



Transportation & the Environment

Description and Review of Alternative
Policies for Departmental Consideration



A Multimodal Planning Process of the Wisconsin Department of Transportation

MISSION STATEMENT

TRANSLINKS 21 — Wisconsin's 21st century transportation plan — will outline a comprehensive transportation system that moves people and goods efficiently, strengthens our economy, protects our environment, and supports our quality of life. Working with DOT, the public will identify Wisconsin's transportation needs — and help to make tomorrow's transportation choices.

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Governor*

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Secretary*



Transportation and Environment



Prepared by the
Wisconsin Department of Transportation
TRANSLINKS 21 Environmental Strategies Team

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Transportation and Environment

Executive Summary

Introduction

Transportation, like all human activities, affects the environment. This paper is designed to both give an overview of the environmental effects of transportation and to present alternative roles in the environmental arena available to the Department of Transportation. It begins with an overview of the issue areas covered, underlying causes of the factors affecting transportation's impact on the environment, legal constraints, environmental strategies and alternative roles under which the strategies would be applied. These topics are expanded somewhat in the remainder of the main report. Two appendices and a technical support document are available upon request to provide in depth discussion of the issue areas and environmental strategies. Appendix A covers the four issue areas; Appendix B describes the strategies under four categories: fuel/vehicle technology, transportation demand/system management, planning related, and research and education.

Issues

Four key environmental issue areas in which transportation plays a role are identified: air quality; the physical environment, encompassing biodiversity, water, and waste issues; energy; and global climate change. The paper is not exhaustive and the department recognizes that there are other environment-related issues affected by transportation. These four areas were selected as particularly timely. Existing environmental legislation requires WisDOT to consider the impact of the transportation system on air quality, particularly in the counties that violate federal ozone standards. Reauthorization of key federal legislation affecting each of the physical environment issues is under consideration. The efficiency and magnitude of use of energy affects all of the other topics to be discussed. Global climate change is an emerging issue at a national and international level, and may become an increasingly significant concern for Wisconsin in the future. The relationships between transportation and land use and the effect of transportation facility development on travel growth are discussed in separate issue papers.

Alternative Roles

Compliance with requirements: Because of the extent of regulation in the environmental area, compliance with legal requirements involves a significant degree of activity. The Department would continue to mitigate adverse environmental impacts during project development to the extent required by existing environmental regulations. WisDOT would participate in debate on environmental policy when a proposal seems likely to harm our ability to meet transportation needs or impose significant implementation costs, perhaps beyond the scale of benefits to be received.

Active role: The Department would continue to acknowledge the link between transportation and the environment, actively mitigate during project development, and consider environmental issues in reaction to public expectations and the recognition of emerging issues.

Aggressive role: As the State's transportation agency, WisDOT's responsibilities would include minimization of the transportation system's environmental impacts. The Department would strive to create a transportation system in which unregulated environmental impacts are avoided or minimized wherever feasible, in addition to the activities described above.

Dominant role: As the designated state transportation agency, WisDOT would actively seek opportunities to harmonize environmental concerns with transportation needs, and environmental concerns would be the determining factor in major transportation policy and planning decisions.

Chapter 1

Transportation and the Environment: Overview of the Issues

INTRODUCTION AND BACKGROUND

Mobility is an integral component of modern life. An efficient and convenient transportation system plays a key role in economic growth, and the preservation of a high quality of life. But, the transportation system can have a disruptive impact on land, water, and air resources. Over the past 20 years, WisDOT has developed an extensive process for review and mitigation of environmental impacts as part of project development. However, continued travel growth, increased awareness of environmental issues, and recognition that some types of impacts are hard to identify during project development warrant consideration of environmental issues as part of the long range planning process. This report provides an overview of the complex relationship between transportation and key environmental issues. Major environmental issue areas are identified, and WisDOT's role in environmental protection is examined. Four alternative roles for the Department with respect to the environment are presented for consideration. More detailed discussion of the environmental issue areas and strategies appear in the appendices.

Environmental Issues and the TRANSLINKS 21 Plan

The Transportation and Environment issue paper is a part of WisDOT's first statewide multimodal transportation plan since the adoption of the Intermodal Surface Transportation Efficiency Act (ISTEA). The plan is called TRANSLINKS 21, and it includes both strategic policy planning and system infrastructure planning components. Analysis of the environmental impacts of transportation is a key component of the TRANSLINKS 21 Plan. Other issues covered in issue papers prepared for TRANSLINKS, such as land use, transportation demand management, and transit have close ties with environmental policy.

TRANSLINKS 21 Goals and Values

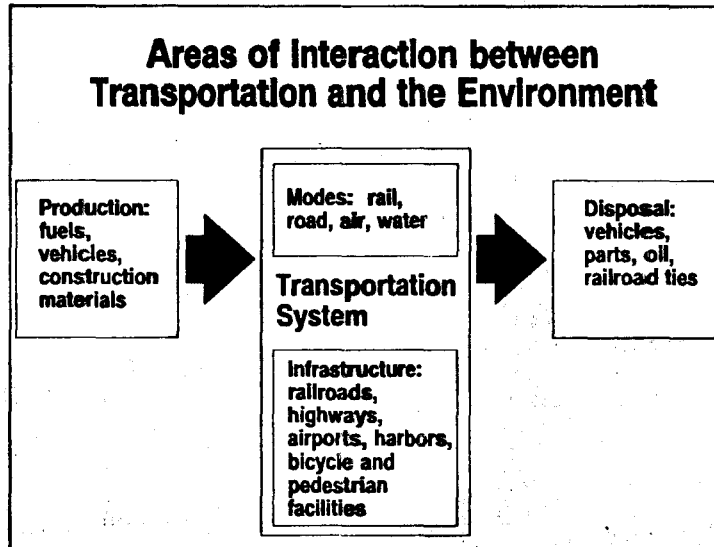
The TRANSLINKS 21 plan has five basic transportation goals: Maintaining and enhancing mobility, maximizing the choices of transportation modes available, maximizing connectivity among modes, maximizing safety, and public sector efficiency. In the development of alternatives, the five basic transportation goals are interpreted in ways which promote livable communities. TRANSLINKS 21 looks carefully at economic growth and environmental issues, recognizing that both are critical to maintaining the long-term livability of Wisconsin's communities.

TRANSPORTATION AND ENVIRONMENT, A FRAMEWORK

Transportation's impact on the environment may be conceptualized in three phases as illustrated in Figure 1.1. The first phase, shown in the left-hand box, includes production of vehicles, fuels, and construction materials.

Processes in this phase include the manufacture of raw materials such as aluminum and steel used in vehicles, which is very energy intensive; and, the refining of petroleum which releases smog forming air pollutants. The middle box represents what is often considered to be the "transportation system". This paper focuses on the environmental impacts of activities that take place in this box. The final phase, shown in the right-hand box, contains the disposal of solid wastes resulting from phases one and two. In this phase

Figure 1.1



environmental impacts can occur as a result of the incorrect disposal of worn tires, old batteries, and used oil.

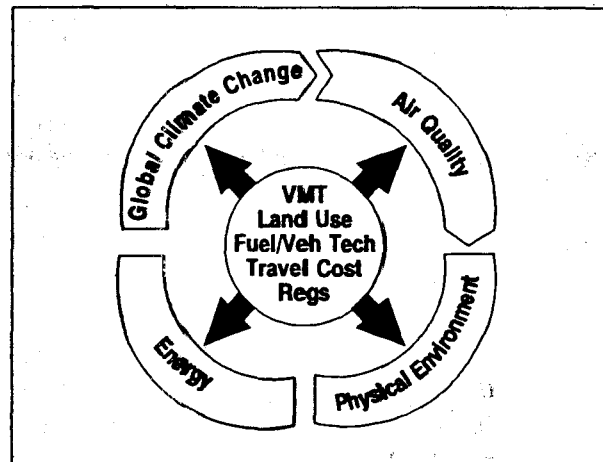
The transportation system consists of two complementary components, travel mode and transportation infrastructure, which together determine the environmental impacts of the transportation system. Travel modes include air, rail, road, and water. Trips by mode can be broken down by length, and purpose. Factors such as cost, convenience, availability, and speed affect trip length, and mode selection. The environmental impacts of each mode vary significantly. Transportation infrastructure includes railroads, highways, airports, and harbors. Transportation infrastructure choices determine which modes can be included in the transportation system. There can be environmental impacts associated with the construction and repair of transportation infrastructure. Policy choices affecting transportation mode and/or infrastructure can determine the transportation system's impact on the environment.

TRENDS

Some fundamental forces influence the extent of the transportation system's impact on the environment. Trends in regulation, land use policy, transportation costs, and the related changes

Figure 1.2

in travel demand, fuel and vehicle technological change each play a role in determining the extent of transportation impacts. They are discussed briefly below. Figure 1.2 illustrates the interactions between each of these factors and the key environmental issue areas, as well as the relationships among the issues.



Regulation

Environmental regulation has a significant influence on transportation policy and the other underlying influences on environmental effects and the transportation system. Legal constraints are discussed in more detail in the next section. The volume of environmental regulation has increased rapidly over the last thirty years. Important revisions and new laws have been passed since 1990, and it is likely that new laws or regulations addressing emerging environmental issues such as global climate change and toxics will be created in the future. As laws are passed at the State and Federal level WisDOT is likely to find its activities even more circumscribed. At the same time, these laws affect land use and travel demand, putting pressure on WisDOT to develop the infrastructure in response. Some important environmental regulations are discussed in the next section.

Land Use

Since World War II, the shift of population and employment away from high density central city locations to lower density suburban and exurban locations has escalated dramatically. Some environmental laws, such as Superfund, discourage redevelopment of industrial properties, which are often located in urban areas. Suburban and exurban sites are less likely to have contamination from previous uses for which developers could be held liable. Local land use decisions, beyond WisDOT input, have also significantly fostered development of suburban areas.

Low density development is not compatible with traditional high occupancy modes such as transit or non-motorized modes of transportation such as walking and bicycling, therefore encouraging dependence on automobile travel. Suburban development has also tended to separate land uses thus encouraging longer trips. This issue is discussed at length in the TRANSLINKS paper on land use-transportation policies¹.

¹Description and Review of Alternative Land Use-Transportation Policies for Departmental Consideration

Travel Cost

Travel cost influences the volume of travel, choice of mode, and preferred vehicle technology to some extent. For example, a significant rise in the cost of gasoline may reduce demand for travel, encourage use of other modes such as transit; and, increase the demand for more fuel efficient vehicles. Likewise, transit ridership falls as cost increases, both absolutely and relative to auto travel.

Travel Growth

In 1990, FHWA updated its nationwide personal transportation survey. Survey results indicate that between 1983 and 1990 vehicle miles travelled (VMT) grew by 40 percent nationwide. In Wisconsin, VMT grew by 138 percent between 1960 and 1990. Figure 1.3 indicates current forecasts of VMT growth in Wisconsin.

It is likely that future travel growth rates will be lower than those seen in recent decades. Factors contributing to the declining growth rate include: a decline in population growth, a peak in the growth of the female labor force, and a stabilization of the decline in vehicle occupancy rates.

However, while overall travel growth rates may drop, travel growth in particular metropolitan areas may continue, thus straining the capacity of individual corridors. As travel increases the transportation system expands with attendant environmental impacts.

Fuel/Vehicle Technology

While VMT has increased, the polluting effects of highway vehicles both on a per mile basis and in absolute terms have diminished. Figure 1.4 indicates this trend. Emission controls were first required on automobiles in the early 1960's, and have become increasingly more effective and sophisticated. Emissions of both hydrocarbons and carbon monoxide from new vehicles have been reduced over 90 percent for automobiles and light duty trucks, and nitrogen oxides have been reduced over 50 percent.

Figure 1.3

Growth in Vehicle Miles Travelled in Wisconsin, 1960-90

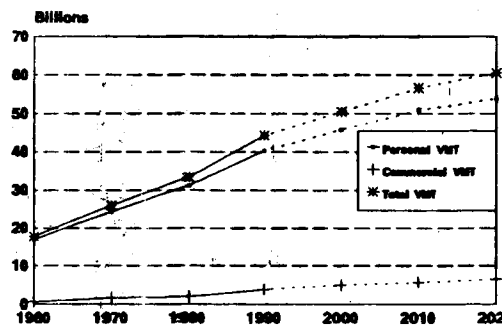
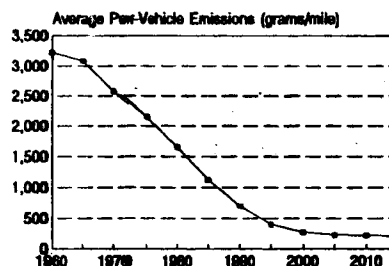


Figure 1.4

National Emissions Trends 1960-2020



LEGAL CONSTRAINTS

Transportation's impacts on the environment are highly regulated at the federal and state level, and environmental regulation is likely to continue to increase in the future. The requirements of existing environmental regulations will determine WisDOT's environmental role to a considerable extent. The primary environmental laws which affect transportation are the Clean Air Act and the Clean Water Act. The National Environmental Policy Act and the Wisconsin Environmental Policy Act lay out the procedure that must be followed in considering environmental aspects of proposed actions. A number of other laws relating to specific environmental impacts also must be considered: The Endangered Species Act, Wisconsin Endangered Species Law, Migratory Bird Treaty Act, Cooperative Agreement with WisDNR for water and wetland laws, Coastal Zone Management Act, and the Coastal Zone Act Re-authorization Amendments of 1990. Requirements for remediation of contaminated sites under the Comprehensive Environmental Response, Compensation, and Liability Act make costly and time consuming contaminated site assessments necessary when corridors are proposed through industrial areas. The primary transportation law is the Intermodal Surface Transportation Efficiency Act. The National Energy Policy Act includes provisions relating to transportation as well. Brief descriptions of the primary laws follow.

Clean Air Act (CAA)

The CAA sets National Ambient Air Quality Standards for five air pollutants. All parts of the country must meet these standards or be considered in nonattainment. When an area is in nonattainment, it must implement certain mandatory control measures, as well as any additional measures that are needed to show progress toward coming into attainment. Mandatory programs in Southeastern Wisconsin include conformity of transportation and air quality plans, enhanced inspection and maintenance of vehicles, clean fuel fleets, reformulated gasoline, and a program for large employers to encourage employees to choose other commuting options than the single occupant vehicle.

Clean Water Act, as Amended

The Clean Water Act was enacted to restore and maintain the integrity of the Nation's waters through the prevention, reduction, and elimination of pollution. Section 404 of this Act requires that Wisconsin DOT coordinate with the Corps of Engineers to obtain permit authorization to discharge fill or dredged material into waters of the United States. Section 401 requires that before permits for discharges can be obtained, water quality certification from the state natural resources agency must be obtained. The WisDNR certification to WisDOT occurs through a Cooperative Agreement process.

National Environmental Policy Act (NEPA)

The objective of this federal law is to insure that an agency will give appropriate and careful consideration to the environmental aspects of proposed actions and alternatives that will significantly affect the human environment. CEQ regulations, which implement NEPA, require that the agency avoid, minimize and compensate for environmental impacts. NEPA requires Environmental Impact Statements for significant projects. It applies to the actions of federal agencies, and state agencies where federal money is used or approval is required.

Wisconsin Environmental Policy Act (WEPA)

This state law complements the National Environmental Policy Act discussed above. It was written for the same purposes as the federal legislation, but it affects the activities of state agencies. It becomes effective where state agencies propose projects that would have a significant impact on the human and natural environment. One of its end products is a state Environmental Impact Statement. A related requirement, 1.12, Stats., mandates consideration of the conservation of energy resources when making major decisions that could significantly affect energy uses.

Under WEPA and NEPA, environmental reviews are done at the project level, often after many previous decisions (planning or budgetary) have already occurred. There is a need to examine impacts of policies, plans or budgets before they are segmented into tens or even hundreds of individual projects. This need to examine impacts with a cumulative perspective has spurred two related efforts at WisDOT that will help examine environmental impacts at earlier stages of decision making - the System-plan Environmental Evaluation (SEE) which is conducted at the plan level and a Legislative Environmental Implementation Statement (LEIS) which is conducted at the policy and budget level.

InterModal Surface Transportation Efficiency Act (ISTEA)

ISTEA requires that states and metropolitan planning organizations consider the overall social, economic, energy, and environmental effects of their transportation plans. It provides funding for transportation projects that reduce air pollution through the Congestion Mitigation and Air Quality improvement program.

National Energy Policy Act

This law encourages the development and use of alternative fuels. It establishes a program for the research and development of electric vehicles, and provides for tax incentives for the use of these vehicles and of alternative fuel vehicles. It mandates the establishment of a governmental fleet program requiring purchases of alternatively fueled vehicles.

AN ENVIRONMENTAL ROLE FOR WISDOT: FOUR ALTERNATIVES

Four key transportation-related "Environmental Issue Areas" determine the broad menu of "Environmental Strategies". An appropriate package of environmental strategies can be drawn from this menu for the Department. Some strategies are mandated by existing law; however, selection and determination of the appropriate geographic and technical scale of implementation of many strategies will be greatly influenced by the "Environmental Role" adopted by the Department. The environmental role provides a set of guiding principles for selection of appropriate environmental strategies, constrained by the Department's broader "Transportation Policies". For instance, in situations where much of the environmental problem results from another source, the Department may wish to avoid the problem or seek other funding rather than take resources away from other goals. Four alternative "environmental strategy packages" are presented for consideration below. Each succeeding alternative, beginning with Alternative One, represents an increased level of WisDOT commitment to environmental concerns. Because of the regulatory nature of environmental protection, the range of alternatives possible is not as broad as for other TRANSLINKS issues. Strategies suggested are examples that illustrate the degree of activity appropriate for that role, not an exhaustive listing.

Alternative One: Compliance With Environmental-Regulations

As the designated state transportation agency WisDOT's responsibility would be to ensure mobility for the citizens and businesses of Wisconsin. The Department would continue to acknowledge the close link between transportation and the environment. The Department would rely on the expertise of Federal and State environmental agencies to determine the level of action which is appropriate to minimize the negative side effects of transportation, while objecting to environmental regulations that are not cost-effective, or that force WisDOT to mitigate environmental problems primarily caused by non-transportation sources.

WisDOT would participate in debate on environmental policy only when a proposal seems likely to harm our ability to meet transportation needs or impose significant implementation costs, perhaps beyond the scale of benefits to be received. The Department would develop a level of staff environmental expertise adequate to participate in such discussions and to aid in compliance with all transportation-related environmental laws. It would be inappropriate for the Department to actively pursue environmental policies not required by law as this function would be performed by other agencies and groups.

Alternative one may be characterized as a decline in WisDOT's environmental protection role.

Alternative Two: Active Role - Reactive to Specific Environmental Issues

As the State's designated transportation agency WisDOT's primary responsibility would be to ensure mobility for the citizens and businesses of Wisconsin. The Department would continue to acknowledge the close link between transportation and environment, and would actively mitigate environmental impacts during project development. The Department would consider environmental issues in reaction to public expectations and in recognition of emerging issues. However, a direct role in setting environmental policy would only be appropriate where benefits to the transportation system outweigh the costs, unless mandated by law.

WisDOT would participate in environmental policy debate wherever transportation-related environmental impacts occur. The Department would comply with all State and Federal transportation-related environmental laws. The Department would foster the development and utilization of in-house environmental expertise to facilitate the mainstreaming of environmental decision making into the transportation planning process, and to develop an awareness of unregulated transportation-related environmental issues so that the Department would be positioned to react to future policy developments in the best interests of the transportation community.

Alternative Two may be characterized as the status-quo.

Alternative Three: Aggressive Role

As the State's designated transportation agency, WisDOT's responsibilities would include minimization of the transportation system's environmental impacts. A direct role in setting environmental policy would be appropriate for the Department under circumstances where environmental policies and programs are compatible with broader transportation goals. The Department would take a broad initiative on State transportation issues, and would support Federal initiatives where appropriate.

WisDOT would participate in environmental policy discussions, and would comply with all Federal and State environmental regulations. The Department would strive to create a transportation system in which unregulated environmental impacts would be avoided or minimized wherever feasible. Communication and debate about transportation-related environmental issues would be actively encouraged, and environmental goals would figure prominently in policy and planning discussions.

Alternative Three may be characterized as an expansion of WisDOT's environmental protection role.

Alternative Four: Dominant Role - Regulatory Approach

Many environmental experts hold the view that long term economic prosperity is dependent on environmental sustainability. As the designated state transportation agency WisDOT would actively seek opportunities to harmonize environmental concerns with transportation needs. The Department would support aggressive measures aimed at changing travel behavior and reducing growth in travel. Environmental issues would be the determining factor in transportation investment decisions. A direct role in setting environmental policy would be appropriate in this context, and appropriate measures would be taken to minimize the negative side effects of transportation.

WisDOT would comply with all State and Federal laws, and would initiate debate on transportation and environmental policy. Environmental considerations would be mainstreamed into the transportation planning process. Unregulated environmental impacts would be mitigated to the extent feasible.

Alternative Four may be characterized as a major expansion of WisDOT's environmental protection role.

Chapter 2

Key Environmental Issue Areas

INTRODUCTION

To evaluate the alternatives presented in Chapter 1, it is necessary to have a basic understanding of the key environmental issue areas in which transportation plays a significant role. This paper focuses on natural resource issues and does not attempt to address socioeconomic, cultural or historic preservation issues. Four categories of environmental issues will be discussed in this chapter: air quality, the physical environment, energy and global climate change. Detailed analyses of each issue are contained in Appendix A.

AIR QUALITY

Transportation can contribute significantly to a range of environmental problems when there are excessive emissions of pollutants to the atmosphere. The effects of the pollutants include health problems, damage to crops and forests, damage to aquatic and terrestrial ecosystems, materials deterioration, and loss of visibility. There is public concern about these impacts, as well as aesthetic problems associated with emissions, such as odors and smoke.

Tropospheric ozone is the air pollutant of greatest concern in Wisconsin. It is formed when volatile organic compounds (VOC) are combined with oxides of nitrogen (NO_x) in the presence of sunlight, although recent modelling indicates that in Southeast Wisconsin, it is more important to control VOC emissions than NO_x. As a result of emissions both within Wisconsin and transported from outside the region, Southeastern Wisconsin violates federal standards for ozone levels. Carbon monoxide, a poisonous gas, and particulates, which can cause respiratory problems, can be local problems. Toxic pollutants, which can cause cancer, are becoming a greater concern as other air pollution problems are lessening. Transportation contributes significantly to all of the air pollution problems listed above. Acid deposition, as a result of oxides of sulfur emissions, will not be discussed because transportation contributes very little to the problem. Transportation does contribute significantly to NO_x emissions which are also acid precursors, however sulfur is the larger problem in acid deposition.

Federal mandates are extremely effective in reducing motor vehicle emissions. National data published by the U.S. Environmental Protection Agency indicate that during the 1980's, VOC emissions from motor vehicles decreased 34 percent nationally, despite a 41 % increase in travel.¹ Even with increases in vehicle miles travelled, emissions from mobile sources are

² United States Environmental Protection Agency. 1991. National Air Pollutant Emission Estimates 1940-1990.

declining in both relative and absolute terms. Figure 2.1 shows trends in VOC emissions and VMT for the 1980 to 1990 period, and Figure 2.2 gives projections assuming two different VMT growth rates.

Figure 2.1

Highway VOC Emissions and VMT 1980-1990

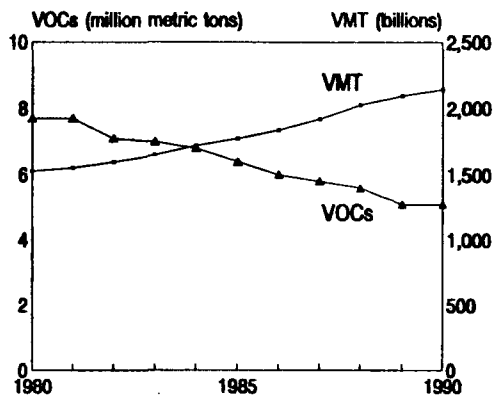


Figure 2.2

Wisconsin VOC Emission Projections

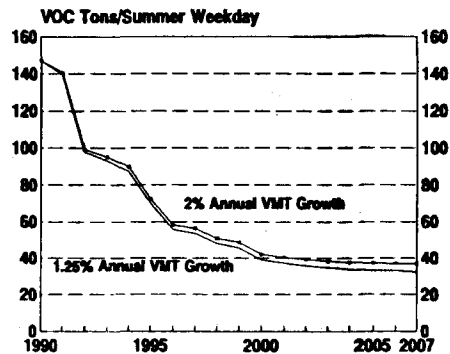
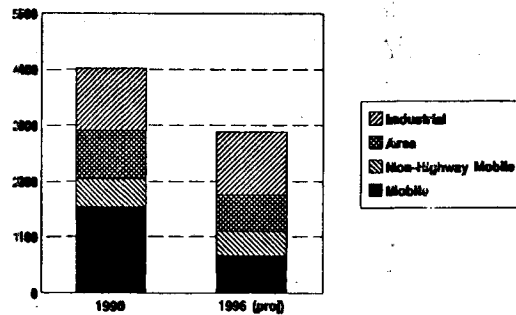


Figure 2.3

Emissions by Sector, 1990 & 1996 (proj)
VOC Tons/Summer Day



Mobile sector VOC emissions in Wisconsin are expected to decline 58 percent, from 160 to 67 tons between 1990 and 1996, as illustrated in Figure 2.3. As a result of control measures being implemented under the Clean Air Act, the fraction of total VOC emissions from mobile sources in Southeast Wisconsin is expected to decrease from 38% in 1990 to 23% in 1996. In absolute terms, total VOC emissions during that same period will decline from 402 tons per summer day to 288 tons per summer day. The EPA is undertaking a reevaluation of the MOBILE model, which it uses to calculate emissions, and is expected to make changes in the emission factors. This will probably result in an overall increase in emissions which are attributed to the mobile source sector. For more information on trends in motor vehicle emissions, see Appendix A.1, or the February draft background paper "Trends in Motor Vehicle Emissions", prepared by WisDOT.

While the largest and most obvious source of emissions from the current transportation system is highway vehicles, the infrastructure and other modes of transportation result in emissions as well. In any discussion of reducing emissions from transportation through adopting an intermodal system, pollution from the modes other than highway should be included.

Very little of the air pollution that can be directly attributed to transportation comes from the construction or maintenance of transportation infrastructure. The issue of induced travel from new capacity is discussed in a separate paper. In the aggregate, highway modes pollute the most because these modes constitute the majority of all travel. Diesel vehicles, including both highway and rail, contribute more to NO_x emissions than gasoline powered vehicles, both on an aggregate and per mile basis.

When comparing modes, it is useful to keep in mind that within each mode, technology, fuel and operating conditions can vary substantially. For this reason, ranges of potential emissions are considered for each mode. On a per passenger or ton mile basis, newer technologies and higher vehicle occupancy or load lowers emissions for most pollutants. For hydrocarbon and carbon monoxide emissions, automobiles have the widest range of emissions represented because of the potential for change given new technology. The lowest emissions from automobiles is represented by the California ultra low emission vehicle standard, which has yet to be proven in the fleet. For the technology contained in the range, current automobiles using current gasoline emit at the top of the range for CO and a little above the middle of the range for NO_x and hydrocarbons. Comparing passenger modes, the single occupant vehicle (SOV) emits significantly more hydrocarbons and carbon monoxide on a per passenger basis than any other mode. The same comparison for NO_x, however, is a different story. Carpooling, vanpooling, intercity diesel trains, and electric powered heavy rail transit systems do better than an SOV, but with current technology and fuels, buses and diesel commuter rail emit more. Under an extreme scenario of very low ridership on a commuter train, emissions of NO_x on a per passenger mile basis from the train are more than ten times as great as from the SOV. Air travel appears much better than any other mode, although only pollution occurring during the landing and take-off cycles is included.

For freight, rail and vessel emit less on a per ton-mile basis than trucks for hydrocarbons and carbon monoxide. NO_x emission from vessel transport could be as high or slightly higher than emissions from truck transport, although much of the emission range for vessels is below the range for trucks. For longer trips -where intermodal shipping is involved, the difference between trucks and rail is less. Easy intermodal shipment of goods requires different types of equipment that are only partially optimized for the modes for which they are used. This intermodal equipment could be less energy efficient or lead to increases in emissions over the best equipment for each mode. For instance, trailer on flatcar shipments have poor aerodynamics compared to other rail equipment, leading to poor fuel economy.

In addition to the mandatory programs under the CAAA listed in Chapter 1, there are a number of other environmental strategies that could reduce emissions:

- Improved vehicle fuel efficiency
- Expanded inspection and maintenance
- Improved vehicle emission controls
- Expanded use of reformulated gasoline
- Lower vapor pressure gasoline
- Controls on locomotive emissions
- Use of selected alternative fuels
- Additional investment in alternative transportation modes
- Incentives and disincentives
- Alternative work schedules/sites
- Traffic flow improvements
- Improved land use/transportation planning
- Reduced speeds

PHYSICAL ENVIRONMENT

Over the last thirty years, new laws and regulations have emerged that have attempted to minimize or mitigate the impact of human activities on the natural world. While air quality effects from transportation are dominated by the use of modes, the detrimental effects on the physical environment result mainly from the provision of the infrastructure. Consequently, reducing the need to provide more infrastructure by providing alternatives to single occupant vehicle travel can reduce some of the effects on the physical environment. These effects include loss of biological diversity and habitat fragmentation, loss of prime agricultural land, noise impacts, non-point stormwater runoff pollution, soil erosion, wetland loss, leaks from underground storage tanks and spills, and water pollution from harbor dredging. Transportation directly causes loss of biodiversity, noise, non-point stormwater runoff pollution and wetland filling at least to some extent. Transportation may indirectly contribute to problems with nonpoint stormwater runoff, and wetland filling through its relationship to land use. Leaking underground storage tanks and abandoned waste sites, and harbor dredged material to a large extent are environmental problems that the Department must deal with in the building and maintenance of the transportation system, although WisDOT may have contributed very little or not at all to the creation of the problem.

Shrinking biological diversity and natural habitat fragmentation

Biological diversity is the diversity of genes, species and ecosystems. The biological world is a series of connected species, with the richness and complexity of species and the connections

between those species contributing significantly to the health and resilience of the biological world. Healthy ecosystems provide clean water and air, and are necessary to support commercial and recreational fish and wildlife populations, forestry products and some aspects of agriculture. Furthermore, the diversity of species and even genetic strains provide a pool of critically important resources for potential use in Wisconsin's agriculture and medicine, and to enhance the quality of life.

The smaller the habitat is for animals, the less species diversity there is, and the more likely the species that do exist there will be eliminated over time because of random events such as tornadoes, droughts or floods. Some habitats in Wisconsin where fragmentation is especially noticeable are woodlands in the southern third of the state and high quality grasslands statewide. When a transportation corridor is placed through a habitat, it breaks up the habitat into smaller pieces, sometimes below a minimum critical area for one or more species. Within transportation, highways contribute the most to fragmentation, although rail while less pervasive, has a similar effect.

Loss of prime agricultural land

Highways and local land use decisions commonly influence the location and timing of developments, although not the total demand for regional development. It is likely that the effects of a given highway expansion will be greatest in those areas also undergoing the greatest growth pressure already. Today, much of Wisconsin's prime agricultural land is located close to urban areas, and is often under the most pressure for conversion to urban use. The loss of prime agricultural lands is an important resource issue since today's decisions about transportation and land use will affect the range of choices available to society in the future.

Noise

If a transportation project has a noise impact, abatement can be provided by shifting the alignment, depressing the roadway, or constructing noise barriers. WisDOT adopted a policy for providing retrofit noise barriers throughout Wisconsin at 209 locations.

WisDOT is also working with local units of government to encourage noise compatible land uses near rail systems and airports, as well as highways.

Non-point stormwater runoff pollution

The source of non-point pollution varies significantly depending on where in Wisconsin measurements are taken. On a statewide basis, agriculture contributes the most toward non-point runoff. However, in several urban counties in southern Wisconsin, non-point runoff originates from many other sources such as construction sites for buildings, utilities, and impervious surfaces such as roof tops, parking lots and highways.

Transportation facilities act as conduits for non-point pollution, tunnelling pollutants from fields, construction sites, and the roads themselves into lakes and streams via storm water drains.

Besides collecting hydrocarbons and heavy metals, large areas of pavement warm the water before discharge, lowering the amount of oxygen it can carry and consequently decreasing the aquatic life it can support.

Road salt, in particular, has been traced to shifts in vegetation in some lakes because of increases in chlorine. For example amounts of chlorine in some Wisconsin lakes were recorded at 5-10 mg/l historically. However recently, those same lake's chlorine count increased to 70 mg/l. Similar increases are measured in Lake Michigan. It should be noted that these are still well below toxic levels for vertebrates. Research in this area has linked changes in algae and other vascular plants to this increase in chlorine. Not all of the chlorine increase can be attributed to road salt. Substantial amounts come from water softening salt and industrial uses.

Although agriculture is the greatest contributor to erosion statewide, construction of homes, utilities and roads contribute significantly in several urban counties in southeastern Wisconsin. In recent years, development of sophisticated erosion control methods, combined with very significant efforts to minimize erosion by WisDOT, road builders and highway designers has reduced erosion from highway projects. Erosion dumps tons of soil sediment into Wisconsin's streams and lakes, smothering all but the most resistant of bottom dwellers, covering spawning areas, and extracting oxygen from the water. In addition, a large percentage of harbor dredging is required because of erosion.

Wetlands

Wetlands and wetland filling have been transportation issues for at least twenty years and continue to be significant issues. The biggest contributor to wetland losses is conversion to agricultural land. Within transportation, highways contribute most toward wetland losses with airport expansion a distant second. WisDOT makes every effort to avoid or minimize the wetland loss and is approaching no net loss of wetlands for any projects. Wetland mitigation for projects takes place at a ratio of 1.5 new acres for each acre lost. Bank sites consisting of wetlands remediated off site have been created for use when on site mitigation is not possible.

Leaking underground storage tanks

Although WisDOT is not directly responsible for these storage tanks, some of the tanks were used for fuel storage, necessitated by the need for transportation. Leaking underground storage tanks are a source of groundwater contamination for Wisconsin. WisDOT is involved in cleanup of these tanks, costing four to five million dollars per year. Soil or water contamination is often encountered during the planning or construction of a highway because of the proximity of service stations and other commercial buildings to existing highways. The entire site, by law, must be cleaned by the owner of the storage tank. Because of the long regulatory process, WisDOT often cannot wait for private parties to clean up before proceeding with construction and often performs the clean-up, at least within the right of way.

Contaminated Soil

Contaminated soil is pervasive in previous industrial and commercial areas in Wisconsin. Federal and state contaminated site laws (Superfund, etc.) contain sweeping liability provisions for all current owners of these sites regardless of the owner's contribution to the problem. Although the laws are intended to cause clean-up of contaminated sites, several unintended impacts have occurred such as abandonment of large areas in many central urban areas throughout the state, and causing tax delinquency on these lands.

WisDOT often encounters contaminated soils in one or more of the alignments considered for any given project. High clean-up costs for problems not created by WisDOT or even the transportation sector may distort decisions, preventing selection of an otherwise desirable alternative. In addition, reluctance of developers and lending institutions to assume liability for clean-up has helped encourage development at the urban fringe rather than redevelopment in central urban areas. These newly developed areas require transportation service whereas redevelopment of existing areas might well be served by existing transportation.

Harbor dredged material

To remain useful to both commercial and recreation traffic, Wisconsin's harbor basins must be dredged on a regular basis. Harbor dredging sometimes involves contaminated sediment. Point and non-point sources from land use and industrial practices contribute to the contamination of the harbor sediment. Not all dredged material is considered to be contaminated, however, and there is the potential for this material to be used beneficially for wetland mitigation/creation, beach restoration, and construction. Confined disposal facilities are used to hold contaminated dredged material. These facilities are filling fast in Wisconsin. Alternatives include extending the lives of existing facilities by increasing dike height and recycling clean dredged material.

Environmental Strategies

In addition to actions taken to comply with the many legal requirements listed in Chapter 1, there are a number of policy options that WisDOT could pursue to mitigate the effect of transportation on the issues listed above. These options are described in detail in Appendix B.

- Mitigation research
- Improve land use/transportation planning
- Transportation demand/system management
- Retain ownership of surplus right-of-way
- Help local governments plan harbor facilities
- Assist local governments in identifying environmentally acceptable dredged material sites (confined and unconfined) and uses
- Increase WisDOT/WisDNR emergency spill education
- Support changes in contamination liability laws
- Support alternatives to road salt in critical areas

In addition, policy options that would reduce emissions of air pollutants would have a beneficial secondary effect on water quality through reduced deposition and runoff.

ENERGY

Transportation requires the input of energy, but the quantity and source of the energy vary by mode and type of technology. Pollution and disruption of the environment occur throughout the fuel cycle, from extraction and distribution through the end use in the vehicles. The magnitude of energy use and its distribution across fuel types determines the size of the effects from energy use. The more efficiently energy is used, the more easily the transportation system can meet the TRANSLINKS goal of mobility without sacrificing environmental quality.

There are two components in an energy efficient transportation system: fuel efficient vehicles, and high occupancy or load of those vehicles. National statistics indicate that between 1970 and 1990, energy efficiency increased for all passenger modes, except transit buses and rail transit.

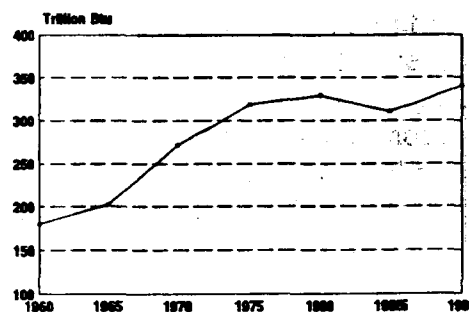
As a result of Corporate Average Fuel Economy standards and rising gasoline prices through the early eighties, automobiles in 1990 were over 31 percent more fuel efficient than in 1970 on a per passenger mile basis. Highway system improvements have reduced congestion and unnecessary speed changes so vehicle engines can operate more efficiently, and so less energy is lost through braking. Transit buses became less energy efficient during this time period, partially due to declining ridership. On a per passenger mile basis, energy efficiency of transit buses dropped by 51 percent between 1970 and 1990.

All freight modes experienced energy efficiency improvements from 1970 to 1990, measured on a per vehicle mile basis. Diesel fuel burned per unit of freight hauled declined as a result of load increases and marginal improvements in operating efficiency over time. In general, vessels are the most energy efficient mode on a per ton mile basis, followed by rail and truck.

Energy consumption in Wisconsin in the transportation sector nearly doubled between 1960 and 1990, from approximately 0.18 quadrillion Btu in 1960 to 0.34 quadrillion Btu in 1990. Figure 2.4 illustrates this trend. In 1991, the industrial, residential, and transportation sectors each used about a quarter of the energy consumed in the state.

Figure 2.4

Transportation Energy Consumption Estimates for Wisconsin



Motor gasoline was the major fuel type used in the state's transportation sector between 1970 and 1990, representing 88 percent and 78 percent of total fuel consumed in those years respectively. Most of the gasoline used in the sector was used to fuel light duty vehicles, which are primarily automobiles. Because of improvements in the fuel efficiency of automobiles, the quantity of gasoline consumed in 1990 did not exceed the 1975 level. Highway diesel fuel use increased significantly during that period as a result of increased highway freight movements. Fuel use by both rail and vessel decreased over this time as freight was shifted to the highway mode and locomotive technology improved.

Energy use has a number of environmental impacts. The development and distribution of oil can result in serious environmental degradation. Burning fuel releases air pollutants and greenhouse gases. Deposition of these pollutants causes some problems with water pollution.

Both the Intermodal Surface Transportation Efficiency Act (ISTEA) and the Energy Policy Act have implications for energy use in transportation. ISTEA requires that states and metropolitan planning organizations consider the energy effects of their transportation plans. The Energy Policy Act contains a number of requirements and incentives to increase the use of alternative fuel vehicles.

The following strategies could be used to conserve energy. They are discussed in more detail in Appendix B.

- Improve vehicle fuel efficiency
- Use of selected alternative fuels
- Invest in energy efficient alternative transportation modes
- Incentives and disincentives to affect travel demand and modal split
- Alternative work schedules/sites
- Traffic flow improvements
- Improve land use/transportation planning
- Assist local governments in identifying environmentally acceptable dredged material sites (confined and unconfined) and uses
- Inspection and maintenance of vehicles
- Reduced speeds

GLOBAL CLIMATE CHANGE

Global climate change is an emerging environmental issue which is surrounded by controversy and uncertainty. A significant body of scientific opinion asserts that some build up of greenhouse gases is already occurring, and that global climate change may occur as

a consequence of this build up. This knowledge has led to public concern about "global warming", and the development of national and international programs to mitigate greenhouse gas emissions.

Greenhouse gases in the atmosphere trap the earth's heat. Research has shown that since 1900 human activities have led to a 25 percent increase in atmospheric concentrations of CO₂, the primary greenhouse gas. The five most important greenhouse gases in order of significance are carbon dioxide, methane, CFCs, ozone, and nitrous oxides. Carbon dioxide, which is a byproduct of fossil fuel combustion, composes the majority of greenhouse gas emissions generated by mobile sources. Transportation accounted for approximately 25 percent of statewide carbon dioxide emissions in 1990.

Many scientists argue that this increase could result in an elevation of the greenhouse effect and consequently a change in global climate. The extent and timing of climatic change is difficult to predict, with predictions of change over the next century ranging from 0.9 degrees Fahrenheit to 8.1 degrees. There are a number of uncertainties which must be resolved in order to determine the likelihood and degree of global climate change. The extent to which the oceans and vegetation can absorb carbon dioxide from the atmosphere, the role clouds play in either warming or cooling the earth, and the amount of heat that the oceans absorb need to be determined in order to assess the amount of warming that could result.

The potential impacts of global climate change on Wisconsin are very uncertain because in addition to the uncertainty discussed above, the models that predict warming look at impacts over large areas and cannot accurately predict regional or local impacts. There is a chance that climate change in Wisconsin could result in a shift in the vegetation provinces northward causing significant ecosystem disruption and species loss. Along with this effect, the change in climate could disrupt the forestry economy and change the type of agriculture that could be supported in the state. Besides these effects on land, the Great Lakes could have lower average lake levels, reduced duration of ice cover, increased thermal stratification, increased growth of algae, decreased water supply capabilities, and higher water temperatures. These changes in the lakes could increase the need for dredging and harm aquatic life.

There is no existing federal legislation in the US to control greenhouse gas emissions. The Clinton administration recently issued a National Action Plan for reducing carbon dioxide emissions. The plan is primarily voluntary in nature, but recommends federal legislation to encourage "parking cash out" policies among employers. Under these policies, employers would give employees cash transportation benefits equal to the value of parking at their site. The policy options listed for energy conservation could also reduce emissions of greenhouse gases. Given the uncertainties surrounding global climate change, it would appear advantageous to focus attention on policies that, wherever possible, carry other environmental and or economic benefits.

Chapter 3

Environmental Strategy Packages

INTRODUCTION

This chapter identifies environmental policies appropriate for mitigation of transportation's impacts on the environment. Most transportation-related environmental policies fall under one of four major policy groups: Fuel and vehicle technology, Transportation demand/system management, Planning-related options, and Research/education efforts. For the most part, project-level mitigation strategies are not dealt with because of the extensive, existing system for project-level mitigation. In addition, there are a number of areas where the level of mitigation pursued is an issue for WisDOT largely because of questions about how the mitigation costs are covered. For example, extensive stormwater control can be very expensive. The TRANSLINKS financial strategy will address options for funding mitigation for areas where cost, rather than the appropriateness of mitigation, is the issue. Selection of environmental policies is determined both by regulatory requirements, and the environmental alternative adopted by the Department. A possible "package" of example policy measures for each alternative is described in the following section. Specific policy measures are described in more detail in Appendix B.

SUMMARIES OF MAJOR STRATEGY GROUPINGS

Vehicle Technology/Fuel Strategy

Improvements in vehicle design/technology can yield significant vehicle fuel economy increases. Improvements in fuel economy may result in a decrease in fuel consumption, if total travel does not increase in response to fuel economy improvements. In addition to energy savings, pollutant emissions are also reduced, although the relationship between fuel saved and emissions reduced is not necessarily linear for all pollutants. The federal government has challenged efforts by states to improve fuel efficiency through rebate programs as conflicting with the federal Corporate Average Fuel Economy (CAFE) program, so measures to increase fuel economy standards may be limited to the federal level. Improvements in the design and maintenance of emission control equipment can yield significant emission reductions. Current emission control technology and maintenance programs target smog forming pollutants. Alternative fuels, if carefully selected, can yield environmental benefits. However, the environmental impacts of each fuel vary widely, and are also dependent on vehicle technology, operating conditions and other variables.

Transportation Demand/System Management

Transportation Demand Management (TDM) is a tool for changing travel behavior. TDM may eliminate, or shorten motor vehicle trips, and shift travel into high occupancy modes. Most research concludes that the potential for TDM to impact total travel, and/or modal shifts is limited. However, TDM may serve as a complementary strategy in combination with other measures aimed at reducing the impact of transportation on the environment. TDM measures include: investment in alternative transportation modes; incentives and disincentives to reduce total travel, and alternative work schedules or sites. Transportation system management (TSM) is used to improve traffic flow, and includes measures such as signal timing improvements, intelligent vehicle/highway systems, ramp metering and speed limit enforcement. TDM and TSM measures can yield energy conservation benefits, emission reductions, and mitigation of impacts on the physical environment.

Planning-Related Options

Land use and transportation planning decisions can be integrated during early development stages of system, community or project level transportation plans. Effective land use/transportation planning can mitigate travel growth by reducing travel distances, and encouraging use of alternate modes. Successful land use/transportation planning and implementation can result in fuel savings, congestion reduction, emissions reductions, and mitigation of impacts on the physical environment. Environmental impacts can be avoided if they are recognized at the transportation planning stage.

Research/Education

These are actions which may be helpful in providing the Department with further guidance in issue areas where knowledge is incomplete.

FOUR STRATEGY PACKAGE ALTERNATIVES

In this section, strategies selected from the above groupings are matched with the four alternative roles described in Chapter 1. The alternatives are broken down into a statement of action for each environmental issue area followed by a brief discussion of implementation issues, and some example strategies, which are described in detail in Appendix B. In general, as environmental actions become more extensive, the costs rise; Alternative One can be considered a baseline cost. For some programs, such as changing from basic to enhanced I/M, the programs become more cost effective as they become more stringent. More typical, however, is increasing costs for smaller incremental benefits. To measure the full costs of the action, both initial capital costs and operating or maintenance costs must be included. Some examples of costs are given with the descriptions of potential environmental strategies in Appendix B, although costs would vary for the programs depending on the level of effort.

ALTERNATIVE ONE: COMPLIANCE WITH REQUIREMENTS**Environmental Actions**

The department would continue to comply with the requirements of NEPA and WEPA.

Air Quality

WisDOT would continue to comply with the CAAA transportation-related requirements to reduce ozone forming pollutants. The Department would work with WisDNR to ensure that negative impacts on the transportation system are minimized.

Physical Environment

WisDOT would continue to comply with the requirements of the Clean Water Act, RCRA, CERCLA, and Endangered Species Act, as well as any other laws that apply. Transportation's impacts on the physical environment would be considered where required by law. The Department would work with appropriate agencies to ensure that negative impacts on the transportation system would be minimized.

Energy

WisDOT would continue to comply with the transportation-related components of the Energy Policy Act of 1992, but would not develop a statewide energy conservation program, or consider energy conservation a principle goal in planning and designing the transportation system. The Department would participate in policy debate to the extent necessary to ensure that the transportation system would not be adversely affected. The Department would promote those policies which would yield energy savings without affecting transportation goals, e.g. traffic flow improvements.

Global Climate Change

There is currently no federal or state legislation to control emissions which contribute to the greenhouse effect, and evidence for the existence of global climate change is limited. Therefore no action would be taken to reduce emissions from the transportation sector. WisDOT would participate in debate on climate change to the extent necessary to ensure that impacts of proposals on the transportation system would be understood and to minimize adverse effects of policy developments.

Environmental Strategies

Federal and State mandatory environmental measures include a number that affect transportation. Some require implementation of new WisDOT programs or enhancements of old ones, and some are primarily being developed by other agencies, but WisDOT may be affected:

WisDOT programs:

1. **Conformity.** Require that emissions generated as a result of implementing the transportation plan must not exceed those budgeted for in the air quality plan.
2. **Inspection and Maintenance.** Develop an "enhanced" car inspection program in the severe nonattainment area and institute an I/M program in Sheboygan County. The new program scheduled to begin in 1995 is estimated to cost nearly \$18 million per year.
3. **Traffic Flow Improvements.** Reduce congestion and fuel consumption through projects which yield traffic flow improvements.

WisDOT subject to requirements:

1. **Reformulated Gasoline.** Sell cleaner burning oxygenated gas in severe nonattainment areas. Additional cost to the consumer is estimated at \$0.03 to \$0.07 per gallon.
2. **Clean Fuel Fleets.** (See Alternative Fuels, Appendix B). Require large centrally fueled fleets to use clean fuels.
3. **Employee Commute Options.** (See Invest in Alternative Modes -Appendix B) Develop a program to reduce drive alone work trips in Southeast Wisconsin. EPA estimates costs at roughly \$100 per employee; DNR puts costs at roughly \$60 per employee. Costs are likely to vary greatly by employer.
4. **Coastal Zone Area Re-Authorization Act (CZARA).** Require the development of a non-point pollution control program within most of the Great Lakes watershed as required by law. This new control program is estimated to cost \$55 million per year, above the \$63 million per year for current stormwater controls.
5. **National Energy Policy Act.** (See Alternative Fuels, Appendix B) Require alternative fuel vehicle purchase requirements.
6. **National Environmental Policy Act (NEPA).** (See Legal Constraints - NEPA Chapter 1) Give appropriate and careful consideration to the environmental aspects of proposed actions that affect the environment.
7. **Wisconsin Environmental Policy Act (WEPA).** Same as NEPA.

Implementation Issues

This alternative would implement the requirements of state and federal law. The measures could involve some expenses to individuals and businesses, as well as some inconvenience. If the measures are not taken, the Department could be subject to sanctions from the EPA, including loss of funding.

ALTERNATIVE TWO: ACTIVE ROLE

Environmental Actions**Air Quality**

The Department would continue to comply with CAAA requirements, and would work with WisDNR to ensure that transportation interests would be adequately represented. The Department would also monitor policy developments concerning emerging air quality issues such as air toxics.

Physical Environment

The Department would continue to comply with all Federal and State laws, and would monitor emerging environmental issues in this area. The Department would be actively involved in wetland banking.

Energy

The Department would take steps to promote the energy conservation benefits of transportation programs where they can be shown to be cost effective.

Global Climate Change

The Department would monitor policy developments related to global climate change to ensure that policy developments would not adversely affect the quality of Wisconsin's transportation system. The department would promote the greenhouse gas reduction benefits of existing transportation programs such as transit.

Environmental Strategies

In addition to mandated measures described in Alternative One the Department would adopt additional measures consistent with this role, as exemplified by the following strategies:

1. **Invest in Alternative Passenger and Freight Transportation Modes.** Support alternative modes to some extent, based primarily on considerations other than the environment.
2. **Support Alternative Fuels.** Investigate the appropriateness of alternative fuels for mitigating environmental impacts.
3. **Traffic Flow Improvements.** Implement IVHS and other traffic flow improvements.
4. **Improve Land Use/Transportation Planning** Help local governments with land use plans, especially focusing on improved coordination with transportation plans and on multimodal supportive land uses and designs.
5. **Retain Ownership of Surplus Right-of-Way Lands.**

Implementation Issues

This alternative represents current Department activity. In addition to the mandatory measures, some policies that support the requirements are included. The package could be more expensive than Alternative One for the Department, requiring some resources to be used for modes other than highway, or new funds found in order to maintain the level of Alternative One funding for highways. Costs and inconvenience to individuals should be similar to Alternative One.

ALTERNATIVE THREE: AGGRESSIVE ROLE

Environmental Actions**Air Quality**

WisDOT would continue to comply with CAAA requirements, and would work with WisDNR to ensure that standards would be met. The Department would investigate and act appropriately, based on cost effectiveness or public interest, on emerging air quality issues.

Physical Environment

WisDOT would continue to comply with Federal and State laws. Wherever it is appropriate, based on cost effectiveness or public demand, the Department would seek to mitigate environmental impacts not covered by existing law, for instance initiation of a cooperative effort by DOT, DNR and local governments to seek beneficial uses of dredged material.

Energy

WisDOT transportation planning would include greater consideration of energy conservation benefits, and support federal initiatives.

Global Climate Change

WisDOT would use less stringent standards of proof in considering the potential threat of global climate change, but would recognize that unilateral action is inappropriate for a transportation agency. Therefore the Department would promote statewide policies which would also yield other environmental benefits including, improvements in energy conservation, cleaner air, reduced runoff, and reductions in greenhouse gases. The Department would support federal initiatives such as increases in Corporate Average Fuel Economy standards.

Environmental Strategies

In addition to actions required in Alternatives One and Two the Department would:

1. **Invest Significantly in Alternative Passenger and Freight Transportation Modes.** Environmental issues would be an equal consideration in the decision to increase provision of Alternative Modes.
2. **Use Incentives and Disincentives.** Use innovative TDM strategies to encourage reductions in drive alone travel.
3. **Alternative fuels.** Actively encourage the use of alternative fuels.
4. **Traffic Flow Improvements.** Design and implement a program of traffic flow improvements
5. **Improve Land Use and Transportation Planning.** State issued guidelines for land use plans, along with a requirement for multimodal-supportive local land use plans where significant development is occurring.
6. **Help local harbor planning.** Widen funding eligibility under WisDOT's Harbor Assistance Program to port communities to plan for potential harbor dredged material disposal sites and beneficial uses.
7. **Research and Education.** Conduct research to determine effects of departmental policies and transportation in general.
8. **Support Selected Federal Environmental Laws.** In anticipation of additional requirements, WisDOT may support the less intrusive alternatives e.g. improvements in vehicle efficiency, and vehicle emission controls rather than expanded TDM measures.
9. **Support Contamination Liability Law Changes.** Support laws at the federal and state level that would limit the liability of property owners who did not cause the contamination and financial institutions that lend them money.
10. **Support Alternatives to Road Salt.** In certain critical areas of the state, use alternatives to road salt, e.g. calcium or magnesium compounds. These alternatives work more slowly and are about ten times the cost of normal salt but they would not contribute to increasing chlorine levels in Wisconsin's lakes.

Implementation Issues

This alternative would require greater Departmental spending on modes other than highway and on mitigation. Individual costs and inconvenience may increase as TDM strategies are implemented.

ALTERNATIVE FOUR: DOMINANT ROLE

Environmental Actions

Air Quality

WisDOT would exceed CAAA requirements, and would expand its activities in the mitigation of other air pollutants.

Physical Environment

WisDOT would implement land use and transportation planning to mitigate habitat damage.

Energy

WisDOT would implement a statewide energy conservation program.

Global Climate Change

The Department would use less stringent standards of proof in considering the potential threat of global climate change and would act unilaterally to minimize the contribution to emissions from Wisconsin's transportation sector.

Environmental Strategies

In addition to strategies proposed in the first three alternatives the Department would:

1. **Strongly support alternative modes.**
 - a) Invest in alternative passenger and freight transportation modes.
 - b) Regulate commuting to a greater extent than ECO.
2. **Support state adoption of new fuel and vehicle technology, such as:**
 - a) Lower vapor pressure gasoline.
 - b) Locomotive emission controls.
 - c) Alternative fuels.
3. **Implement stringent transportation demand/system management measures**
 - a) Use more and stronger incentives and disincentives to reduce highway travel.
4. **Conduct research and education**
 - a) Conduct collaborative research with the U.S. Army Corps of Engineers on the remediation and use of contaminated harbor dredged material.
5. **Reduce speeds (see Traffic Flow Improvements, Appendix B)**
 - a) Reduce speed limits
 - b) Stricter speed enforcement
6. **Improve Land Use/Transportation Planning.** Adopt a State land use policy, binding on local governments that addresses multimodal transportation needs and the land use impacts WisDOT investments.
7. **Support Federal environmental laws that could reduce the environmental impacts of transportation.**
 - a) Improve vehicle fuel efficiency.
 - b) Improve vehicle emission controls.

Implementation Issues

Cost and inconvenience to individuals would be significantly greater than under current policies. There would be more regulations more strictly enforced as well as higher costs of all forms of transportation.

Glossary of Terms

Alternative fuel: as defined in the National Energy Policy Act, alternative fuels include methanol, denatured ethanol, and other alcohols; mixtures containing 85 percent or more (or such other percentage, but not less than 70 percent, as determined by the Secretary, by rule, to provide for requirements relating to cold start, safety, or vehicle functions) by volume of methanol, denatured ethanol, and other alcohols with gasoline or other fuels; natural gas; liquefied petroleum gas; hydrogen; coal- derived liquid fuels; fuels (other than alcohol) derived from biological materials; electricity (including electricity from solar energy); and any other fuel the Secretary determines, by rule is substantially not petroleum and would yield substantial energy security benefits and substantial environmental benefits

AWS: Alternative Work Schedules

BTU: One Btu is the quantity of energy in the form of heat required to raise the temperature of one pound of water one degree Fahrenheit).

CAAA: Clean Air Act Amendments of 1990

CDF: Confined Disposal Facility, used for harbor dredge material

CFC: Chlorofluorocarbons, a category of greenhouse gases

CNMQ: Congestion Mitigation and Air Quality

CMS: Congestion Management Systems

CNG: Compressed Natural Gas, an alternative fuel

CO: Carbon monoxide, a poisonous gas

CZARA: Coastal Zone Re-Authorization Act

ECO: Employee Commute Options

FHWA: Federal Highway Administration

FTMS: Freeway Traffic Management Systems

HC: Hydrocarbon, a category of ozone precursors

HOV: High Occupancy Vehicle

I/M: Inspection and Maintenance program for testing and repairing automobiles and light duty trucks

IM240: New transient test for I/M that more accurately tests vehicle emissions over a typical driving cycle

ISTEA: Intermodal Surface Transportation Efficiency Act of 1991

IVHS: Intelligent Vehicle and Highway Systems

LDT: Light Duty Truck

LEV: Low Emission Vehicle, defined under California law

LMOS: Lake Michigan Ozone Study

LPG: Liquefied petroleum gas; propane

LTO: Landing/Take off cycle

NW: Metropolitan Planning Organization

NAAQS: National Ambient Air Quality Standards; apply to particulates, sulfur oxides, carbon monoxide, nitrogen oxides, ozone, and lead

NEPA: National Environmental Policy Act

NES: National Energy Strategy
NMHC: Non-methane hydrocarbon, a category of ozone precursors
NMOG: Non-methane organic gases, a subset of hydrocarbons which is a category of ozone precursors
NMVOG: Non-methane volatile organic compounds, a subset of hydrocarbons which is a category of ozone precursors
NOx: Oxides of nitrogen, ozone and acid precursors
PECFA: Petroleum Environmental Clean-up Fund Act
RFG: Reformulated gasoline
RVP: Reid Vapor Pressure; a measure of volatility
SEWRPC: Southeastern Wisconsin Regional Planning Commission
SOV: Single Occupancy Vehicle
TDM: Transportation Demand Management
TLEV: Transition Low Emission Vehicle, defined under California law
TOFC: Trailer on flatcar; intermodal truck/rail shipping
TSM: Transportation System Management
ULEV: Ultra Low Emission Vehicle, defined under California law
VMT: Vehicle Miles Traveled
VOC: Volatile Organic Compounds, a subset of hydrocarbons which is a category of ozone precursors
WEPA: Wisconsin Environmental Policy Act
ZEV: Zero emission vehicle, defined under California law

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