Sustainable Transportation and TDM

Planning That Balances Economic, Social and Ecological Objectives

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TDM Encyclopedia

Victoria Transport Policy Institute

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This chapter discusses the concepts of sustainability, sustainable development and sustainable transportation, and how TDM can help achieve sustainability goals. Sustainability is a planning perspective that accounts for economic, social and environmental goals, including impacts that are indirect, difficult to measure, and distant in time and space. Sustainable transportation requires more comprehensive planning than what is commonly practiced. Sustainable planning can provide an opportunity to identify strategies that can help achieve multiple goals. TDM tends to support sustainability objectives, and sustainability planning tends to support TDM implementation.

Wit and Humor

The earth provides enough to satisfy every person's need but not every person's greed…When we take more than we need we are simply taking from each other, borrowing from the future, or destroying the environment and other species.

Mahatma Ghandi, *Principle of Enoughness*

Introduction

There is growing interest in the concepts of sustainability, sustainable development, and sustainable transport. Sustainability reflects one of the most fundamental human desires supported by virtually all philosophies and religions: to create a better future world. It provides guidance for long-term, strategic decision-making. Sustainability emphasizes the integrated nature of human activities and therefore the importance of comprehensive Planning that coordinates between sectors, jurisdictions and groups. This is an important change because existing institutions are often poorly suited to address complex, long-term problems.

Defining Sustainability

There is no universally accepted definition of sustainability, sustainable development or sustainable transport (Beatley, 1995). Some definitions are listed below.

Brundtland Commission (1987)

Sustainable development "meets the needs of the present without compromising the ability of future generations to meet their own needs."

Transport Canada (1999)

"The goal of sustainable transportation is to ensure that environment, social and economic considerations are factored into decisions affecting transportation activity."

Richardson (1999)

A sustainable transportation system is "one in which fuel consumption, vehicle emissions, safety, congestion, and social and economic access are of such levels that they can be sustained into the indefinite future without causing great or irreparable harm to future generations of people throughout the world."

Transportation Research Board (TRB, 1997)

"…sustainability is not about threat analysis; sustainability is about systems analysis. Specifically, it is about how environmental, economic, and social systems interact to their mutual advantage or disadvantage at various space-based scales of operation."

Organization for Economic Co-operation and Development (OECD)

The Environmental Directorate of the OECD defines environmentally sustainable transportation as, "transportation that does not endanger public health or ecosystems and that meets needs for access consistent with (a) use of renewable resources that are below their rates of regeneration, and (b) use of non-renewable resources below the rates of development of renewable substitutes."

Litman (2005)

Sustainable planning means that local, short-term decisions are consistent with strategic, regional and global, long-term goals.

European Union Council of Ministers of Transport

A sustainable transportation system is one that:

- Allows the basic access and development needs of individuals, companies and society to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations.

- Is Affordable, operates fairly and efficiently, offers a choice of transport mode, and supports a competitive economy, as well as balanced regional development.

- Limits emissions and waste within the planet's ability to absorb them, uses renewable resources at or below their rates of generation, and uses non-renewable resources at or below the rates of development of renewable substitutes, while minimizing the impact on the use of land and the generation of noise.

Transportation Association of Canada (TAC)

The Transportation Association of Canada proposes that a sustainable transportation system has the following characteristics:

(a) in the natural environment:

- limit emissions and waste (that pollute air, soil and water) within the urban area's ability to absorb/ recycle/cleanse;
- provide power to vehicles from renewable or inexhaustible energy sources. This implies solar power

over the long run; and

- recycle natural resources used in vehicles and infrastructure (such as steel, plastic, etc.).

(b) In society:

- provide equity of access for people and their goods, in this generation and in all future generations;
- enhance human health;
- help support the highest quality of life compatible with available wealth;
- facilitate urban development at the human scale;
- limit noise intrusion below levels accepted by communities; and
- be safe for people and their property.

(c) In the economy:

- Be financially affordable in each generation;
- Be designed and operated to maximize economic efficiency and minimize economic costs; and
- help support a strong, vibrant and diverse economy.

Center for Sustainability (www.c4s.info)

Sustainability has been identified as "The capacity for continuance into the long term future." Anything that can go on being done on an indefinite basis is sustainable. Anything that cannot go on being done indefinitely is unsustainable. The practices of the world's populace are currently unsustainable.

If we do not reach a point where our activities are sustainable, then we will eventually consume all available resources and generate a level of pollution that will mean the earth is no longer capable of sustaining human life.

Within a sustainable society it is also expected that every individual will have a right to "a better quality of life," which would include having adequate food, education, employment and housing, and for this to occur stable economic growth will be required. The challenge is to decouple social progress and economic growth from resource depletion and adverse environmental impacts.

The UK Government has set out the following 4 pillars of sustainability:

- Social progress for everyone.
- Stable economic growth and employment.
- Protection of the environment.
- Prudent use of natural resource.

Concern about sustainability can be considered a reaction to increased specialization in the way institutions are organized, and the tendency of decision-makers to focus on easily measured goals and impacts, while ignoring those that are indirect or more difficult to measure (Measuring Transportation). Conventional planning often reflects a "reductionist" approach, in which a particular organization or individual is responsible for dealing with a particular problem. This may be appropriate in some situations, but it often results in solutions to one problem that exacerbate other problems, or failure to implement solutions that provide modest but multiple benefits. Sustainable decision-making can therefore be described as Comprehensive Planning that considers a variety of goals and impacts

regardless of how difficult they are to measure. Sustainable planning and economics often refer to the *triple bottom line*, meaning consideration of economic, social and environmental impacts.

Conventional planning typically uses a 5-20 year time-frame, less than one generation. Sustainability incorporates concerns about long-term risks, such as depletion of resources, harmful pollution and climatic change that may harm people decades or even centuries in the future. This reflects concerns over "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 to people in other regions or cultures. Thus, sustainability ultimately reflects the goals of Equity, ecological integrity and human welfare, regardless of time or location.

Sustainable economics maintains a distinction between *growth* (increased quantity) and *development* (increased quality). Growth assumes that the goal is to replicate what currently exists at a larger scale – bigger is better. Development assumes that the goal is improvement, which may involve expansion or contraction to an optimal scale.

Economic *growth* focuses primarily on market activities, while economic *development* also considers non-market social and ecological activities (Daly 1996). Sustainable development 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 for ever 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 no positive value to actions that prevent illness or environmental degradation. Sustainable development indicators attempt to take into account qualitative and non-market values (Cobb, Halstead and Rowe, 1998).

Conventional planning tends to ask, "Does it work?" Sustainability planning tends to ask "Does it fit?" That is, sustainability planning places greater emphasis on how individual decisions fit into the overall context of total long-term goals and objectives.

Conventional economics defines people primarily as *consumers*, with the implication that the way to improve social welfare (i.e., to make people better off) is too maximize consumption of market goods (as reflected in GDP). Sustainable economics recognizes that people are also community members, residents, and citizens who also value non-market goods and community resource. For example, many people value friendship, security and tradition, and will forego material wealth to achieve them. The relative value of these non-market goods tends to increase as people become wealthier, since their most basic physical needs are already met. For example, an increase of $1,000 in annual income tends to provide far greater benefit to somebody who only earns $10,000 a year than to somebody earning $100,000 a year, since the wealthier person already has their basic material needs met (this is called *declining marginal benefit*). As a result, as a region becomes more economically developed and wealthier, the relative value of additional market goods tends to decline, while the relative value of non-market goods tends to increase.

Sustainability is sometimes defined narrowly. Some studies of sustainability focus on long-term resource depletion and air pollution problems, on the grounds that they represent the greatest risk and are prone to being neglected by conventional planning (TRB, 1997). But sustainability is increasingly defined more broadly to include the range of issues listed in Table 1.

Table 1 **Sustainability Issues**

Economic	Social	Environmental
Affordability	Equity	Pollution prevention
Resource efficiency	Human health	Climate protection
Cost internalization	Education	Biodiversity
Trade and business activity	Community	Precautionary action
Employment	Quality of life	Avoidance of irreversibility
Productivity	Public Participation	Habitat preservation
Tax burden		Aesthetics

This table lists various sustainability issues.

Although Table 1 implies that each issue fits into a specific category, in practice they often overlap. For example, pollution prevention is an environmental concern, but it also protects human health (a social concern) and is important for fishing and tourism industries (economic concerns). Sustainable planning reflects the realization that impacts and objectives often interact, so solutions must reflect integrated analysis.

Who Is More Sustainable?

Who is more sustainable, somebody who drives a fuel-efficient vehicle high annual miles, or somebody who drives an inefficient vehicle low annual miles?

If sustainability is defined only in terms of fuel efficiency and related emissions, it can be achieved by driving a fuel efficient vehicle, such as a 60 mile-per-gallon (MPG) hybrid car. However, such a car does not reduce traffic congestion or the barrier effect (delay and risk to pedestrians and cyclists), road and parking requirements, accident risk, or sprawl. A motorist who lives in a more accessible location and relies on alternative modes as much as possible (for example, commuting by bicycle, carpool or transit most days) and so drives an average efficiency vehicle low annual miles, consumes a similar amount of fuel, but imposes far lower costs on society overall.

Sustainability Principles

Principles reflect fundamental goals and practices. Below are basic principles of sustainability planning.

- *Comprehensive Analysis.* Sustainability requires planning that considers economic, social and environmental impacts, including those that are indirect, long-term and nonmarket. This requires adequate information and evaluation tools that allow stakeholders and decision-makers to understand the effects of their decisions.

- *Integrated and Strategic Planning*. Sustainability planning requires that individual decisions support a community's long-term strategic objectives. For example, transportation planning decisions should be subordinate to strategic economic, social and land use plans.

- *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.

- *Consideration of Equity.* Sustainability emphasizes that Equity impacts should be considered in decision-making, including those that are indirect and long-term (imposed on future generations).

- *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.

- *Precautionary Principle.* Sustainability supports the Precautionary Principle, which emphasizes the importance of incorporating risks in decision-making and favoring policies that minimize such risks when possible. It values Resilience.

- *Conservation Ethic.* Sustainability favors solutions that increase efficiency and reduce resource consumption, due to uncertainties about future market conditions and environmental impacts.

- *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.

Many organizations have developed recommended best practices for sustainable planning. The U.K. Royal Academy of Engineering provides the following principles of Engineering for Sustainable Development (RAE, 2005). See the report for detailed information on these principles.

1. Look beyond your own locality and the immediate future
2. Innovate and be creative
3. Seek a balanced solution
4. Seek engagement from all stakeholders
5. Make sure you know the needs and wants
6. Plan and manage effectively
7. Give sustainability the benefit of any doubt
8. If polluters must pollute … then they must pay as well
9. Adopt a holistic,'cradle-to-grave 'approach
10. Do things right,having decided on the right thing to do
11. Beware cost reductions that masquerade as value engineering
12. Practice what you preach.

Sustainability Indicators

Various sets of indicators have been proposed and applied to evaluate sustainability. They expand on existing indicators, such as GDP, to account for diverse social goals and objectives (Redefining Progress). These include specific, measurable indicators that reflect progress toward community development objectives. Table 2 is an example of a *Genuine Progress Indicator* developed for Alberta, Canada (Pembina Institute, 2001). Other regions, goals and analysis perspectives may require somewhat different indicators.

Table 2 **Sustainability Indicators**

Economic	Social	Environmental
Economy, GDP and Trade	Time Use	Energy
Economic growth (GDP)	Paid work time	Oil and gas reserve life
Economic diversity	Household work	
Trade	Parenting and eldercare	Agriculture
	Free time	Agricultural sustainability
Personal Consumption Expenditures,	Volunteerism	
Disposable Income and Savings	Commuting time	Forests
Disposable income		Timber sustainability
Personal expenditures	Human Health and Wellness	Forest fragmentation
Taxes	Life expectancy	
Savings rate	Premature mortality	Parks and Wilderness
	Infant mortality	Parks and wilderness
Money, Debt, Assets and Net Worth	Obesity	
Household Debt		Fish and Wildlife
	Suicide	Fish and wildlife
Income Inequality, Wealth, Poverty and Living Wages	Suicide	Wetlands and Peatlands
Income distribution	Substance Abuse: Alcohol, Drugs and Tobacco	Wetlands
Poverty	Drug use (youth)	Peatlands
Public and Household Infrastructure		Water Resource and Quality
Public infrastructure	Auto Crashes and Injuries	Water quality
Household infrastructure	Auto crashes	
		Energy Use Intensity and Air Quality
Employment	Family Breakdown	Energy use intensity
Weekly wage rate	Divorce	Air quality-related emissions
Unemployment rate		Greenhouse gas emissions
Underemployment	Crime	
	Crime	Carbon Budget
Transportation		Carbon budget deficit
Transportation expenditures	Gambling	
	Problem gambling	Municipal and Hazardous Waste
		Hazardous waste
	Democracy	Landfill waste
	Voter participation	
		Ecological Footprint
	Intellectual & Knowledge Capital	Ecological footprint
	Educational attainment	

This table summarizes Genuine Progress Indicators used to evaluate sustainability.

Transportation Impacts on Sustainability

Transportation facilities and activities have significant sustainability impacts, including those listed in Table 3. As a result, strategies that increase transportation system efficiency and reduce negative impacts from transportation are among the most effective ways to make progress toward sustainability objectives.

Table 3 **Transportation Impacts on Sustainability**

Economic	Social	Environmental
Traffic congestion	Inequity of impacts	Air pollution
Mobility barriers	Mobility disadvantaged	Climate change
Crash damages	Human health impacts	Habitat loss
Transportation facility costs	Community cohesion	Water pollution
Consumer transportation costs	Community livability	Hydrologic impacts
Depletion of non-renewable resources	Aesthetics	Noise pollution

This table lists impacts that transportation activities tend to have on sustainability objectives.

Because transportation activities have so many impacts related to sustainability, it is important to identify strategies that help achieve multiple objectives, and avoid those that solve one transportation problem but exacerbate others (Comprehensive Planning). For example, a policy or program that reduces traffic congestion but increases air pollution emissions or crashes cannot be considered a sustainable solution. Similarly, a strategy that reduces energy consumption and air pollution emission, but increases traffic congestion, crashes and consumer costs is not necessarily a sustainable strategy. The most sustainable strategies are those that simultaneously help reduce traffic congestion, pollution, crashes and consumer costs, increase mobility options for non-drivers, and encourages more efficient land use patterns, or at least avoid contradicting these objectives (Win-Win Transportation Solutions).

Conventional planning tends to assume that transport progress is linear, consisting of newer, faster modes that displace older, slower modes as illustrated below. This *series model* assumes that the older modes are unimportant, and so, for example, there is no harm if increasing automobile traffic causes congestion delay to public transit or creates a barrier to pedestrian travel. From this perspective it would be backward to give public transit or walking Priority over automobile travel.

Walk è Bicycle è Train è Bus è Automobile è Improved Automobiles

Sustainable reflects a *parallel model*, which assumes that each mode can be useful, and strives to create balanced transport systems that use each mode for what it does best. Transport progress therefore involves improving all useful modes, not just the newest mode, as illustrated below. For example, in many cities the most beneficial transportation strategies may involve Improving Walking and Cycling, Support for Public Transit Use, and Restricting Automobile Traffic in congested urban areas. It does not assume that faster, motorized modes should have priority over slower modes, or that increased travel speed is necessarily more important than qualitative factors such as comfort, safety and equity.

Walk è Improved Walking Conditions

Bicycle è Improved Cycling Conditions
Train/Bus è Improved Public Transit Service
Automobile è Improved Automobile Travel Conditions

Sustainable Transportation Performance Indicators

Sustainability and sustainable transportation are difficult to measure directly, so various Performance Indicators are used to evaluate them. Some are relatively narrow, focusing on just a few impacts, such as air pollution emissions, while others attempt to represent a broader range of economic, social and environmental objectives (Gilbert and Tanguay, 2000; Gudmundsson, 2001; Litman, 2003). Below are examples of indicators.

- Quality of overall Accessibility (ability to reach desired goods, services and activities). More is better.

- *Land Use Mix* - Number of job opportunities and commercial services within 30-minute travel distance of residents. Higher is better.

- *Land use accessibility* - Average number of basic services (schools, shops and government offices) within walking distance of residences. Higher is better.

- *Children's accessibility* - Portion of children who can walk or bicycle to Schools, shops and parks from their homes. Higher is better.

- *Electronic accessibility* - Portion of population with Internet service (Telework). Higher is better.

- *Commute speed* - Average commute travel time. Lower is better, particularly for disadvantaged populations.

- *Transport diversity* - Variety and quality of transport Options available in a community. Higher is better.

- *Mode split* - Portion of travel made by walking, cycling, rideshare, public transit and telework. Higher is better.

- *Transit service* – Public transit service quality, including coverage (portion of households and jobs within 5-minute walking distance of 15-minute transit service), service frequency, comfort (portion of trips in which passenger can sit and portion of transit stops with shelters), affordability (fares as a portion of minimum wage income), information availability, and safety (injuries per billion passenger-miles) (Transit Evaluation).

- *Motor Transport Options* - Quantity and quality of airline, rail, public transit, ferry, rideshare and taxi services. Higher is better.

- *Congestion delay* - Per capita traffic Congestion delay. Lower is better.

- *Consumer Transport costs* - Portion of household expenditures devoted to transport (Transport Costs). Lower is better.

- *Affordability* - Portion of household expenditures devoted to transport, including vehicle expenses, fares, residential parking costs, and taxes devoted to transport; particularly by people who are economically, socially and physically disadvantaged. Lower is better, particularly for disadvantaged populations.

- *Facility costs* - Per capita expenditures on roads, traffic services and parking facilities (Transport Costs). Lower is better.

- *Freight and commercial transport efficiency* – Speed, quality and affordability of Freight and commercial transport. Higher is better.

- *Delivery services* - Quantity and quality of delivery services (international/intercity courier, and stores that offer delivery). Higher is better.

- *Market principles* - Degree to which transport systems reflect Market Principles, including prices that reflect full costs and neutral tax policies. Higher is better.

- *Planning Practices* - Degree to which transport institutions reflect Least-cost planning and investment practices. Higher is better.

- *User rating* - Overall satisfaction rating of transport system and services by users (Surveys). Higher is better.

- *Citizen involvement* - Public involvement in transport Planning process. Higher is better.

- *Crash costs* - Per capita crash fatalities, disabilities and monetized Crash Costs. Lower is better.

- *Planning process* - Range of solutions considered in transport Planning. Higher is better.

- *Health and fitness* - Portion of population that regularly uses active transport modes (walking and cycling). Higher is better.

- *Community Livability* - Degree to which transport activities increase community livability (local environmental quality). Higher is better.

- *Cultural Preservation* - Degree to which cultural and historic values are reflected and preserved in transport planning decisions. Higher is better.

- Basic Access – Quality of transport to access socially valuable activities such as medical services, education, employment and essential shopping, particularly for disadvantaged populations.

- *Horizontal Equity (fairness)* - Degree to which prices reflect full costs unless a subsidy is specifically justified (Equity). Higher is better.

- *Progressivity* - Degree to which transport policies make lower-income people relatively better off (Equity). Higher is better.

- *Mobility for non-drivers* - Quality of accessibility and transport services for non-drivers (Equity). Higher is better.

- *Mobility for people with disabilities)* - Quality of transport facilities and services for people with disabilities, such as wheelchair users and people with visual impairments (Universal Design). Higher is better.

- *Nonmotorized transport* - Quality of walking and cycling conditions (Non-motorized Evaluation). Higher is better.

- *Climate change emissions* - Per capita fossil fuel consumption, and emissions of CO2 and other climate change emissions (Energy and Emission Reductions). Lower is better.

- *Other air pollution* - Per capita emissions of "conventional" air pollutants (CO, VOC, NOx, particulates, etc.) (Energy and Emission Reductions). Lower is better.

- *Noise pollution* - Portion of population exposed to high levels of traffic noise. Lower is better.

- *Water pollution* - Per capita vehicle fluid losses. Lower is better.

- *Land use impacts* - Per capita land devoted to transportation facilities (Land Use Evaluation). Lower is better.

- *Habitat protection* - Preservation of high-quality wildlife habitat (wetlands, old-growth forests, etc.) from loss due to transport facilities and development (Land Use Evaluation). Higher is better.

- Roadway aesthetic conditions (people tend to be more inclined to care for environments that they consider beautiful and meaningful).

Implications of Sustainable Transportation

Sustainability objectives have several implications for transport planning.

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. It involves Prioritizing Transportation to give higher value trips and lower cost modes priority over lower value, higher cost trips.

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.

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).

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 (Newman and Kenworthy, 1999).

Developing Regions

Sustainable transportation planning tends to be particularly important in lower-income, Developing Regions, since they have more limited resources, tend to rely more on alternative travel modes, and are currently making critical planning decisions which will determine the type of transportation system they will have in the future. Sustainability planning tends to favor more multi-modal transportation planning and Smart Growth, in order to avoid excessive Automobile Dependency, particularly in economically developing regions.

Demand Management and Sustainable Transportation

Many strategies have been proposed to create more sustainable transportation. Most involve either technical innovation or Transportation Demand Management. Sometimes these are presented as mutually exclusive (i.e., one approach or the other), but most objective research indicates that a combination of strategies is needed to achieve sustainability goals. For example, fuel efficient and alternative fueled vehicles can help achieve resource conservation and pollution reduction objectives, but demand management is needed to address other objectives, such as facility cost savings and improved travel

choices for non-drivers.

Most analysis suggest that Transportation Demand Management is essential for achieving more sustainable transportation, although the term "Transportation Demand Management" is not always used (World Bank, 1996). Some TDM strategies, called "No regrets" or Win-Win Transportation Solutions, help achieve a combination of economic, environmental and social objectives, and so are justified regardless of uncertainty over the value placed on impacts such as climate change and inequity.

Economic efficiency and resource conservation are important principles sustainability. This suggests that TDM strategies that reflect Market Principles, encourage more resource-efficient travel choices, or result in more efficient land use tend to support sustainability. TDM can also help achieve Livability objectives such as increased local environmental quality and community cohesion.

Market Principles	Efficient Land Use	Efficient Transportation
Comprehensive Market Reforms	Smart Growth	Walking and Cycling Improvements
Road Pricing	Location Efficient Development	Transit Improvements
Parking Pricing	New Urbanism	Ridesharing
Carbon Taxes	Transit Oriented Development	HOV Priority
Least Cost Planning	Access Management	Commute Trip Reduction
Asset Management		
Institutional Reforms		

Incorporating sustainability principles, objectives and evaluation criteria into transportation decision-making can support increased implementation of TDM, and greater coordination between transportation and land use planning.

Wit and Humor

Three fellows were sitting at a bar, and their conversation turns to collectables. One man describes his coin collection. "I have more than 2,000 coins from every country in the world, including several that are quite rare. My collection is valued at over $25,000. I keep it in a high-security cabinet."

The second man brags about his book collection. "I have more than 400 antique books, including several signed first editions. My collection is valued at over $50,000. I keep them in a climate-controlled room in my house."

The third man say, "I have the world's largest seashell collection, including countless unique specimens. My collection is considered priceless. I keep it on beaches all over the world."

Related Chapters

For more information on issues related to sustainable development see Evaluating TDM, TDM Planning, Comprehensive TDM Evaluation, Measuring Transportation, Evaluating TDM Equity, Transportation

Affordability, TDM and Economic Development, Transportation Costs, Asset Management, TDM in Developing Regions, Market Principles, Evaluating Pricing Strategies and Evaluating Transportation Choice.

Examples and Case Studies

Seattle Climate Action Plan (www.ci.seattle.wa.us/climate/report.htm)

In 2005 Seattle Mayor Greg Nickels established a Green Ribbon Commission that included a wide variety of stakeholders and experts to recommend climate protection actions for the Seattle community to meet or beat the Kyoto target. In 2006 the Commission released a report and recommendations, which include the following strategies to reduce automobile use (plus other strategies to reduce emissions in other ways):

- Increase the Supply of Frequent, Reliable and Convenient Public Transportation
- Significantly Expand Bicycling and Pedestrian Infrastructure
- Lead a Regional Partnership to Develop and Implement a Road Pricing System
- Implement a New Commercial Parking Tax
- Expand Efforts to Create Compact, Green, Urban Neighborhoods

Along with their recommendations the Commission offered these observations:

- Success will require a deliberate, sustained, community-wide effort. And, since cars and other transportation sources are the largest source of climate pollution in our area, we will need strong regional collaboration as well.

- The actions and investments needed to rein in Seattle's climate pollution will, at the same time, make our community healthier and more livable, for example, by reducing traffic congestion and toxic air pollution from diesel emissions.

- In addition, reducing our reliance on fossil fuels increases our energy independence, keeps more money circulating in the local economy and supports local and regional economic development.

- The road to a more climate-friendly community is paved with economic opportunities, including cost-savings from energy efficiency measures for our families and businesses—especially in light of rising and volatile energy prices—and new business prospects for our companies and entrepreneurs.

- Implementing these recommendations requires a significant investment of time and money by the community. But we believe the price tag is dwarfed by the cost to our community of not taking additional action.

- Finally, meeting the Kyoto target here—and, more important, transforming Seattle into the nation's most climate-friendly city—is an extraordinary challenge. But our community has rallied to meet such challenges in the past. With Seattle's unique mix of eco-intelligence and entrepreneurial zeal, we will meet and exceed the goal.

Post-Oil Planning (Perl, 2007)

A special issue of the *Journal of Urban Technology* (Perl, 2007) examines the paradigm shifts needed in urban transportation and land use planning to prepare for riding energy costs and to achieve sustainability objectives. The analysis indicates that sustainability objectives can be achieved through a combination of transportation and land use policy changes that reduce per capita transportation energy consumption, and create cities that better meet human needs, but that this requires fundamental changes in policy analysis and planning practices.

Integrated Planning (European Commission, 2002)

Leading experts recommend the following general principles to create more integrated and efficient local decision-making in the European Union:

1. Establish and enforce strategic (integration and with a long term perspective) visions, planning ability, capacity to use a wider and more innovative range of tools.
2. Promote management skills to develop participatory and proactive processes, involving all relevant stakeholders, and to implement local strategic planning, influencing and promoting the adoption of self – regulated behaviour from all the partners.
3. Consider and reflect upon national/local specificity and differences, being aware of new urban dynamics and of recent and relevant trends (such as increasing liberalisation of the environmental markets, globalisation of pressures, the need for urban renewal, etc.).

Evaluating Urban Sustainability (Barker, 2005)

A study evaluated the sustainability of transportation trends in San Antonio, Texas, including per capita vehicle travel, consumer costs, traffic fatalities, energy consumption and pollution emissions (Barker, 2005). Compared with other cities, San Antonio is found to be less sustainable. The study identifies factors that contribute to high levels of per capita vehicle travel, including development patterns, road density, jobs/housing balance and transit supply. The author identifies various strategies that could be applied to increase sustainability.

References And Resources For More Information

Access; the Sustainable Transport Forum (www.the-commons.org/access/eehome.htm) is an information network dedicated to exploring and promoting sustainable transportation.

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Graham **Bullock** (2006), *Stakeholders and the Development of National Environmental Indicators: Case Studies from the Sustainable Roundtables, EPA, and the Heinz Center*, Kennedy School of Government Environment and

Natural Resources Program Working Paper; at http://belfercenter.ksg.harvard.edu/files/bcsia%20enr%20discussion%20paper%20submission_bullock.pdf.

Canadian National Round Table on the Environment and Economy (www.nrtee-trnee.ca) is working to develop national policies that support more sustainable development and transport.

Centre for Alternative and Sustainable Transport (CAST) (www.staffs.ac.uk/schools/sciences/geography/cast/casthome.html) performs research on non-motorised, sustainable transport.

Center of Excellence for Sustainable Development (www.sustainable.doe.gov) is a US Department of Energy program that supports more resource efficient development.

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Centre for Science and Environment (www.cseindia.org) is a leading environmental NGO located in India, which promotes sustainable development.

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