provide recommended routes to all equipped vehicles, dependent both on their destinations and the current traffic conditions. Evidence suggests that familiar drivers are more likely to prefer information, and to choose their own routes, while unfamiliar drivers prefer guidance (Bonsall, 1992).</p>	Prospects, 2001b
	<p>Conventional direction signing can provide benefits to car users, and other traffic, by reducing journey lengths and travel times; evidence suggests that around 6% of travel time may be accounted for by poor routeing, and that inadequate destination signing may as much as double the time spent searching for unfamiliar destinations (Jeffery, 1981). Conversely, direction signing can be used to divert traffic away from environmentally sensitive routes; however, familiar drivers are unlikely to respond to such measures.</p>	Prospects, 2001b

Cont...	Variable message signs enable drivers to be diverted away from known, but unpredictable congestion.	Prospects, 2001b
	Parking guidance and information systems are a further application of ITS principles, designed to reduce the high level of traffic searching for parking space in urban centres. Detectors identify car parks which are full or almost full, and trigger signs indicating the route to the nearest available space (examples can be found in IHT, 1997 and DoE/DoT, 1995). Studies have demonstrated a significant reduction in time spent finding a parking space, but it has proved more difficult to estimate the resulting reduction in vehicle-km (Polak <i>et al</i> , 1990). As with VMS, the actual response levels to PGI are lower than expected, due to the complexity involved in the behavioural choice (Thompson and Bonsall, 1997). The efficiency and accessibility benefits from reduced searching may be associated with some reductions in environmental intrusion and accidents, but these will depend on the local circumstances.	Prospects, 2001b
	Real time passenger information is now being provided, not just at major terminals, but at individual stations and bus stops, and on trains and in buses. There is some indication that real-time information can increase bus patronage, and if this is the case it offers considerable accessibility and equity benefits. However, technology costs are high.	Prospects, 2001b
	Trip Planning Systems (IHT, 1997), based on either dedicated terminals (at public transport interchanges and stations), over the telephone, or via the Internet, are an attempt to assist the traveller sort through the different travel options with some 'expert' advice. Again there appears to be no study of how effective these are in maintaining or increasing public transport patronage, nor about their reliability or use.	Prospects, 2001b
	Static direction signs are virtually the only measure available under this heading, but can be used to enhance the use of cycle priority routes and to improve access within pedestrian areas for disabled pedestrians. Tactile footways are a further facility providing specifically for visually handicapped pedestrians. Public awareness campaigns (see section 3.1) can be used to encourage walking and cycling, and familiarise road users with appropriate signing. Static direction signs may be the main element in voluntary lorry routing schemes.	Prospects, 2001b
	Fleet management systems have been introduced widely for freight vehicles, enabling them to respond more rapidly to the changing demands of Just in Time delivery schedules, and reducing the number of empty return journeys. They can also extend to dynamic route guidance to avoid congestion. However, whilst a more efficient freight sector is likely to lead to some wider benefits to society in terms of fewer lorries adding to congestion at key times and places, most such systems are introduced by freight operators, and local authorities have little role in their implementation or operation.	Prospects, 2001b
	Operation information systems use ITS-based fleet management facilities to identify locations of buses and to reschedule services to reduce the impact of unreliability. Such systems were studied initially in the 1970s (Finnamore and Jackson, 1978) and under the EU DRIVE programme (Keen, 1992).	Prospects, 2001b
Optimization of the Existing System	Optimize the use of existing transportation systems to move people and goods. This means we should make the most of what we have.	TAC, 96
Safety	Decrease - Transportation-related Accidents. The cost in human lives, injuries, and suffering attributable to highway and road crashes is staggering, particularly compared to other, less common risks of harm that invoke much greater publicity with far fewer victims. Toward the end of the 1990s, around 42,000 people were killed each year in road accidents in Western Europe, down from around 56,000 at the beginning of the decade. In the United States, the number of people killed in road accidents per year varied between 40,000 and 45,000. On average in the two regions together, a person dies in a road accident about every six minutes. In some countries, road accidents are the primary cause of death in the 15- to 30-year-old age group. The number of people seriously injured in road accidents is typically more than ten times higher, and the number of people receiving light injuries over 65 times higher, than the number of fatalities. Fatality rates in the cities of the developing world are growing rapidly and are often already at alarmingly high rates, given the low absolute levels of motorization.	WBCSD, 2001
	Accident remedial measures also cover a wide range of possibilities, and are much more fully documented elsewhere (IHT, 1990, 1997; Elvik, Mysen and Vaa 1997). Most blackspot treatment and mass action measures (such as skid-resistant surfacing) will have few impacts other than a reduction in accidents; their effects on other objectives can therefore be considered minimal. Area wide measures are likely to have other impacts, and are considered below under the general heading of traffic calming.	Prospects, 2001b

Cont...	Safety and severity of traffic accidents. As with environmental sub-objectives, there is also a distributional perspective associated with traffic accidents. This ought to be reflected by our indicator list. [Accident Costs, Accidents by location, mode, victim.]	Prospects, 2001a
	Traffic calming measures are designed to reduce the adverse environmental and safety impacts of car (and commercial vehicle) use. They have traditionally focused on residential streets, for which Buchanan, in "Traffic in Towns", proposed an environmental capacity of 300 veh/h (Buchanan, 1963), and [has] involved two types of approach: segregation, in which extraneous traffic is removed; and integration, in which traffic is permitted, but encouraged to respect the environment.	Prospects, 2001b
Long-term Planning Horizons	Guideline 1: Develop a long-term vision of a desirable transport future that is sustainable for environment and health and provides the benefits of mobility and access.	OECD, 2000
Implementation Plan	Guideline 8: Develop 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).	OECD, 2000
Land Use & Transportation Planning	Compact, mixed use communities. Implement policies that will bring about more compact, mixed-use development in urban areas to shorten travel distances and reduce vehicular travel demand.	Ontario, RT, 1995
	Land Use. Emphasise compact urban form in order to reduce habitat destruction and division of ecosystems, and loss of agricultural and recreational lands around urban areas. Reorganise cities primarily around transport services that minimise land use. Minimise division of land, its use as well as the impact on natural habitat and the wildlife and people it supports in the design, construction and operation of inter-city transportation systems and infrastructure, including, for example, highways, pipelines, and railways.	OECD, 1996
	Urban Planning and Transportation Planning. Limit urban sprawl and provide for more mixed land use through urban structure, economic and land use policies. This would reduce demand (especially for automobile trips) by moving origins and destinations closer together and also help reduce habitat destruction and loss of agricultural and recreational lands. Give priority to less polluting, lower impact modes of transportation in the design of transportation systems and urban areas. Pedestrian and cycling paths should be provided as attractive and safe alternatives to cars. Maintain and enhance the performance and viability of urban public transit systems. Reconsider the organisation of transport modes, whether for passengers or goods, in order to provide more environmentally efficient goods movement, and to increase the availability and attractiveness of lower impact transportation options such as public transit. Protect historical sites and archaeological resources, and consider both safety and attractiveness in the planning, design and construction of transportation systems.	OECD, 1996
	Plan for increased densities and more mixed land use. This principle is fundamental to achieving the whole vision. It calls for new developments within existing urban boundaries, especially at town centres and along transit corridors. If successful this will reduce dependence on the private auto, shorten many trips and encourage walking, cycling and transit use.	TAC, 96
	Land-use planning aiming at reduced transport demand is a necessary condition for a long-term sustainable development. It does not necessarily reduce car use and car kilometres directly when the price of car use is low (compared to income) and when no shortage in road or parking space is existing. Anyhow, this complimentary strategy is very important to mitigate transport and emission on the long term. A comprehensive planning system would start with principles of land-use development to be laid down by the national and by the provincial levels, which give the frame to local detailed planning on the community level. These principles could include minimum settlement densities for different areas and purposes, demand rail-oriented development for land-uses with high transport activities, give design guidelines to support efficient service of public transportation, and demand compliance with sustainability objectives like e.g. maximum vehicle kilometres per capita or per planning area. Planning regulations should demand the assessment of consequences, not only the direct environmental impact as it is demanded in Environmental Impact Assessment (EIA) but also of the long-term impact on spatial development, transport demand and energy consumption. Shortcomings of the usually used instrument of Cost-Benefit Analysis (CBA) to exist with respect to the long-term consequences.	Baltic 21, 1998

Cont...	Subnational development planning and local land-use planning should be deeply concerned with the implications of transport and of transport-related environmental effects; they should be effectively used for decreasing the demand for transport, preventing its excessive concentration and mitigating its ecological impacts, e.g. by encouraging compact rather than dispersed development patterns. ... Developing Countries: Human settlements management should be strengthened, so as to be able to steer physical development in a way which reduces the demand for transport and prevents damage to the environment. Properly located and well-timed investment in transport infrastructure might be a guiding force to induce development in defined directions.	UNCHS, 2000
	Land Use. Transportation patterns can be affected significantly by land use patterns. In particular, low density development, hierarchical street patterns, generous road and parking capacity, and automobile oriented site design tends to increase automobile dependency, leading to high levels of per capita motor vehicle mileage and a reduction in the quality of travel alternatives (transit, walking and cycling). Many experts conclude that sustainable transportation requires higher density land use patterns that accommodate alternative modes, and that cities with high-density neighborhoods developed around passenger rail transit systems are the most sustainable model for urban areas. Others argue that high density development imposes costs; that most households will not willingly choose to live in high-density, transit oriented cities; and that a low density, automobile-oriented land use pattern are not necessarily more energy intensive than higher-density, transit-oriented cities.	VTPI, 1999
	6] Reduce urban sprawl and land-take for settlement and transport purposes.	Prospects, 2001a
	Analyse policies and actions for integrating environmental objectives in territorial, regional and land use policies and their impacts on transport supply and demand.	OECD, 2001b
	Develop and use cost-effective demand side management tools and land use planning to reduce the need for travel, encourage transport usage that minimises its negative environmental effects, such as risks from maritime transport of hazardous substances, ... through a better balance in the modal split.	OECD, 2001b
	Decrease - Disruption of Communities. Although more difficult to quantify, the increasing orientation of the urban transport system toward private vehicles can have additional effects on the quality of community life. Urban motorways were sometimes built through the middle of established communities (most frequently through communities with insufficient political power to oppose that alignment successfully), in effect dividing the community and constructing a physical barrier between the two halves. More generally, there are relatively few opportunities for serendipitous interactions between residents in a community dominated by private vehicle travel, because when people leave their homes they isolate themselves in cars. This can lead to a loss of sense of community and social cohesion.	WBCSD, 2001
	Supportive land-use policies — a deliberate effort to concentrate development in transportation corridors and control the rate of development outside designated urban boundaries.	WBCSD, 2001
	Development densities, involving an increase in density of development throughout an area to reduce the need to travel, can be specified in local authorities' Development Plans, and will apply to new development. Higher densities enable more opportunities to be reached within a given distance, and hence may encourage shorter journeys and use of cycling and walking. By increasing population and employment densities, they also make public transport more viable.	Prospects, 2001b
	Development pattern, including transport corridor-based developments whereby development is encouraged within transport corridors and near to transport nodes, can be influenced in such a way as to encourage provision and use of public transport. It can provide a way of concentrating denser development, and that which can more readily use public transport, in those areas where public transport is readily available. This can lead to a corridor-style development, and has been used to considerable effect in cities such as Toronto (Knight and Trygg, 1977).	Prospects, 2001b
	Development mix, in which homes, jobs and shops are placed close together, thus reducing the need to travel, is strongly advocated in UK government advice (DETR, 2001c). The key objective is to reduce car use and travel distances.	Prospects, 2001b

Livable Streets and Neighborhoods	Livable streets and neighbourhoods. To us, this has the following aspects. 1] Increased freedom of movement for vulnerable road users, including reduced risk of traffic accidents. 2] Positive external effects of our transport and land use strategy on social, cultural and recreational activity in inner city and in neighbourhoods. This objective is focused on streets and outdoor conditions in residential areas. It is an important objective when planning for sustainability, and deserves to stand alone because it is neither captured in the economic efficiency objective, as we can measure it now, nor fully in environmental protection or safety objectives.	Prospects, 2001a
Location Efficient Planning	Location Efficient Development. (http://www.vtpi.org/tdm/tdm22.htm). Location Efficient Development consists of residential and commercial development designed and located to provide good walking and cycling conditions, access transit service, and proximity to services such as stores and schools. In such conditions, residents and employees tend to drive less, rely more on alternative forms of transportation, and enjoy better transportation choices. Location Efficient Mortgages (LEMs) means that lenders recognize these potential savings when assessing a household's borrowing ability. It considers transportation and housing costs together, so vehicle cost savings are treated as additional income that can be spent on a mortgage. This gives homebuyers an added incentive to choose location efficient residences, and tends to encourage more infill development as opposed to more automobile-dependent development at the urban periphery (Hare, 1995; Goldstein, 1996; Hoeveler, 1997; Russo, 2001). Location Efficient Development and Mortgages tend to benefit lower-income households by providing financial savings and improving affordable transport and housing options. Location Efficient Development is implemented by developers, usually with support and encouragement from local governments. It is often implemented as part of Smart Growth and New Urbanist planning. Location Efficient mortgages are implemented by residential mortgage lenders, often with the support and encouragement of government agencies such as Fannie Mae and the Canadian Mortgage and Housing Corporation.	VTPI, 2001
Least Cost Planning	LCP [Least Cost Planning] aims at reaching maximum benefits at lowest cost. It does not follow the traditional rule of the business but concentrates on the services the customer asks for. In energy economics, this principle led to demand-side measures, i.e. investments in the reduction of energy consumption instead of increasing the amount of energy delivered. The idea of LCP can be transferred to the various levels of transport decisions under the name of Least Cost Access (LCA) or Least Cost Transportation Management (LCTM). For private house holds and for enterprises, it is quite obvious that a decision for a location near a rail or a public transportation line allows to save money which otherwise would have to be spent for operating an additional car or additional truck transport. When these savings are higher than the eventually higher cost for real estate or other possible cost, then the demand-side management would pay. This kind of decision is made often without naming it least cost transportation management: Choosing a house near shopping areas and schools or not far away from a working place. In the context of this study, the principle of least cost management in transport only can be described in general. For the idea of sustainable transportation, this principle especially is attractive because it combines economic savings and protection of the environment. For the private households, less passenger car demand, either reducing the demand for an additional car in a household or for a first car, can enable people to spend the money for own property or for retirement savings. This increases the social stability. A company could reduce transport cost and spend the money for improvement of products. For the implementation of Least Cost Management schemes, two basic steps are necessary to make. First, for all transport infrastructure plans, really comprehensive trans-sectoral cost-benefit analyses should be demanded, part of which would be a strategic environmental impact assessment. This especially is of importance for North-West countries where the density of the transport networks is on a very high level which leads to the expectation that the advantage of additional infrastructure would not be that high than in countries with a less developed transport network. Second, transport cost - especially of those modes which impose high burdens to the environment - ought to be increased step by step over the coming decades. This would make non-transport alternatives economically viable, and gives a reliable planning perspective for the economic actors.	Baltic 21, 1998

Cont...	Least Cost Planning. (http://www.vtpi.org/tdm/tdm21.htm). Least-Cost Planning (or Integrated Planning) is an approach to resource planning that; Considers demand management solutions equally with strategies to increase capacity; Considers all significant impacts (costs and benefits), including non-market impacts; and Involves the public in developing and evaluating alternatives. Transportation Demand Management is often the most cost effective solution to transportation problems, when all costs and benefits are considered. However, current planning practices tend to overlook and undervalue TDM, and over invest in road and parking capacity. Least Cost Planning allows TDM to be implemented when it is cost effective. Least-Cost Planning first developed in the field of energy planning, when decision-makers realized that it can be cheaper to invest in conservation than to build additional electrical generation and distribution capacity. The same approach is now being applied to transportation planning. Least-Cost Planning implementation usually involves policy changes by state, provincial, regional or local governments, and changes in administrative practices within a transportation agency. It may require legislation to change funding practices. Some U.S. states have constitutional limitations on how fuel taxes may be used, which may restrict Least Cost Planning, although there may be some flexibility if demand management is shown to benefit road users.	VTPI, 2001
Smart Growth	Smart Growth. (http://www.vtpi.org/tdm/tdm38.htm). Smart Growth is a general term for land use practices intended to create more resource efficient and livable communities. These practices help create more accessible land use patterns that reduce the amount of mobility required reach goods and services. Smart Growth is an alternative to urban sprawl. Smart Growth is usually implemented as a set of policies and programs by state/provincial, regional or local governments. To be effective it requires multi-jurisdictional coordination. Some professional and non-profit organizations support Smart Growth (including the American Planning Association, the National Governor's Association, and citizen's groups such as 1000 Friends of Oregon).	VTPI, 2001
New Urbanism	New Urbanism. (http://www.vtpi.org/tdm/tdm24.htm). New Urbanism (also called Neotraditional Design, Traditional Neighborhood Development, Location Efficient Development and Transit Oriented Development) is a set of development practices to create more attractive and efficient communities. These can significantly improve access and reduce per-capita automobile travel. New Urbanist features can be designed into new development or implemented incrementally in existing neighborhoods. It usually requires changes to street design standards, and to zoning laws to allow higher densities and mixed land use. Urban renovation projects can incorporate New Urbanism features, including commercial infill and pedestrianization.	VTPI, 2001
Reduction of Impervious Surface	Reduce impervious surface. Reduce parking and road capacity standards, TDM, parking management, design roads to minimize habitat impacts, [and] encourage higher-density, infill development.	VTPI, 1999
Road Maintenance	Road maintenance may include general renewal of road surface (resurfacing), improvement of surface evenness or friction, and winter maintenance. Resurfacing and improvement of evenness seem to increase the number of accidents slightly, probably due to speed level increase (Elvik, Mysen and Vaa, 1997). Improvement of friction means better ability to drain water from the road surface. This has a greater effect on accident numbers if friction originally is low. High drainage surfaces also reduce noise. Impacts	Prospects, 2001b
Job Creation	Job Creation. Consider the potential economic, social and employment benefits that could be derived from the restructuring of present transportation systems, in particular for those sectors involved in construction of infrastructure that need to adapt to new markets.	OECD, 1996
Impacts of tourism	Analyse the scope for policies to mitigate the negative environmental impacts from leisure and tourism travel.	OECD, 2001b

Teleworking	Telecommunications provide an alternative to travel for all, but studies have focused particularly on their use as an alternative to car travel. Teleworking, through which employees can work at home, has been more extensively studied. A variant involves “telecottages” which provide common remote facilities for use by tele-workers. Other developments include teleshopping and teleconferencing (Mokhtarian, 1991). The former is now growing in popularity and practicality through the internet as products can be bought in ‘virtual stores’ and delivered to the consumer’s home. However, such schemes are relatively new, and there is little indication yet as to whether they are replacing or complementing retail trips and to what extent personal trips to shops are simply being substituted for trips by delivery vans. There is a similar lack of information regarding the extent to which teleconferencing is replacing face-to-face meetings. It is not yet clear how popular teleworking may become, although attitudinal surveys in the UK suggest that up to 40% of commuters would prefer to work at home (Dodgson et al, 1997). Teleworking is seen as particularly attractive for long distance commuters, who are also have the highest share of public transport use. This may lead to a reduction of public transport use instead of reducing car use, as found in two Norwegian studies referred to by Kolbenstvedt, Solheim and Amundsen (2000).	Prospects, 2001b
Park and ride	Park and ride refers to the provision of car parking (and perhaps other facilities for motorists) at bus stops and/or rail stations so as to provide for interchange between car and public transport.	Prospects, 2001b
Parking	Plan parking supply and price to be in balance with walking, cycling and transit priorities. Coordinated area wide parking strategies and control are required. On-street/off-street, short term/long term, public/private and park-and-ride strategies must all be considered.	TAC, 96
	Parking standards probably offer the single most direct impact on levels of car use among land use measures. Conventionally these have required developers to provide at least a minimum number of parking spaces per unit floor area to ensure that all parking generated takes place off street. The resulting parking adds to the stock of private non residential space, and further reduces the ability of city authorities to use parking controls as a restraint tool. UK guidance now requires local authorities to set much more restrictive ‘maximum standards and several authorities have already followed this approach (Sanderson, 1994). Such measures can limit the growth in parking space and aim to induce mode switching (although it is possible that workers simply park elsewhere). Reducing parking can increase the gross floorspace, and hence site profitability. Changes in mode use can lead to efficiency and environmental benefits.	Prospects, 2001b
	Commuted payments or ‘cashing out’ offers developers the option of providing less parking than the minimum required under normal planning conditions, but paying for public space. The normal requirements for private parking provision at new developments are waived in return for payment to the local authority of a charge per space so that the local authority can make provision in public car parks. This has the twin advantages of permitting denser development and increasing the proportion of parking stock which is within public control. Hamburg has combined park-and-ride with commuted payments, although the success of these policies is largely unknown (DoE/DoT, 1995). This measure is not feasible when low maximum parking standards are introduced. A variant on commuted payments is the Californian ‘cashing-out’ policy, where employers are required to offer their employees cash in lieu of a parking space. Initial results have shown that solo drivers fell by 17% while car-poolers and public transport patronage increased (Shoup, 1997).	Prospects, 2001b
	New off-street parking is the other main way in which infrastructure can be provided for cars. New off street parking is probably therefore best combined with a reduction in on street parking. This should reduce searching traffic (since parking locations are clearer), improve the environment and increase safety. It may, however, aggravate accessibility problems, particularly for those who need to park close to their destination. More seriously, car crime is on the whole higher in poorly designed car parks, and there may be personal security concerns (Valleley, 1997). As with new roads, the cost of parking provision, which in multi-storey facilities may well exceed Euro 15k per space, time scale and land availability are likely to be significant constraints.	Prospects, 2001b
	Lorry parks provide a means of reducing the environmental impact of on-street overnight parking of lorries.	Prospects, 2001b
	Parking controls potentially provide a more effective way of controlling car use. Controls can be by reducing the supply of spaces, restricting duration or opening hours, regulating use through permits or charging.	Prospects, 2001b
Parking charges provide one of the most widely used forms of parking control. Uniquely among parking control measures, they enable demand to be kept below the supply of parking space, thus reducing time spent searching (see section 5.1).	Prospects, 2001b	

Cont...	Parking Pricing. (http://www.vtpi.org/tdm/tdm26.htm). Parking Pricing means that motorists pay directly for using parking facilities. Parking Pricing may be implemented as a TDM strategy (to reduce vehicle traffic in an area), as a parking management strategy (to reduce parking problems in a particular location), to recover parking facility costs, to generate revenue for other purposes (such as a local transportation program or downtown improvement district), or for a combination of these objectives. Much of the resistance to Parking Pricing reflects the inconvenience of current payment methods, and obstacles to using alternatives. Parking Pricing can become more accepted if; Better Pricing Methods are used that make pricing more convenient and fair; Transportation and Parking Management strategies are used to improve consumers' Transportation Choices; and Marketing provided better information on parking prices and availability, and transportation alternatives. Parking price changes are usually implemented by local governments or individual businesses, either as part of a TDM program or for revenue generation. Off-street Parking Pricing is often managed by specialized companies that serve many property owners. Implementation depends on the objectives.	VTPI, 2001
Road Pricing	Road Pricing. (http://www.vtpi.org/tdm/tdm35.htm). Road Pricing means that vehicle users are charged directly for using a particular road or bridge, or driving in a particular area (a "cordon"). Value Pricing is a marketing term which emphasizes that road pricing can directly benefit motorists through reduced congestion or improved roadway facilities. Economists have long advocated Road Pricing as an efficient and equitable way to pay roadway costs and to manage congestion. Different types of Road Pricing are Toll Roads, Congestion Pricing, HOT Lanes, Cordon (Area) Tolls, and Vehicle Use Fees. Road Pricing is usually implemented by public or private highway agencies or local authorities as part of transportation project funding packages or transportation demand management programs. Implementation may require approval of other levels of government (for example, U.S. federal law restricts tolling on the Interstate Highway System).	VTPI, 2001
Value Capture and Business Taxes	Value capture and business taxes are designed to reflect the windfall benefits to existing developments from improved accessibility. The simplest system is a tax related to turnover or number of employees, though the tax may also be related to land values and/or other transport service level criteria. In Vienna the "Dienstgeberabgabe" is a municipal tax collected from all employers in the municipality. Employers pay a fixed rate per employee and the tax revenue is earmarked for investment in the Vienna subway. Tax revenues are earmarked for subsidising public transport investment and operating costs. While such schemes provide a valuable source of finance, there is little evidence on their impacts on travel. True value capture, as proposed, involves taxing land owners close to new infrastructure to reflect their increased accessibility benefits. There is little evidence of its application in practice.	Prospects, 2001b
Taxes	Taxes and fees influence the fixed and the variable cost of transport. They can be implemented on national, provincial and community level. These can be directed towards the purchase price of vehicles for individual households and for enterprises (e.g. via V.A.T (Value Added Tax) or import tariffs), towards ownership (e.g. via annual vehicle taxes), towards the use of vehicles (e.g. via mineral oil taxes, road user fees and parking fees). All of these measures need different implementation strategies and aim at different reactions of the users. As a basic principle, it is recommended to make transport cover all direct and indirect costs that are caused by the respective transport activity (true cost pricing). If designed accordingly, taxes and fees on passenger car use as well as on truck and air transport will help to reach various desired effects; inter alia: mitigation of demand for motorised transport in general, support for public transportation and rail, modernisation of vehicle fleets, dense and mixed-use settlement development, support for local and regional production and distribution chains.	Baltic 21, 1998
	Vehicle ownership taxes are the most obvious direct charge on the private car. However, while there is evidence that they can affect car ownership (Fridstrom, 1999), they have no direct effect on car use. Indeed, by increasing the proportion of car use costs which are fixed, they could potentially have the opposite effect. They are, however, a major source of revenue which can potentially be used to finance transport investment. Such taxes are usually the responsibility of national government, and cannot generally be influenced directly by local authorities. Vehicle ownership taxes could also be an instrument to influence the mix of vehicles. The tax system can be designed to reduce the number of vehicles with high accident risks (Elvik, Mysen and Vaa, 1997) or high fuel consumption and emissions.	Prospects, 2001b
	Fuel taxes, being a variable cost, have a more direct effect on car use. During the 1990s the UK government committed itself to a 6% p.a. real increase in the tax rate as a contribution to its sustainability objective, and the Royal Commission on Environmental Pollution has advocated more rapid increases than this (RCEP, 1994, 1997).	Prospects, 2001b

Charging	Urban congestion charging (or road pricing) can take a number of different forms, although most involve charging to cross screenlines or cordons (DETR, 1998). There are three major concerns about urban congestion charging. The first is the potentially adverse impact on the economy of the charged area if charging encourages drivers to travel elsewhere, on which there is no empirical evidence. However, a number of desktop and attitudinal studies have concluded that there would only be minor negative economic impacts, although it is very much dependent upon the characteristics of the urban centre (e.g.. Flowerdew 1994, Richards <i>et al</i> , 1996, Still, 1996). Most studies have highlighted the need for complementary public transport improvements. The second concern is the equity implications. Bus users, pedestrians and cyclists will benefit; rail users will be little affected except, perhaps, by increased patronage; but car and commercial vehicle users, and particularly those on low incomes, will suffer. The third concern relates to the practicability of the technology, which is largely untested, and the enforcement procedures.	Prospects, 2001b
	Charges for ownership of private parking space, such as the recently introduced Workplace Parking Levy in the UK, enable city authorities to implement a levy on all private non-residential parking at the workplace (DETR, 1998).	Prospects, 2001b
Fares	Fare levels can be adjusted on all public transport services, and will have a direct effect on patronage and on car use.	Prospects, 2001b
	Fare structures, such as flat fares, zonal fares, monthly passes and integrated multi-modal ticketing and fares systems, provide alternatives to conventional graduated and separated fares.	Prospects, 2001b
	Concessionary fares provide lower fares or free travel to identifiable categories of passenger with special needs. These may include schoolchildren, students, elderly people and people with disabilities. In some countries, for example, statutory school travel must be funded by local authorities, the others are currently optional. Their main objective is equity-related, in enabling people who would otherwise find public transport too expensive, or who cannot use cars, to travel. They probably have no significant efficiency or environmental benefits, but they do improve accessibility for the target population (Goodwin, 1988). They do, however, impose a substantial financial burden on the city authorities which support them.	Prospects, 2001b
Developer Contributions	Developer contributions towards the financing of transport infrastructure can be required from developers as part of the process of obtaining permission for development. This approach has been applied successfully in the UK to secure finance for new roads and also for the provision of park and ride sites. The main risks are that the developer may go elsewhere if too many contributions are demanded and that the social benefits of the scheme may be compromised if developers are permitted to influence it too much to their own benefit.	Prospects, 2001b
Company Travel Plans	Company Travel Plans can be required as a form of developer contribution. They can also be implemented voluntarily (DoE/DoT, 1995, Transport 2000, 1997). There are several examples of Company Travel Plans in action, for example the UK Highways Agency Toolkit has an example of its own travel plan (HA, 1998). A review of studies into their impacts has concluded that only around 4% of firms in the UK, and 15% in the Netherlands, have implemented such plans. As a result, while there may be clear reductions at individual workplaces, there appears to be less impact at a wider spatial scale (Rye, 1999; CTM, 1999).	Prospects, 2001b
New Road Construction	New road construction has, until the recent past, been the traditional response to relieving congestion. New roads can, by bypassing particularly sensitive urban areas, achieve environmental improvements there, as evidenced by a series of studies (Mackie and Davies, 1981). In this way, orbital roads can have a different impact from radial ones (Izquierdo, Monzon and Gutierrez, 1999). However, these environmental improvements are only likely to be sustained if steps are taken to redesign the roads which are relieved of traffic; this has been the main focus of a UK bypass demonstration project (DOT, 1995).	Prospects, 2001b
Public Transport Service Levels	Public transport service levels can be modified to increase patronage, and hence to attract diversion from car use.	Prospects, 2001b
Promotion of Responsible Behaviour	Promote responsible behaviour of individuals and responsible decisions by enterprises.	Baltic 21, 1998

Public Awareness Programs	Education of the Public. Ensure adequate education, disclosure of information and raising awareness to allow the public to recognise the full costs and benefits of alternative transportation choices. Public participation will be critical at all stages in the transition to sustainable transportation.	OECD, 1996
	Raise public awareness about the environmental, social, economic, and safety-related consequences of excessive motorised transport; provide information and promote public discussion of sustainable transport. Decentralised decision making and participation of the public is a key approach to use local and regional knowledge for better solutions and to gain acceptance. Local initiatives dealing with environmental and transport issues should be asked by the responsible authorities to participate in the process of planning and decision making. Environmentalist groups should form round tables and become approved partners of the administration. Intensive contact should be held and discussion should be organised by municipal environment bureaus. The public should be asked before launching important projects like city motorways, underground lines, and large private facilities. Behaviour of local politicians, choosing public transport, walking, and cycling instead of using official cars can serve as a model. The city councils should implement and publish appropriate guidelines for the administration and for public authorities. Politicians should try to persuade large local employers to follow.	Baltic 21, 1998
	Education for Transportation and Sustainability. Enhance in-service courses and university transportation programs, to quickly disseminate and ultimately apply new research results and provide broad inter-disciplinary training to planning and transportation professionals; to raise the awareness of young people and the public about relationships between individual travel behavior, transportation systems, and environmental conditions; and to provide resources to assist decision makers with identifying transportation decisions that promote sustainability.	Volpe, 1999
	Measures to promote public awareness of the transport-related environmental impact should be undertaken, so as to enhance the development of environment-friendly travel behaviour: education of drivers in vehicle maintenance and operation should be given attention, since it has proved to result insignificant energy savings and lessened pollution.	UNCHS, 2000
	National Governments may ... wish to consider adopting measures to [e]ducate the public on the effects of mode choice on the environment at the local and global levels.	UNESC, 2000
	Improving education and awareness of sustainable transportation. Commitment 1.1. Transport Canada will extend the Moving On Sustainable Transportation (MOST) program by two additional years to 2003/2004, and add resources to the program subject to Treasury Board approval. It will also implement a targeted marketing campaign to increase awareness of the program, by 2001/2002. Commitment 1.2. Transport Canada's Headquarters and Quebec Region, in partnership with Health Canada and Environment Canada, will develop tools for providing Canadians with information on active transportation options by 2002/2003. Examples include the development of brochures, a website, and a kiosk for sustainable development forums. Commitment 1.3. Transport Canada will expand its Green Commute program to its regional offices, and promote adoption of the program by other federal departments across Canada. TC's Quebec, Ontario and Pacific regions will promote the program to large employers in Montreal, Toronto and Vancouver by 2003/2004. Commitment 1.4. Transport Canada will work with the transportation sector in Canada and abroad to promote best practices for environmental management by hosting a workshop in 2001, and by working with international transportation partners to promote best practices in environmental management, by 2003/2004.	TC, 2001
Public awareness campaigns are designed to encourage individuals to use alternatives which reduce overall travel, and travel by car. They might use a range of media, e.g. advertisements in newspapers, television, radio, cinemas, and leaflets and other material distributed to specific groups or to drivers in general. The purpose is increased knowledge and understanding. However, unless this results in behavioural changes, no effect is obtained. It is difficult to isolate effects that follow from awareness campaigns. Behavioural changes seem to be larger when the share of unwanted behaviour initially is low, when the campaign is combined with increased enforcement, and when the medium is television. Those studies which have assessed the impact of encouragements to use more sustainable modes have typically suggested that reductions in car use of around 5% to 10% can be achieved (INPHORMM, 1998). Those which have used personalised marketing to focus advice on the particular needs of the individual have claimed reductions in excess of 20% (Brog et al, 1999).	Prospects, 2001b	
Public Realm	Enhance the public realm through street improvements. Traffic calming, pedestrian planning, livable community design features.	VTPI, 1999

Enhancement of Appropriate Infrastructure	Increase - Appropriate Mobility Infrastructure. Inadequate infrastructure seriously impedes sustainable economic and social development, particularly in the developing world. Extensive passenger rail networks exist only in Asia and Europe, and general roadway provision in the developing countries falls far behind that in the developed world. Lack of capacity is often a serious issue on both urban and interurban links. The basic connectivity of the road network may be deficient, with important population or economic centers poorly linked to the rest of the country.	WBCSD, 2001
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**APPENDIX B1: CONSULTATION –
PENNSYLVANIA STATE DOT**

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PENNSYLVANIA STATE DEPARTMENT OF TRANSPORTATIONTelephone Conference - Thursday 26th July 2001

Discussion held with Tom Kotay

BACKGROUND

Towards the end of the 1990's, the Pennsylvania state Department of Transportation (PennDOT) embarked on a far-reaching reengineering process to solve the difficulties that were entrenched in their transportation planning and programming processes. During the period between 1960 to the mid 1990's, PennDOT lead the development of almost all the transportation plans within their state, including the Long-Range transportation Plans (LRTPs), Short-Range Transportation Programs (SRTPs), and the Transportation Improvement Programs (TIPs), which meant the roles of the Metropolitan Planning Organizations (MPOs) and other planning authorities were reduced to that of only reviewing the plans they were presented with. The MPOs faced continual frustration, since they had little delegated authority, the state fund sharing process was unpredictable, and often decisions about the selection of transportation projects were unclear.

The problems came to a head in 1996 when the PennDOT rejected several of the TIPs reviewed and altered by the MPOs. A new governor was elected who installed a philosophy of maintaining the existing system before new construction, which resulted in a cut of \$2.2 billion from the transportation budget in an effort to streamline the process. This cut was made possible through canceling those projects that did not align adequately with the new fiscal constraints. This action only fuelled the frustration of all stakeholders involved in transportation planning, and was the point at which a decision was made to revolutionize the transportation planning and programming processes.

THE REENGINEERING PROCESS

For many of the transit companies, MPOs (PennDOT – currently have 15 in operation), Local Development Districts (LDD, currently 6 in operation, now renamed Rural Planning Organizations (RPOs) and with the same responsibilities as MPOs), and rural independent counties in Pennsylvania, the reengineering process represented the potential for further loss of autonomy and this was a major barrier to PennDOT's reengineering efforts. To try and counter this problem, PennDOT restructured its role in the planning process and passed much of its decision-making authority in the metropolitan and rural areas over to the appropriate planning authorities. In addition to the redistribution of planning powers, PennDOT focused on streamlining the transportation planning process. Both the long- and short-range transportation planning activities were on different time cycles and an effort was made to bring the Federal TIPs, LRTPs, SRTPs, and the Pennsylvania 12 year transportation program, prepared by the State Transportation Commission (STC), into a consistent planning cycle.

All guidance (general/procedural, financial and schedules) are jointly developed and approved by all metro and rural partners before a program update cycle begins. Each rural county/region develops its multi-modal, 4-year TIP collaboratively between PennDOT, the policy/advisory committee, and locally elected officials with input from the general public. Each RPO and independent county has its own unique process to locally review and prioritize candidate projects for possible inclusion in the draft TIP. The draft TIP is finalized via a series of working meetings with the policy/advisory committee and PennDOT. These individually-approved TIPs are submitted to the state and rolled up without changes to form the STIP, which is then approved by

U.S. DOT. This process also helps to satisfy the state mandate to develop a Pennsylvania 12-Year Transportation Program.

The STC is responsible for developing the Pennsylvania 12-Year Transportation Program. This process and the schedule for updating the program are integrated within the update process for developing the STIP. Consequently, the STC allows for additional consultation with rurally elected officials and the general public as the update process begins. The update cycle in Pennsylvania occurs every 2 years; however, the Commission also holds quarterly meetings at which time program adjustments are made in coordination with the state's planning partners (PennDOT, MPOs, LDDs, and independent counties).

The decision to streamline the process has coordinated the public consultations, which means both the public and the business communities are more confident that their voice is reaching 'all' decision-makers in the planning process.

To review and monitor the progress towards the Statewide Long-Range Transportation Plan (SLRTP - 25 year planning period, called PennPlan Moves), MPOs, RPOs and independent counties submit yearly updates of their transportation programs. The output of this exercise is presented in an 'Achievement Report', which documents the progress of the Statewide Transportation Improvement Programs (STIPs) and corridor plans. The Achievement report documents each activity that PennDOT is undertaking in order to reach its long-term goals and whether they are likely to be achieved or not.

The reengineered process has resulted in the formation ten working groups, which cover the following core areas:

- General/Procedural guidance
- Financial guidance
- Workshop/Conference planning
- Automation/Computerization
- Statewide long-range planning
- Modal integration
- "Easy to understand" documents
- Oversight
- Intelligent Transportation Systems (ITS)
- Geographical Information Systems (GIS)

It is these work groups that have made the reengineering process happen and will enable the new transportation planning and programming regime to continue and to improve in the future. PennDOT plans to bring more technology into planning and programming and the ITS and GIS groups will focus on this area. The ITS work group will also assist in the development of regional ITS architectures as required by the TEA-21 ITS rules that were recently released by the Bush Administration.

Sustainable Development

Although sustainable development can be seen as antigrowth and antidevelopment, PennDOT believes that sustainable development initiatives will permit development and growth in the right locations. The 'Urban and Village Growth Boundaries' initiative has been developed by Pennsylvania and adopted by several MPOs, such as Lancaster County Planning Commission

(LCPC), to ensure that transportation and land use developments only occur within the defined boundaries. The LCPC, in cooperation with municipalities, has developed urban growth boundaries to direct growth to areas that have the infrastructure – including transportation infrastructure – to accommodate it. Thus whilst growth will continue to occur at a disproportionate rate in outlying municipalities, the placement of the growth will be guided by the urban growth boundaries.

Improving Metropolitan Planning Organizations

Effective leadership and management skills within the MPOs are seen as essential for the planning process to work effectively. Many MPO's would like to do more, but do not have the institutional capacity or resources to go further. PennDOT would prefer fewer mandates that try to force effective working relationships and support the dissemination of best practice initiatives and projects from states across the United States.

PennDOT believes the U.S DOT should be as broad as possible in its guidance and rulemaking and should leave it to individual states to develop initiatives and programs which encourage effective state DOT and MPO working relationships. PennDOT believes that it is essential to bring the rural planning organizations into the decision making process, since a large proportion of sprawl and development is occurring in the rural areas.

Planning Funds

In Pennsylvania, federal and statewide planning funds are being used to encourage stakeholders to interact under a new land use and transportation coordination initiative, which is an outgrowth of the reengineering process. Since PennDOT began the reengineering effort, they have increased their federal planning funds (FHWA Metro Planning (PL) and State Planning & Research (SPR)) to their partners by slightly more than 30%. The increase in funds was directed towards ongoing, routine activities and towards new activities such as land use and transportation planning. For example, \$2 million was granted for a Transportation Projects/Land Use Planning Coordination Initiative, that puts \$400,000 of federal planning funds towards five state fiscal year budgets for the Office of Planning (2000 - 2005). A local match of 20% is required each year. One example of how the funds are being used can be found in a pilot project being undertaken by one of the MPOs. The traditional transportation and air quality modeling tools are being combined with land use and social economic data, to identify the impact of any major development plans even before the plans are approved at local municipal level.

U.S. DOT PROGRAMS

Discretionary Programs

Programs such as the Transportation and Community Preservation Pilot Program (TCSP)⁴¹ were initially found to be of great value, since they brought communities, decision-makers and planners together who would not normally work with each other under the existing planning regime. However, congressional earmarking of the TCSP program funds has hindered the goal of improving land use by not permitting the development and identification of innovative new approaches. Programs which aim to develop livable communities, such as the TCSP program, the Transportation

⁴¹ For further information on the TSCP program, please refer to the FHWA website: <http://www.fhwa.dot.gov/tcsp/index.html> (01/19/02).

Enhancements Program, and the Congestion Mitigation and Air Quality Improvement Program (CMAQ), are seen by PennDOT as vital since they provide communities with the tools and resources they need to combat congestion and sprawl. An alternative way of creating livable communities would be to install the principles of programs such as the TCSP program, into statewide and metro planning requirements and initiatives such as Corridors and Borders. The main emphasis is to use federal funds to encourage people to work together who would not normally do so.

Non-Discretionary Programs

During the initial development of the TIPs, PennDOT do not divide their federal funding between the MPOs and RPOs for their direct use, but instead allocate the funding to federal highways and federal bridges. They then work directly with the MPOs, RPOs, and other planning partners to develop a mutually acceptable TIP for each metropolitan area. The objectives used to establish the TIP may vary slightly, due to area specific safety requirements, etc., but the majority are directed towards the preservation of infrastructure. Having formulated the TIPs, the question of fund allocation is addressed.

The incorporation of sustainable development concepts occurs during the environmental clearance and project development stages. PennDOT is taking action to ensure that context-sensitive design and community values are a key part of the development of each project.

DISCUSSION TOPICS FOR THE REAUTHORIZATION OF TEA-21

PennDOT is working closely with the American Association of State Highway and Transportation Officials (AASHTO) to develop policies that they will promote through Congress during the reauthorization of TEA-21, and strongly supports the AASHTO position that reauthorization should not deal with formula changes or with new program funding categories. PennDOT believes that there are three main areas where the USDOT should invest time and resources and these are discussed below.

Streamlining Project Development

PennDOT believes that considerable time and resources must be invested in streamlining project development, such as the timeliness and coordination of reviews of environmental clearance documents. Planning partners, whether they are metro or rural, will play a major role in streamlining project development and currently there has been no federal guidance on how states should proceed with their efforts. It is recommended that the U.S. DOT should become more involved with all federal and state resource and regulatory agencies and agree to some streamlining principles or broad parameters within which everyone can operate. Failure to provide guidance at the federal level will mean that streamlining will not be achieved at the state level.

There is a concern that agencies such as the U.S. Fish and Wildlife Service or the Environmental Protection Agency, can find ways to stop a vital project if they do not support the project's objectives. PennDOT would like the U.S. DOT to initiate discussions for 'interagency agreements' that will result in the timeliness of environmental documents and decision-making. PennDOT is already addressing this topic and is concerned that its efforts may be thwarted if federal guidance is issued too late. For example, PennDOT would like agencies to discuss content sensitive design and undertake major investment studies at an early stage of the development process, so that this information can be used to help streamline project development.

Access Management Along Transportation Corridors

PennDOT has faced considerable difficulty in working through federal regulations and laws with respect to the preservation of right of way. PennDOT would like to ‘preserve alternatives’ by buying up the right of way on land adjacent to core transportation corridors, but has been stopped by FHWA who are concerned that this could prejudice the outcome of an Environmental Impact Statement (EIS). The problem is that an EIS can take five or more years to complete, and on completion some of the opportunities that were initially available might no longer exist leaving the remaining options too cost prohibitive to implement.

PennDOT is currently using a tool called ‘official mapping’, which allows them to officially map a new road, or a road widening, and to protect that right of way. If a person/business would like to develop some land on the right of way, the municipality or the state has a given period of time to buy that parcel of land before it is developed. PennDOT would like federal support to use this type land use planning tool to preserve their transportation planning options and to ensure that development does not occur in an unsustainable manner. It is recommended that FHWA establish a dialog with states to identify ways of getting beyond the restrictive right of way policies that currently exist.

Management and Monitoring Systems

ISTEA required state authorities to develop a number of management and monitoring systems (e.g. such as for a bridge, a pavement, a congestion, an intermodal, a public transit, etc.), to enable the authorities to report on the performance of their transportation network. Over time, many of these requirements have been removed through federal laws and regulations that have narrowed state obligations. PennDOT highly recommend the concepts of management, monitoring and reporting of infrastructure, and would like to have the requirements for these systems re-established. It is believed that many states are doing a poor job of informing their constituents and the federal government of what and how they are doing. Asset management systems are seen as the most effective way of collecting and disseminating this information.

It is recommended that U.S. DOT develop incentives to enable State DOTs to develop asset management systems which can record an asset’s location, condition and performance. PennDOT believe that there is a growing need to provide Congress and the public with solid evidence that State DOTs are taking action to make things better.

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**APPENDIX B2: CONSULTATION –
KENTUCKY TRANSPORTATION CABINET**

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KENTUCKY TRANSPORTATION CABINETTelephone Conference - Monday 30th July 2001

Discussion held with Mike Hancock

THE PLANNING PROCESS

Kentucky's reengineering took place in the early 1990's and was more of a natural evolution initiated by ISTEA, than a complete change in transportation planning and programming as experienced in Pennsylvania. ISTEA made reference to increased levels of regional and statewide planning, and the Kentucky Transportation Cabinet (KYTC) decided the most effective way of meeting these requirements would be to utilize and build upon the existing Area Development District (ADD) framework. Hence, the ADDs now have the same planning role as RPOs.

The KYTC oversees the statewide planning and programming process and is responsible for preparing a 20-year long-range plan, which includes a 6-year short term highway element (Six Year Highway Plan) and the STIP. Their consultation process covers planning for highways and transit, as well as for ferry, bicycle and pedestrian facilities, intermodal projects and intelligent transportation system (ITS) improvements. Beginning in 1995, Kentucky established a statewide planning process for non-metropolitan areas. This process focuses on 15 Area Development Districts (ADDs) and 12 Highway Districts. The ADDs work under contract with KYTC and receive state funds to support transportation planning activities. No planning funds are given to city and county governments in non-metropolitan areas.

The ADD Transportation Committees include local and county officials, representatives of other interest groups, and private citizens. These ADD committees provide input and direction for all the regional planning activities relevant to the statewide transportation planning process, including the identification and prioritization of highway projects. These priorities are then considered when projects are selected for inclusion in the long-range plan, 6 year plan, and STIP. ADD activities include the formulation of regional goals and objectives by regional transportation committees, development of regional concept plans, and providing assistance to the KYTC on intermediate planning studies/meetings, corridor planning/scoping studies and small urban studies. The ADDs' primary activity is participation in the identification, preliminary evaluation, prioritization and ranking of the 'unscheduled needs' projects.

The ADD regional planning element of the statewide transportation process is primarily aimed at highway project development since Kentucky is largely a rural state. Projects in other modes, such as air, bicycle and pedestrian, rail, intermodal and ITS projects, may also be submitted through the transportation committees of the ADDs. However some of these projects will be evaluated through a different process to that described above for highway projects. The majority of land use planning in Kentucky is undertaken through the ADDs at the local level, and therefore, it is essential that KYTC solicits the support of the local organizations when developing new approaches to land use and transportation planning.

KYTC's Role in Planning

The KYTC is a voting member on the technical and policy committees at the MPO level and, as such, has all the rights and responsibilities that accompany that position. Decisions about what happens in the MPO areas are largely made by the policy committee of the MPO. The ADDs do not have the same structure as the MPOs. The ADDs have transportation committees in which the Transportation Cabinet takes an active role. While most of the final decision-making for rural

transportation projects is made by the Kentucky Transportation Cabinet, those decisions are largely based on the input provided at local, regional and district levels through the rural ADDs.

Sustainable development

KYTC believes that a U.S. DOT perspective on sustainable transportation would be useful. However, the perspective/principles must be flexible enough to enable KYTC to work toward its own solutions. KYTC cited concerns over “anti-sprawl” policies that were aimed at preventing growth problems that had occurred in more populous states; policies which could have a detrimental effect on Kentucky’s economic development opportunities.

Planning Funds

KYTC is currently evaluating their funding allocation for transportation planning activities with a view to enhancing the capacity of the MPOs and ADDs. At present, KYTC manages most of the funding allocations for the transportation planning programs.

U.S. DOT PROGRAMS

Discretionary Programs

As with PennDOT, KYTC recognized the problems with congressional earmarking, and saw that this undermined the basic objectives of the programs. These problems were noted even though Kentucky’s congressional delegation had secured earmarked funding for the TCSP program projects that might not necessarily meet the program’s requirements in the strictest sense.

KYTC believes that the U.S. DOT has an obligation to assist the states in marrying the agendas of federal programs – such as Corridors and Borders, CMAQ, TCSP, Transportation Enhancements, and also the Recreational Trails and Scenic Byways – to bring the various agendas onto one common page and enable the states to work towards a sustainable transportation network and living/working environment. It is KYTC’s belief that this marriage will occur regardless of federal assistance, since their customers (the public, transit operators, etc.) demand to be included in transportation program development and implementation.

In addition to marrying program agendas, KYTC cited some encouraging news with regards to future working partnerships with federal agencies. Representatives of the Environmental Protection Agency (EPA) recently advised that it has realized the need to work with transportation agencies to create “win-win” situations wherever possible. The EPA would like to look into ways of working with State DOTs, so they can access the states’ resources to assist them in accomplishing their goals. KYTC feels that this would enhance their planning capacity and ultimately improve the environment and the transportation network.

On a more general note, KYTC felt that the continual evolution of the project development process is working towards solutions to planning and programming issues, and that overly prescriptive rules and regulations at this point in time might prevent or stifle creativity and adaptability for the states.

Non-Discretionary Programs

Non-Discretionary programs such as the National Highway System (NHS), the Surface Transportation Program (STP), and the Interstate Maintenance, and Bridge Replacement Program, constitute the lion's share of Kentucky's federal-aid transportation programs. It is through these programs that the "culture" of its Project Delivery processes is being changed. As it works directly with the public, elected officials, resource agencies, and other groups, KYTC is discovering the value of "context-sensitive" project development. Marrying agendas is more than a concept; it is becoming a way of doing business. Processes are being redrawn to reflect the emphasis on understanding the context within which individual projects are developed, and the realization that there is no longer a "cookbook" for every situation. Though a considerable departure from the old project development philosophy, the new processes are being embraced by KYTC personnel as the number of success stories continue to increase.

In more specific terms, the Non-discretionary program funds are expended on projects which have been identified, evaluated and prioritized at the local, regional, district and state level through the rural transportation planning process. Specific Surface Transportation Program (dedicated) funds are used by the metropolitan governments to implement highway improvements located in the larger metropolitan areas. The projects funded in these areas do not flow through the rural transportation planning process, but are identified, evaluated and prioritized at the MPO level with input and consultation from the Transportation Cabinet, local officials and citizens through the MPO technical and policy committees. These prioritized projects are reviewed on a regular basis in concert with existing and proposed land use/zoning plans of the metropolitan areas.

The Interstate Maintenance Program and the Bridge Replacement and Rehabilitation Program are maintained by the KYTC. Selection of projects is based on the federal criteria and data collected by the Cabinet. However, the Cabinet does base the selection of projects on input from the district highway offices located throughout the state, local citizen input and on the data maintained on these systems by the Cabinet.

DISCUSSION TOPICS FOR THE REAUTHORIZATION OF TEA-21

KYTC supports those recommendations put forward by PennDOT and has made the following additional comments.

Streamlining project Development

PennDOT was seen as being very successful in streamlining project development. In Kentucky, the KYTC has moved away from what was called the "DAD" (Decide, Announce & Defend) philosophy to one known as the "POP" (Publicly Owned Project) philosophy, which adds considerable depth to the consultation process. The USDOT should seek ways to support initiatives that move toward involving the public and resource agencies in a more effective way.

U.S. DOT and Congressional Guidance – Planning Capacity

The role of the U.S. DOT and Congress in the development of legislation, policy and guidance needs to be more over-arching, but respectful of state uniqueness. At the MPO and ADD level, there is a growing need for the continual improvement of core competencies such as leadership, management skills, and planning capabilities. The overarching principles must relate to this basic need through the translational process that occurs at the state level. Since it is the role of

the state legislator to interpret federal guidance to ensure that the local governments/authorities are undertaking activities appropriately, the U.S. DOT and Congress have an obligation to ensure their guiding principles are clear and precise and to set the boundaries within which the State DOT, MPOs and ADDs can work.

**APPENDIX B3: CONSULTATION –
SOUTH CAROLINA DOT**

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SOUTH CAROLINA DEPARTMENT OF TRANSPORTATIONTelephone Conference - Tuesday 31st July 2001

Discussion held with Mark Pleasant

THE PLANNING PROCESS

South Carolina has a comprehensive metropolitan and rural planning process. Currently there are three Transportation Management Areas (TMAs – MPOs that have a population of more than 200,000 people in their designated urban area), seven MPOs and ten Council of Governments (COGs) in the South Carolina region. The South Carolina DOT (SCDOT) effectively treats all of the MPOs and COGs as if they were TMAs, in the sense that they rely on MPOs and COGs to identify local priorities for roadway improvements; and while COGs can identify potential projects, the Transportation Commission has the final right of approval. In addition, three of the COGs have dual urban/rural planning responsibilities. Each TMA, MPO and COG has been delegated authority to identify their transportation needs and to prioritize projects within their areas. Effectively, transportation planning has been decentralized from the SCDOT to the local areas for the system upgrade program.

SCDOT provides much of the technical analysis, travel demand modeling and air quality assessment for the MPOs, TMAs and COGs but they do not specify the projects that need to be included in the long-range transportation plans.

In South Carolina the TIPs and STIP are prepared on a 2-year cycle, however each show an additional 3-years for planning purposes. The LRTP has a 20-year planning period.

Funding

The SCDOT use a fund allocation process called ‘Guide Shares’, which allows a portion of the federal funding that the state receives to be allocated to all the MPOs based on an agreed formula. Typically the Guide Shares funds are used for upgrade projects, mainly for highways, and this is reflected in the MPOs’ TIPs that specify projects such as road widening or major intersection enhancements. The SCDOT maintains the role of the project planning and implementation for the interstate highways, the safety program, and the maintenance program.

In addition to the Guide Shares funds, South Carolina has initiated a new program called ‘27 and 7’, in which they have leveraged Guide Shares funding for state highway bonds that are advancing almost \$5 billion worth of projects for both MPOs and COGs. 27 and 7 is a funding option that is offered, not mandated, to the MPOs and COGs by the SCDOT. The concept is for the MPO or COGs to relinquish a proportion (up to half of their Guide Share) of their federal funding for debt service and for money up front to accelerate and construct projects today that might otherwise take 20 years under the current planning regime. In order to accomplish this new and creative financing program, SCDOT have developed a strong partnership with the MPOs and COGs.

The state maintenance budget has been identified in South Carolina as one of the major funding issues that must be addressed. South Carolina has the 5th largest state maintained highway system in the country. The SCDOT Executive Director, the state highway engineer and the transportation commission, prepared a funding proposal for the state legislature to increase gas tax and licensing fees as part of a package to raise maintenance funds. However, the state legislature did not address the proposal due to the current economic climate. SCDOT are still working towards a possible solution to the expected shortfall in maintenance funds.

Link Between Land use and Transportation Planning

In most cases, the technical staff in the MPOs are the same staff that work with the county/city jurisdictions to assist in the development of local comprehensive plans or to assist with the implementation of zoning ordinances. Consequently, there is an active link between transportation and land use planning, as the socioeconomic data used to run a travel demand model, is based on many of the assumptions and projections from future land use plans.

A point of concern was raised by SCDOT as regards how closely transportation planners follow the land use plans when making assumptions for modeling purposes. In most cases, projections are based more on current trends than comprehensive plans. A community might endorse "smart-growth", but their actual growth trend is low-density sprawl. The local planner's projections are more likely to reflect current growth trends, which means the transportation plan will identify projects to support the trend, not the plan. SCDOT highlighted this concern as a significant barrier to sustainable development principles.

Streamlining of Transportation Planning

SCDOT has begun to work with its resource agencies during the development of its LRTPs, in an effort to make them an active part of the planning and programming process. Special effort has been made with those resources that are involved directly with Title 6 – Environmental Justice. SCDOT plans to provide each resource agency with a list of proposed projects in their LRTP from which the agencies can identify an inventory of constraints that SCDOT might/will need to address in the future. Typically much of the planning/permitting issues are not dealt with until the design stage of a project, and it is SCDOT's objective to change this through working with all the relevant agencies as partners at the onset of the transportation planning process.

This new planning approach is currently being tested through a pilot project involving two MPOs and two COGs, which are in the process of updating their LRTPs. A preliminary environmental screening of all the proposed projects will occur in-house between the MPOs and SCDOT, and the outcome will be sent to all resource agencies for comment. Any concerns the agencies have with the proposed projects will be documented, for the first time, in the LRTP. It is hoped that this formal process will enable the SCDOT, MPOs, COGs and the resource agencies to share information at an early stage and to familiarize all partners with the issues that will need to be solved.

U.S. DOT PROGRAMS FOR TEA-21

Discretionary Programs

South Carolina is one of the most rural and sprawling states, and therefore its people have a strong incentive to ensure their living and working environments are not adversely affected by uncontrolled growth. SCDOT believes that the willingness of communities to work with authorities to study smart growth issues and prepare grant applications for federal programs such as the TSCP program, reflects this growing concern. SCDOT encourages U.S. DOT initiatives that provide funds for communities to become more involved with transportation planning. However, they did note an area for concern with the allocation of federal funds, and stated that earmarking has the potential to demoralize those communities that adopt, in good faith, the spirit and principles of programs such as the TCSP program.

Non-Discretionary Programs

Non-discretionary programs were not discussed in detailed with SCDOT, however it was highlighted that many of the NHS/STP projects are dealt with through the MPO/COG planning process.

DISCUSSION TOPICS FOR THE REAUTHORIZATION OF TEA-21

SCDOT supports those recommendations put forward by PennDOT and KYTC, and makes the following additional comments outlined below.

Flexibility of Federal Funding

SCDOT would like the U.S. DOT to provide more funding options and more flexibility in the existing funding. Specific reference was made to allow funding to be channeled towards maintenance work on items other than the interstate highway.

Public Involvement

Achieving adequate and effective public involvement in long-range planning is seen by SCDOT as being a major challenge. It is believed that many of the issues that that are raised during the development of the LRTP, might be avoided if public consultation were a more inclusive process. The SCDOT noted that the problem is not a symptom of State DOTs negligence, but that simply involving the public and all relevant stakeholders requires significant experience and resources. SCDOT would like the U.S. DOT to assist innovative practices that aim to enhance public involvement in decision-making, and to capture best practice across the U.S for the benefit of all planning authorities.

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APPENDIX C: REVIEW OF UK TRANSPORTATION PLANNING

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U.K. TRANSPORTATION PLANNING

In an effort to broaden the search for innovative sustainable transportation practices, this report focuses on transportation planning in England. This country was selected for two reasons. Firstly, England has recently developed a planning framework that specifically focuses on integrating transportation and land use planning and secondly, the author has a good working knowledge of England's transportation system since the U.K. is his country of citizenship.

Two days were spent questioning members of the Department for Transport, Local Government and the Regions (DTLR), the Commission for Integrated Transport (CfIT), and the Commission for Sustainable Development (CSD) in order to obtain a useful understanding of how the transportation planning framework interacts. The following sections provide a summary of these discussions and give an overview of England's transportation policy structure.

TRANSPORTATION POLICY FRAMEWORK

In 1998, the U.K. Government set out its policy for the future of transportation in the White Paper '*A New Deal for Transport: Better for Everyone*'⁴². The objective of the paper was to extend choice in transport and secure mobility in a way that supports sustainable development. The New Deal for Transport aims to deliver an integrated *national* transport policy, which means integration:

- within and between different types of transport modes;
- with policies for the environment;
- with land use planning; and
- with policies for education, health and wealth creation.

To ensure the New Deal for Transport had statutory authority the '*Transport Act 2000*'⁴³ was enacted. In addition, the Government published '*Transport 2010: The 10 Year Plan*'⁴⁴. The 10 Year Plan was developed to encourage partnerships between the public and private sectors to provide a modern integrated transportation system, and to ensure that promises made in the New Deal for Transport would be achieved. The 10 Year Plan details some £180 billion of public and private spending across the decade from 2001/2 to 2010/11. Public expenditure is expected to reach approximately £132 billion with private investment making up the remainder.

Land use planning was seen by the Government as being a major element in reducing the need to travel, reducing the length of journeys, and making it safer and easier for people to access jobs, shopping, leisure facilities and services by public transport, walking and cycling. Shaping the pattern of development and influencing the location, scale, density, design and mix of land uses were seen as the most effective ways of achieving this goal. To enable this change to happen the New

⁴² A New Deal for Transport (also known as the Integrated Transport White Paper - ITWP) can be located on the DTLR website. <http://www.dtlr.gov.U.K./itwp/paper/index.htm> (01/19/02).

⁴³ The Transport Act 2000 can be located on Her Majesty's Stationery Office website. <http://www.hmso.gov.U.K./acts/acts2000/20000038.htm> (01/19/02). Additional information, such as explanatory notes, on the Transport Act 2000 can be located in the Integrated Transport section of the DTLR website. <http://www.dtlr.gov.U.K./itwp/index.htm#leg> (01/19/02).

⁴⁴ The 10 Year Plan can be located on the DTLR website. <http://www.dtlr.gov.U.K./trans2010/index.htm> (01/19/02).

Deal for Transport called for the full integration of transport policies and proposals, and land use planning at national, regional and local levels. Better integration was seen as critical to supporting more sustainable travel choices.

To assist the co-ordination of transportation and land use planning the Government developed Planning Policy Guidance (PPG) notes. The two main guidance documents that are of specific relevance to transportation are PPG11⁴⁵ and PPG13⁴⁶.

PPG11 – Regional Planning

PPG11 provides regional planning guidance for the preparation of the Regional Transport Strategies (RTS). The main aims of the RTS are to provide:

- regional priorities for transport investment and management;
- a strategic steer on the role of future development of railways, airports, ports and inland waterways in the region, for both passenger and freight;
- guidance on measures to increase transport choice;
- public transport accessibility criteria for regionally or sub-regionally significant levels or types of development, to be set in development plans and local transport plans, to guide the location of new development and the provision of new transport services and infrastructure;
- advice on the approach to be taken in determining standards for the provision of off-street parking; and
- guidance on the strategic context for demand management measures such as road-user charging and levies on workplace car parking.

RTS cover a 15 to 20 year period and have immediate 5-year regional transport priorities within the long-term strategy to assist the development of Local Transport Plans (LTPs). The RTS should take into account any existing plans and programs of the transport operators, the Strategic Rail Authority (SRA)⁴⁷ and Railtrack⁴⁸, and help to inform the subsequent development of these plans.

⁴⁵ The general index for all Planning Policy Guidance (PPG) notes can be found on the DETR website. <http://www.planning.dtlr.gov.U.K./ppg/index.htm> (01/19/02). PPG11 – Regional Planning, can be located using the following link. <http://www.planning.dtlr.gov.U.K./ppg11/index.htm> (01/19/02).

⁴⁶ PPG13 – Transport, can be located using the following link. <http://www.planning.dtlr.gov.U.K./ppg/ppg13/index.htm> (01/19/02).

⁴⁷ The SRA is a relatively new rail authority that was established to provide a clear, coherent and strategic program for the development of the U.K.'s railway system. The authority is a statutory body with its board members appointed by Ministers. The SRA supports the integrated transport initiatives and for the first time provides a clear focus for the promotion of rail freight. In addition, the SRA will become the main regulator of passenger network benefits (i.e. the benefits of an integrated network of train services, including through-ticketing and passenger information). The SRA should not be confused with the Office of Passenger Rail Franchising (OPRAF), which is charged with regulating the railway operators.

⁴⁸ Railtrack is the company that owns and operates Britain's railway infrastructure - the tracks, signals, tunnels, bridges, viaducts, level crossings and stations.

PPG13 – Transport

The main objectives of PPG13 are to integrate planning and transportation at the national, regional, and local levels to:

- promote more sustainable transport choices both for people and for moving freight;
- promote accessibility to jobs, shopping, leisure facilities and services;
- reduce the need to travel, especially by car.

The guidance presents the circumstances where it is appropriate to change the emphasis and priorities in provision between different transport modes, in pursuit of wider Government objectives. However, it is recognized that the car will continue to play an important part in transportation and for some journeys, particularly in rural areas, it will remain the only viable option.

In addition to PPG11 and PPG13, PPG12⁴⁹ on *Development Plans* provides advice about maintaining consistency between local transport plans and development plans.

Local transport Plans (LTPs)

LTPs (for authorities outside London⁵⁰) are seen as playing a central role in coordinating and improving local transportation systems. In addition, the Transport Act 2000 makes the preparation of local transportation plans a statutory requirement.

Authorities are required to draw up the LTPs every 5 years. In preparing these plans the authorities must actively involve local people, businesses, transport operators and other organizations such as those which provide health care. The LTP sets out the authority's proposal for both capital and revenue expenditure on transportation, which the Government uses for annual block allocation of credit approvals to spend as transportation capital. In general, the new framework has reduced central government involvement in local authority decision-making. However, the government still makes the final funding decisions for LTPs and this is heavily influenced by the consistency between each LTP and the corresponding RTS.

The 5-year LTPs aim to:

- provide a strategic transportation planning framework, linked to local development plans and proposals;
- cover both capital and revenue spending;
- give local authorities more control in the allocation of capital resources;
- take a partnership approach, involving local communities, local business and transport providers;
- place greater emphasis on targets, performance indicators and monitoring; and

⁴⁹ PPG12 – Development Plans, can be located using the following link.

<http://www.planning.dtlr.gov.U.K./ppg12/index.htm> (01/19/02).

⁵⁰ All transportation planning for the city of London is the responsibility of the 'Greater London Authority' (GLA), which has established an organization, called Transport for London (TfL), to manage London's transportation infrastructure. The Mayor of London has wide powers of direction over TfL. The Mayor sets the structure and level of public transport fares in London (including 'black cabs' but not National Rail or minicab fares); has a say in how the commuter railways are run; and has powers to fund new transport services and to invest in new transport systems. <http://www.london.gov.U.K./gla/transport.htm> (01/19/02).

- emphasize integrated solutions, looking across all types of transportation.
- In addition, the Transport Act 2000 enables the local authorities to introduce charging to reduce traffic congestion and to channel the revenues directly into transportation improvements.

Air Quality

Under Part IV of the Environmental Act 1995, local authorities are required to review and assess air quality in their localities, to designate air quality management areas (AQMAs) and draw up action plans where national policies and instruments alone appear unlikely to deliver the Government's health-based national air quality objectives. This means that the action plans will be closely integrated with local transport plans and other local and regional planning and transportation strategies⁵¹.

Commission for Integrated Transport (CfIT)

The role of CfIT is defined in the New Deal for Transport as providing '*independent advice to Government on the implementation of integrated transport policy, to monitor developments across transport, environment, health and other sectors and to review progress towards meeting our objectives*'. In particular, the New Deal for Transport identified the following roles for the Commission:

- Reviewing and monitoring progress towards objectives and targets laid out in the White Paper 'A New Deal for Transport';
- Continuing and refreshing the transport policy debate;
- Fostering consensus among practical providers;
- Identifying and disseminating examples of best practice from home and abroad;
- Advising on developments in Europe, including relevant EU initiatives;
- Advising on the role of existing and emerging technologies.

The independence granted to CfIT and the diversity of its members puts it in a unique position to push forward and stimulate debates on important issues that face the transportation sector.

Now the transportation policy framework is in place (i.e. the New Deal for Transport and its daughter documents, the 10 Year Plan and the Planning Policy Guidance notes), CfIT's main responsibility lies in monitoring and advising on the implementation and delivery of the transportation program. Box A provides the core issues that CfIT will be addressing to ensure the delivery of a sustainable transport sector.

⁵¹ The DETR (Department of Environment, Transport and the Regions – now renamed DTLR) published guidance to local authorities in March 2000 on '*Air Quality and Land Use Planning*'.

BOX A: Issues Facing the U.K. Transport Sector in Delivering Sustainability***How to bring about behavioral change***

- develop an understanding of, and take action to minimize, the adverse impacts of long-term lifestyle issues (e.g. by understanding the issues surrounding the location of home and workplace); and
- deliver short-term transport choices.

Bringing together land use and transport planning on the ground

- reduce time lags in the planning system;
- establish robust structures (regionally and locally) to deliver the new policy; and
- encourage developers to deliver investment with “untried” access arrangements, resulting in a heavier reliance on public transport, and slow modes such as walking and cycling.

Joining up and reconciling tensions between national policies

- marry the agendas for sustainable development, parental choice of schools, and centralization of health services.

Integrating the transport modes

- ensure the integration of surface transport (bus/train/car/cycle/walk);
- minimize the problems with competing modes (short haul air/intercity rail/interurban roads); and
- enhance the surface access requirements of airports and seaports.

Making it easier to travel

- deliver real time information to travelers to assist journey planning and mode choice;
- establish innovative ticketing arrangements; and
- provide physical access to transport.

Impact/use of new technology

- provide incentives to reduce the need to travel;
- enhance network utilization; and
- facilitate higher levels of service provision.

Commission for Sustainable Development (CSD)

The CSD was formally established in the summer of 2000 and was created by the integration of the Round Table for Sustainable Development with the British Government Panel on Sustainable Development. These two sister groups had already undertaken much work in the field of transportation and their reports were a valuable resource for this paper. The newly formed CSD will become the voice for sustainable development initiatives and much of their work will feed into national and local policies/strategies. They also plan to take an active role in the proposed Earth Summit for Sustainable Development in 2002 (Johannesburg). The combination of the CSD and CfIT provides the U.K. with a powerful resource to push the sustainable transportation agenda forward.

CURRENT ISSUES

While it is clear that the U.K. transportation planning and programming framework appears relatively robust and to have sufficient resources to address the concept of sustainable transportation, there are several areas where action is being taken to ensure that the planning and program objectives are achieved.

Lack of Private Sector Confidence in the Rail Industry

The recent spate of railway incidents, in particular the Paddington and Hatfield railway crashes, have resulted in a lack of confidence in the private sector and there is concern that it will not be possible to reach investment levels set in the 10 Year Plan for the rehabilitation of existing, and construction of new, railway infrastructure. The U.K. railway network is now operating at the level it was two years ago. The maintenance activities and imposed speed limits that followed the train crashes caused much disruption to the system and it has taken time to recover. The Government aims to counter private sector concerns by focusing on the timely delivery of proposed projects and ensuring that the public are aware of the improvements that are being made to the system.

There is also a concern from the SRA that the investment levels set in the 10 Year Plan are not sufficient to meet the objectives of the New Deal for Transport. The expected shortfall in the required level of investment has no immediate solution.

Public Support for Congestion Charging

The thought of imposing additional costs for automobile use is a major challenge for all governments. Public opinion has a significant influence on the successful implementation of mechanisms such as congestion charging and the use of tolls, which is why the latest CfIT report on public attitudes to transit in England⁵², has provided some encouragement for sustainable transportation supporters.

The survey shows that the public supports increased transportation costs, but only if tangible alternatives are in place before charging occurs. The survey indicates that transport has become the most important issue locally, ahead of crime and vandalism, with those questioned demonstrating an impatience for delivery. Professor David Begg, Chairman of CfIT, commented as follows;

‘The single most important transport issue across the country is congestion and people showed they were prepared for both radical action and higher public investment to solve it and improve public transport. Four in ten are now willing to pay more taxes in order to have a better public transport system. A majority of people are now in favor of both congestion charging and motorway tolling when the revenue is ploughed back into transport or used to reduce other motoring taxes. Overwhelmingly people are showing that more must be done to make them look at alternatives to the car for some journeys.’

⁵² *The CfIT Report 2001, Public Attitudes to Transport in England*, a survey carried out by MORI for the Commission for Integrated Transport, July 2001. MORI interviewed a representative quota sample of 2002 adults aged 16+, including a sample of 490 in London. All interviews were conducted face to face in 204 enumeration districts throughout England. Data was weighted to reflect the correct geographic and demographic profile of the population. <http://www.cfit.gov.U.K./reports/mori2001/index.htm#02> (01/19/02).

It is Professor Begg's intention to use this latest report to persuade U.K. Ministers to support programs that seek to internalize the full cost of transportation.

Dissemination of Best Practice in Transportation Planning

As a consequence of the greater planning flexibility afforded to local authorities and the extended 5-year financial planning period, the Government was concerned that the new planning freedom might result in some uncertainty at local level regarding the content of the LTPs. The DTLR has produced a guidance document to assist in the preparation of LTPs, however this document provides no specific examples of how the objectives could be achieved in practice. To solve this problem the DTLR recently produced '*A Good Practice Guide for the Development of Local Transport Plans*'⁵³. The document highlights examples of good practice from provisional LTPs so that authorities can learn from each other. The Good Practice Guide will also be available on the Internet and will be regularly updated as planning tools are developed. It is also hoped that implementing and monitoring the LTPs will generate much interest in improving and sharing good practice.

⁵³ DTLR's *A Good Practice Guide for the Development of Local Transport Plans*, April 2000, can be found online at: <http://www.planning.dtlr.gov.U.K./advice.htm> (01/19/02).