TRANSPORTATION RESEARCH FOR THE INFORMATION ERA

How Transportation and the Information Revolution Can Build More Sustainable Communities

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Hank Dittmar, Executive Director
Surface Transportation Policy Project

Thomas A. Horan, Executive Director
Claremont Graduate University Research Institute

Lee W. Munnich, Jr., Senior Fellow and Director
State and Local Policy Program, Humphrey Institute of Public Affairs,
University of Minnesota

Judith M. Espinosa, Director
Alliance for Transportation Research
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Executive Summary

Two revolutions -- a policy revolution embodied in ISTEAD, and a technological revolution spurred by advances in information technology -- call for new directions in transportation research. With ISTEAD’s emphasis on building sustainable communities, the major research questions are no longer focused solely on how to use technology to maximize traffic flow. The focus, instead, is on how to integrate transportation and information technology to make communities more economically viable, environmentally sound, and readily accessible to all.

After over two years examining issues of Intelligent Transportation Systems (ITS) and sustainable communities, our findings underscore the need for a broader understanding of the interplay between transportation and new technology. Most research on ITS, which focuses narrowly on improving modal performance and vehicle throughput, only hints at the profound changes sweeping the transportation sector as the 21st century approaches. Telecommunications and information technology may, for example, transform the transportation system by influencing travel behavior, location decisions, and community design. New technologies may also enable better methods of assessing transportation system performance and create new opportunities for public involvement in transportation decisionmaking.

To pursue a transportation research agenda appropriate for the Information Age, the proposed National Research Consortium on Transportation and Information Technology would explore how telecommunications and information technology may affect the transportation system and the quality of life in communities. The proposed Consortium would consolidate the ongoing research activities of four organizations: the Humphrey Institute of the University of Minnesota, the Surface Transportation Policy Project, the Claremont Graduate University Research Institute, and the Alliance for Transportation Research. The research agenda would address five substantive areas:

- Developing linkages between transportation and telecommunications planning
- Benchmarking environmental performance using Geographic Information Systems (GIS)
- Integrating information technology with community design
- Understanding the impacts of innovative technology applications on travel behavior
- Outreach and educational activities

This proposed research program will help the transportation sector thrive in the information era by filling gaps in current ITS research and providing guidance for the nation’s large investment in transportation technology.
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Background: A Revolution in Transportation and Technology

Passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991 signaled a new era in U.S. transportation. Federal policy priorities shifted away from highway construction toward a greater concern with managing the existing highway system and with making transportation investments compatible with community values. In doing so, ISTEA placed federal transportation policy at the forefront of the emerging movement toward “sustainable communities,” a policy framework in which traditional transportation goals (i.e. moving people and goods) are considered within the context of creating more environmentally sound, “livable,” and economically successful communities.

The policy revolution ISTEA engendered in transportation is taking place along side another revolution: the revolution in telecommunications and information technology. Transportation, like virtually all human activities, is being profoundly affected by developments in information technology, as the growing prominence of Intelligent Transportation Systems (ITS), telecommuting and other telework strategies, and sophisticated planning tools such as Geographic Information Systems (GIS) vividly demonstrate.

The rise of information technology, together with ISTEA’s community-centered approach to transportation, presents new opportunities and challenges for transportation research. New questions are being asked: Can information technologies make the transportation system more efficient and more responsive to community priorities and environmental concerns? Can technology alter travel behavior and encourage non-auto modes of travel, including transit, bicycling, and walking? Does information technology have a role to play in making urban areas more “livable” and economically viable? Transportation policymakers currently possess a very limited research base to assist them in answering these questions. What is needed is a new approach to transportation research that begins to address these critical issues.
Over the past several years, a unique research partnership between the University of Minnesota’s Humphrey Institute, the Claremont Graduate University Research Institute, the Surface Transportation Policy Project, and the Alliance for Transportation Research has conducted research and outreach activities on issues of transportation, information technologies and sustainable communities. The numerous projects have included literature and institutional reviews related to the sustainable communities concept; commissioned policy papers addressing several dimensions of transportation and environmental policy; expert conferences and educational activities in California, New Mexico, Minnesota and Washington D.C.; and case studies of innovative transportation and information technology planning in the Twin Cities, Santa Monica, and the lower Hudson Valley region of New York.

As a way to both coordinate their ongoing research and embark upon new activities that build upon their previous work, these four organizations are seeking to form a National Research Consortium on Transportation and Information Technology. The proposed Consortium’s research agenda would focus on five substantive areas:

- Developing linkages between transportation and telecommunications planning
- Benchmarking environmental performance using Geographic Information Systems (GIS)
- Integrating information technology with community design
- Understanding the impacts of innovative technology applications on travel behavior
- Outreach and educational activities

The proposed Consortium’s research agenda is described in greater detail below. This description includes further discussion of previous and ongoing research activities, the research findings generated from these activities, and how those findings underscore the need for a transportation research program that keeps pace with the rapidly evolving Information Era.
1) Developing Linkages Between Transportation and Telecommunications Planning

The relationship between transportation and telecommunications is complex and multifaceted. On the one hand, for example, an increasing number of telecommuters and improved traffic information promise reductions in congestion and automobile emissions. On the other hand, the rise of “just-in-time” logistics made possible by information technology is improving productivity yet may also generate more trips related to goods movement (see Figure 1, below). It is difficult to predict what the net effect of such trends will be for the transportation system and for the broader society. What is certain, however, is that communities must plan carefully to maximize the social, economic and environmental benefits potentially afforded them by these trends.

The integration of transportation and telecommunications planning has and continues to be the centerpiece of our research conducted over the past several years in conjunction with the Minnesota Department of Transportation (MnDOT). The project has explored the implications of the sustainable communities concept for the deployment of Intelligent Transportation Systems (ITS) and other transportation-related technologies in the Twin Cities metropolitan area. One key finding from this research is that MnDOT needs to broaden its ITS deployment focus by placing more emphasis on multi-modal ITS applications. Policy recommendations in this regard included an increased provision of pre-trip travel and traffic information, which MnDOT already provides on the Internet. Studies in Boston showed that 45%-50% of individuals using a traveler information service changed their route or travel time in response to real-time information. Another recommendation was that MnDOT explore new uses of telecommunications and telecommuting, such as the establishment of urban and suburban telecommuting centers to connect employees and employers and reduce peak-hour congestion.

In our continuing research efforts with MnDOT, we have now embarked on a comprehensive initiative exploring the effects of telecommunications on transportation
Figure 1: Integrating Information Technology and Transportation

- Personal Travel
  - Home Delivery
  - Super Stores
  - Electronic Commerce
  - Telecommuting
  - Teleconferencing
- Goods Movement
  - FedEx
  - Just-in-Time Logistics

Information and Telecommunications Technology
planning in Minnesota. Researchers are also participating in MnDOT’s Transportation Action Model planning process in the Two Harbors area of Minnesota.

All of our research activities point to the need for a more precise understanding of how to achieve environmental and economic efficiencies through the integration of telecommunications and transportation planning. The proposed Consortium would address this need by developing corporate partnerships to empirically analyze the synergies between transportation and telecommunications. A key research question to be explored would be whether (or under what circumstances) telecommunications can substitute for or complement traditional transportation activities.

2) Benchmarking Environmental Performance Using GIS

The increased emphasis on sustainable communities has heightened the importance of developing “benchmarks” of environmental performance. An increasingly popular benchmarking technique is to develop measurable indicators of environmental and community sustainability. In developing sustainability indicators, public participation is critical, as the very process of deciding what constitutes progress toward sustainability requires communities to articulate their values and priorities.

Beyond offering an excellent tool to enhance traditional transportation planning, Geographic Information Systems (GIS) provide an ideal way to engage communities in analyzing and understanding spatial data. Spatial data can address transportation, land use, environmental quality, as well as how area residents perceive the quality of their community. Our previous research in this area includes a comprehensive GIS-based analysis of the 29th Street Greenway and Lake Street redevelopment project in the mid-Minneapolis area. The greenway project involves the development of a bike and pedestrian trail in an old rail corridor that runs across south Minneapolis. The perceptions of greenway area residents about several dimensions of their community were surveyed and their responses mapped using GIS. The GIS mapping highlighted the
spatial distribution of how greenway residents perceive the community’s assets and liabilities (see Figure 2), and clearly illustrated the areas most in need of revitalization.

The research conducted on the 29th Street corridor underscores the importance of tailoring sustainability indicators to specific communities and of including a broad array of community stakeholders in developing those indicators. It also demonstrates the utility of visual methodologies as a tool in the community planning process. Utilizing GIS, the proposed Consortium would engage communities across the nation in efforts to develop indicators of environmental performance, allowing individual communities to visualize and measure progress toward sustainability in ways that reflect their particular circumstances and priorities.

3) Integrating Information Technology with Community Design

“Community design” refers to community development through both the physical and social infrastructure. ISTEAs spurred a wave of new thinking about transportation’s contribution to community design, and much of this new thinking has manifested in efforts to create more “livable” communities. While differing in their specifics, livable communities initiatives tend to emphasize the revitalization of traditional downtown cores as a center for entertainment, commerce and social interaction. This can involve the creation of a more pedestrian-friendly atmosphere, re-arranging downtown traffic circulation and improving transit services, as well as mixing residential and commercial land uses. Ideally, such an approach can simultaneously serve numerous economic, social and environmental goals.

As the 21st century approaches, the livability of communities will increasingly depend on their ability to incorporate information technology into their broader community planning efforts. At present, however, few communities have integrated information technology with the various elements of community design, such as transportation, urban form and
Figure 2: Assets of all Respondents

Rail Lines

- 28th Street Corridor
- North-South RR
- Major Roads

# of Respondents
Above 10
8-10
5-7
3-4
1-2

Claremont
GRADUATE UNIVERSITY

2 0 2 4 Miles
human-scale urban settings. One community that is attempting to integrate these multifaceted issues is Santa Monica, California. Santa Monica is engaged in a comprehensive effort to integrate transportation, urban design, and information technology to improve the overall quality of life throughout its community. Our ongoing research into Santa Monica’s effort to conduct this coordinated planning effort included sponsorship of a one-day Policy Consultation. This Consultation included discussion of the City’s recently adopted Downtown Urban Design Plan, which will alter vehicle circulation patterns, widen sidewalks, improve numerous street amenities, and enhance transit services throughout downtown. Also discussed was the City’s development of a Telecommunications Master Plan to assess its future telecommunications needs and the opportunities presented by these technologies to facilitate commerce and encourage social interaction. The discussion framework that emerged from the Consultation appears in Figure 3.

The Santa Monica case study demonstrates the difficulties that communities are likely to face as they attempt to integrate information technology into their broader planning. The proposed Consortium will conduct extensive case study research on policy options for integrating information technology with transportation, urban design and numerous other community goals. This will include extensive case studies of areas engaged in this activity, as well as developing visual methodologies for improving urban community planning and urban design linkages.

4) Understanding the Impacts of Innovative Technology Applications on Travel Behavior

Altering patterns of personal travel, particularly reducing the prevalence single occupancy vehicles (SOVs), has been a major element of federal, state and local transportation policy since the 1970s. Policymakers are now studying ways in which information technology might assist in managing travel behavior.
Figure 3: Policy Consultation Discussion Framework

Policy and Community Goals

A Santa Monica that is:

“Economically Vibrant”
“Livable Community”
“Accessible”
“Sustainable”

Specific Initiatives

Projects in Santa Monica:

Downtown Urban Design Plan
Downtown Transit Management
Parking Management
Telecommunication Master Plan
-PEN
SMART Corridor Extension

Gaps and Synergies

Areas of Potential Integration:

Improved Access to Places and Opportunities
“Recombinant” Urban Designs through Technology

Potential Benefits

Makes downtown a more attractive travel destination
Provides consumer information via telecommunications
Facilitates on-line transactions for entertainment & business services
Facilitates commerce throughout city
Increases sense of community among city residents
Provides electronic channels for civic participation and government services
Increases walking and transit use
Encourages trip substitution
Reduces automobile congestion & congestion-related emissions
Over the past year, the research team has conducted a major study on a form of congestion pricing known as High Occupancy Toll (HOT) lanes. Utilizing GIS and extensive stakeholder interviews, our research has focused on (if any) equity implications such a policy could have in southern California. The analysis indicates that there is a strong spatial dimension to the equity question with respect to HOT lanes. The research shows that the HOT lane concept will likely be serving corridors comprised of travelers having very different socio-economic characteristics (see Figure 4). Moreover, a key finding is that HOV2s (carpool lanes allowing two or more persons) may be the real “losers” under the HOT concept, especially if the HOT policy is implemented through the conversion of an existing HOV lane with a 2-person carpooling requirement.

The proposed Consortium would focus on identifying trends in travel behavior and generating empirical data relevant to policies, such as congestion pricing and HOT lanes, aimed at altering that behavior. The identification and possible effectiveness of trip-substitution strategies facilitated by information technologies would be a major element of this research.

5) Outreach and Educational Activities

Our research activities have included extensive outreach and educational activities. In addition, several project-generated papers have been published in leading transportation journals and presented at transportation conferences around the country. In all these endeavors, our aim has been to both disseminate research findings and gather feedback from a wide array of stakeholders.

One recent outreach/educational activity was a workshop in Albuquerque, NM, on Developing a Research Agenda for Sustainable Transportation. This two-day workshop brought together transportation professionals throughout the country. Participants concurred with recent reports that indicate that there is a mismatch between transportation
research and the nation’s goals. They endorsed a Transportation Research Statement of Policy to this effect. The workshop noted the increasing complex nature of transportation issues and the need for research to focus on these issues. The sustainable implications of ISTEA were lauded, but at the same time participants found that research did not adequately address the issue of sustainability at various transportation levels. A well defined research agenda with a long-term strategy could help to further these goals. The workshop was able to identify several areas in which long and short term research focus should be directed. These areas include vehicle performance, planning and management techniques and technologies, safety, intermodalism, travel behavior, incentives, land use and infrastructure design, environmental impact, social impact, and planning and institutional issues.

The proposed Consortium would continue to engage in extensive outreach activities. In addition to the kinds of events discussed above, this would also include a high-profile presence on the World Wide Web through the Surface Transportation Policy Project Web site.

**Consortium Outline and Management**

Four organizations have arranged the proposed Research Consortium to execute a national research agenda based on the above findings. For more information about the Consortium, please contact:

Hank Dittmar, Surface Transportation Policy Project
Thomas Horan, Claremont Graduate School Research Institute
Lee Munnich, Humphrey Institute of Public Affairs, University of Minnesota
Judith M. Espinosa, Alliance for Transportation Research
Appendices
Transportation and Information Technologies for Sustainable Communities

Final Report: Executive Summary

A study conducted for the Minnesota Department of Transportation and Minnesota Guidestar

July 24, 1997

State and Local Policy Program
Hubert H. Humphrey Institute of Public Affairs
University of Minnesota

Claremont Graduate School

Surface Transportation Policy Project
The concept of sustainable communities provides a framework for analyzing transportation issues and crafting solutions to transportation problems. This study applies this emerging concept to strategic planning for intelligent transportation systems (ITS) and related information technologies. It has been prepared for the Minnesota Department of Transportation (Mn/Dot) and Minnesota Guidestar, the state’s intelligent transportation systems (ITS) program. The study began in January 1995, and has focused on the Twin Cities Metropolitan area.

Major tasks completed in this study include:

- a concept review, which defines the sustainable communities concept and links it to emerging issues in transportation planning. (Appendix A in the Final Report);
- an institutional review, which summarizes sustainable communities initiatives at the local, state and national level (Appendix B in the Final Report);
- a literature and program review, which summarizes the sustainable transportation literature and assessed programmatic components of ITS development (Appendix B in the Final Report);
- a consortium feasibility assessment, which examines the feasibility of a national initiative for the promotion of sustainable ITS applications (this initiative was funded by the U.S. Department of Transportation/ITS Joint Programs Office and began on March 1, 1996).
- policy papers on emissions, travel behavior, and land use patterns (Appendix C in the Final Report).
- extensive public outreach activities including a policy consultation near the beginning of the project, focus groups with key stakeholders at the mid-point, a forum and policy round-table near the end of the project, and presentations at numerous national conferences.

These tasks yielded several insights into the sustainable communities concept, suggested ways in which to operationalize this concept using ITS and other information technologies, and the potential applications of ITS to transportation policies in the Twin Cities region. These insights are discussed below.
The Concept of Sustainable Communities

The sustainable communities concept, particularly its application to transportation and ITS, incorporates four major themes:

Vision: a recognition that economic, environmental and social objectives should be considered in all policy decisions. This may require a more nuanced, complex, and longer transportation planning process than one in which the primary objective is enhanced mobility.

Participation: the need for a community-based participation process to define what constitutes a sustainable community and to develop strategies for moving toward that goal.

Indicators: the importance of developing measures of progress toward sustainability. Public participation is critical in the development of indicators, as the very process of deciding what constitutes progress toward sustainability will require communities to articulate their values and priorities.

Feedback: the need to alert individuals and agencies of the social and environmental costs of their actions. Such “feedback mechanisms” may take the form of full-cost accounting, which attempts to calculate the full social and environmental costs of infrastructure investments, and pricing strategies, which incorporate these costs into the prices faced by consumers.

Based on these themes, a sustainable community is one in which:

- levels of pollution, consumption, and population size are in keeping with regional carrying capacity;
- members share a sense of responsibility for each other and to future generations;
- the goods and services reflect the full social and environmental costs of their provision;
- the system of governance encourages democratic deliberation;
- and, within which transportation, land use, and architecture all enhance neighborhood livability and environmental quality.
ITS and Sustainable Communities

The link between ITS and sustainable communities stems from the ability of ITS to create a transportation system rich in information, or what might be called an “information-intensive” transportation system.

An information-intensive transportation system presents important opportunities. First, rather than adding new lanes, roads, and highways, information can be used to increase the capacity of the transportation system. Examples include demand-responsive transit services, telecommuting, traffic signal synchronization, and pre-trip traveler information for transit users and automobile drivers. In this sense, ITS supports an important underlying premise of “sustainability thinking:” that the Earth’s resource base has limits, that some of those limits are being approached, and, therefore that sustainable development depends on accommodating economic growth while consuming fewer resources.

Second, the information that ITS provides may also enhance the performance of the transportation system. It is critical, however, that “enhanced performance” be defined broadly to include greater traffic efficiency and a reduction in the transportation system’s negative externalities. ITS can contribute to this broader notion of enhanced performance by providing information that will allow greater operational control of the transportation system. Remote sensing, for example, can generate emissions data and assist air quality officials in targeting gross polluters. Another example is congestion pricing, which conveys information (in the form of price signals) that alerts drivers to the overall social and environmental costs of driving, making them aware that driving imposes external costs while encouraging more environmentally benign travel behavior.
ITS and Sustainable Communities in Minnesota

Minnesota is uniquely situated to connect ITS technologies to the promotion of sustainable communities. The state has adopted an aggressive ITS program and is one of the national leaders in ITS investment. Also, the state’s Orion model deployment plan details an array of innovative ITS applications in freeway, transit, incident management, and multimodal traveler information services. Finally, the region is engaged in a vigorous debate over future growth patterns, and the role that land use, housing and transportation polices will play.

The matrix below incorporates the insights of this analysis into findings, implications, and recommendations for using ITS and other information technologies to promote sustainable communities in the Twin Cities region.
## Recommendations for ITS and Information Technologies in the Twin Cities Metropolitan Area

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<th>Regional Coordination</th>
<th>Key Findings</th>
<th>Implications</th>
<th>Recommendations</th>
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- Coordinating ITS and other transportation investments with broader growth management policies can channel growth and perhaps limit the spatial extent of metropolitan areas.

- ITS investments could prove useful in supporting the preferred growth option for the Twin Cities region recently adopted by the Metropolitan Council.

- Mn/DOT, in coordination with the Metropolitan Council, should develop a long range strategic plan for ITS that supports the preferred growth option. One way to do this may be to “cluster” ITS investments in the preferred growth centers.

<table>
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<th>Broadening the Deployment Focus</th>
<th>Key Findings</th>
<th>Implications</th>
<th>Recommendations</th>
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- In the focus groups and policy forums conducted during this study, it became apparent that ITS is frequently perceived as applying primarily (if not exclusively) to automobiles. This is perhaps not surprising, as ITS deployment up to this point has focused on increasing throughput on roads and highways.

- There is a need to broaden the purposes for which ITS technologies are deployed to a more multi-modal focus. ITS should expand the range of viable transportation options, not constrain them further to automobiles.

- The following ITS applications are particularly promising:

1. Pre-trip travel and traffic information, which Mn/DOT already provides on the Internet, should be marketed more aggressively. Studies in Boston showed that 45%-50% of individuals using a traveler information service changed their route and or travel time in response to real-time information.

2. Use ITS to enhance the safety and reliability of public transit, car-pooling and bicycling, and to improve intermodal connections between them. Such applications include heightened enforcement of HOV lanes, surveillance systems on buses and bicycle routes, and route information for bicycles and pedestrians.

3. Demand-responsive transit could provide relatively cost-effective transit service to the low and medium-density portions of the Twin Cities metropolitan area. Demand-responsive transit could also improve transit service to new workers entering the workforce as a result of the federal Welfare Reform Act.
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<th>Key Findings</th>
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<tr>
<td>Outreach</td>
<td>More public outreach on ITS deployment decisions is needed, and transportation officials should link this outreach with objectives consistent with sustainable communities.</td>
<td>ITS outreach efforts could emphasize the following:</td>
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<tr>
<td></td>
<td>1. The technologies’ ability to provide better information on travel options, to reduce environmental impacts, and to facilitate full-cost pricing of the transportation system.</td>
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<td>2. Somewhat beyond ITS, emphasis could be placed on new information technologies that convey how transportation investments will affect a community’s quality of life. For example, Dr. Michael Shiffer of the Massachusetts Institute of Technology uses computers to simulate the audio-visual consequences of alternative transportation investment scenarios. This technology could assist communities as they weigh the cost and benefits of transportation investments.</td>
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<td>3. Make demonstration grants available to communities (i.e. neighborhood associations, non-profit organizations, cities) that use technology (especially ITS) in innovative ways that promote broad social, environmental, and economic objectives.</td>
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<tr>
<td>Key Findings</td>
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<td><strong>Beyond ITS</strong></td>
<td>ITS is but one element of the broader revolution in telecommunications and information technologies.</td>
<td>Advancements in information technology are likely to enhance the ability of ITS to produce and disseminate transportation-related information, complement efforts to reduce the number of SOVs, as well as produce better tools to monitor progress toward sustainability.</td>
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<td>1. Promote telecommuting. Mn/Dot could, for example, promote the establishment of urban and suburban telecommuting centers to connect employees and employers and reduce peak-period congestion.</td>
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<td>2. Use GIS to analyze and present spatial data. In addition to offering an excellent tool to enhance traditional transportation planning, GIS presents an ideal way to develop indicators of progress toward sustainability using data on transportation, land use, demographics, employment and environmental quality.</td>
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29th Street Greenway Corridor Research Project — Project Synthesis

Putting It All Together:

Using the ISTEA Framework
To Synthesize Transportation
And Broader Community Goals

William Fulton
Thomas A. Horan
Kara Serrano

Claremont Graduate University Research Institute

We would like to acknowledge the help and assistance of the project participants—Lee Munnich, Lyn Kathiene, and Tom Luce—and project sponsors—Hennepin Community Works, Larry Blackstad, and Rob Luckow.

Draft, Not for Quotation or Attribution
12 November 1997
Executive Summary and Recommendations

The Intermodal Surface Transportation Efficiency Act (ISTEA) passed in 1991, marks a revolutionary change in transportation policy. With the passage of ISTEA transportation policy shifted to more holistic approach. This paper identifies four elements—community design, alternative transportation benefits, greenspace development, and economic development—that when integrated with transportation policy can lead to an improved urban environment. The development of the Midtown Corridor in Minneapolis, Minnesota serves as a model of this policy paradigm.

This paper examines the development of the Midtown Greenway; the greenway is a five mile abandoned rail corridor, at grade and below grade, which crosses through 12 diverse communities. The multipurpose amenity, which parallels 29th Street and is approximately two blocks north of Lake Street, is being developed in three segments. Partial funding is provided through the ISTEA's enhancement program.

This paper reports on a series of finding from a study conducted by the Humphrey Institute, University of Minnesota. Project members undertook a variety of studies that analyzed the impact of the greenway on the corridor. Tom Luce analyzed data on the impact of a greenway on a house's selling price, area jobs, and commuter travel patterns. Lee Munnich and Matilda Larson studied alternative transportation patterns in the region. Lyn Kathlene conducted surveys and interview local residents. Tom Horan provided recommendations based on the findings and an overall synthesis of the material.

This study found that an overwhelming majority of local residents support construction of the greenway; moreover, no one did not support construction. Community members indicate that once built, they will be use the greenway for a variety of actives of issues regarding safety and security are addressed. Other important findings show usage of alternative transportation modes is strong in the corridor; the potential for the greenway to encourage alternative transportation modes is high, especially, when paired with proposed transportation options such as a “short-hop” bus. Based on studies conducted on other Minneapolis neighborhoods that border greenways, the Midtown greenway also has the potential to stabilize and increase local housing value.

This new policy framework is not without potential challenges. The ways in which ISTEA are revolutionary from previous policy mean new challenges for all involved. Because implementation of projects under ISTEA calls for increased local participation and decision making, leadership, and coalition building among various groups, a governance structure that can address the needs of all
constituencies will be important.

The development of the Midtown Corridor can serve as a model for other cities. By integrating issues of community design, alternative transportation benefits, greenspace development, and economic development, this amenity illustrates that the impact of a transportation enhancement goes far beyond the development of an alternative transportation mode. Based on the findings of this report, the following recommendations are made.

*Continue Active Community Participation:*

The Greenway project should continue to build on the strong community activism of the area. The survey indicates strong interest in the corridor and local community groups have been instrumental in developing the greenway plans. The policy outcomes must appeal to and be accepted by a wide range of interests, including recreationalists, business interests, and residents from many different types of neighborhoods. If the Greenway is viewed as a project that will benefit just a few of these interests at the expense of others, or some neighborhoods and not others, it will not likely be viewed as a success. The project has demonstrated that much can be done beyond the most passive of approaches. By creatively involving all stakeholders the projects has been able to and will continue to encourage community revitalization and neighborhood redevelopment.

*Work with Transportation Partners to Devise Innovative Transportation/Transit Elements:*

The Greenway project lies within one of the most heavily used transit corridors in the city. Achieving linkages between them is vital. Moreover, the survey results suggest even more could be done to market transit in the corridor, perhaps based on shuttle hop concepts. Intelligent Transportation Systems (ITS) can also be paired with greenway development to address issues of safety as well as to encourage linkages to transportation objectives. Major employers in the area can help to provide incentives for employees to use alternative transportation modes. Within the zones there are indications that people walk and bus to work in high numbers. By continuing to encourage these transportation modes and providing linkages between modes, alternative transportation uses can be encouraged. The promise of ISTEA is that by “putting it all together,” transportation improvements can do more than simply further transportation objectives; they also assist in achieving a whole series of community and environmental goals in an integrated fashion that provides a better and more manageable pattern of daily living for urban dwellers. The
Midtown Greenway is a project that holds promise to be a national example of how ISTEAs promise can be fulfilled "on the ground" if the community's residents and policy makers bear in mind the lessons that ISTEAs successes and failures provide.

**Comprehensively Integrate Greenway with Economic Development of Corridor:**

The economic redevelopment of the area show signs of the awakening. The Midtown Corridor can serve as a catalyst for area redevelopment especially when integrated with other projects. A key finding of the study is that the success of the greenway is closely linked to the economic development of the Lake Street corridor. The Sears redevelopment promises to invigorate the neighborhood, as is the partnership to bring other private sector representatives to the table. Encouraging local business development also is important. Survey results indicate that greenway users and local employees from major employers in the area would support the service and restaurant business that could be established in the greenway area. Attending to related social issues can improve the business investment climate and addressing area liabilities such as crime can also lead to successful area redevelopment.

An integrated policy approach must be pursued on a continual basis. The Midtown Greenway situation suggests that the project is likely to be viewed as a success only if a broad range of community goals are integrated in the implementation stage, and only if different aspects of the project can work together to achieve multiple policy goals. The Greenway will likely not be considered a success if it does not contribute to revitalization of Lake Street, increased access to recreation and employment opportunities for corridor residents, and a wide range of other goals that have been discussed in this paper.

Project advocates should have realistic expectations about the project's impact. No one project—not even a major ISTEAs transportation project like the Greenway—will serve as the "magic bullet" to solve all problems in a community. Rather, given the integrated approach and need for a broad buy-in, a project such as the Greenway is likely to make a small but significant contribution to improving community life in many different ways. These successes must be identified, documented, and dovetailed with other, similar community efforts that also make a contribution, so that the whole of all these improvements is greater than the sum of its parts.
Move Swiftly to Adopt Governance Model:

The Midtown Greenway is a strong example of more local level decision making and involvement. The ISTEA application represents letters of recommendation from a variety of coalitions in the corridor area from council members to biking advocates. As more groups have become involved in the policy process, local leadership is needed to build win-win situations and build consensus among a diverse group of needs.

A governance structure that involves all local community groups is important. Because the greenway development is strongly tied with redevelopment goals, support from local businesses and major employers will be important to successful policy implementation. A public-private partnership can help spur local interest and investment in the community.

The Midtown Greenway must be viewed as an integral part of the community not just a bike path for it to be successful. It must help to connect not only the east-west ends but the north-south connections that can be made as well. Leadership at the local level will become increasingly important as federal policy devolution continues.

There is no substitute for strong and consistent political leadership in using projects such as the Greenway to pursue a variety of community goals. Communities do not achieve dramatic change or improvement overnight. Rather, they improve incrementally, over a long period of time, as a result of many different initiatives that all move in the same direction. A project such as the Greenway should be used not only as a vehicle to pursue multiple policy objectives, but also as a foundation for a multitude of future initiatives in many different areas, each of which can contribute to the community's success.
Thinking Like a System:
Operationalizing Sustainability Through Transportation Technologies

Presented by Hank Dittmar, Executive Director
Surface Transportation Policy Project

Today we’re here to talk about the environmental impacts of Intelligent Transportation Systems, but I would like to broaden the topic to looking at the question of “sustainability.” We know that sustainability is a serious concern for the gamut of interests and populations -- everyone has something at stake. Take my uncle, for instance. He’s a typical conservative insurance executive from Iowa and he told me recently that he’s becoming worried about the viability of their industry. Their ability to predict major catastrophes based on what’s happened in the past is faltering because of erratic weather patterns. To him, sustainability means not only environmental sustainability, but the ability to make a living.

Policy makers and scholars have for years attempted to define, bound, and refine the elusive concept of sustainability. The Surface Transportation Policy Projects is a coalition of groups concerned about the relationship between transportation and the economy, the environment and our social fabric. We believe that transportation policy and investment should serve the needs of people and communities, not just the needs of vehicles and facilities. For the past several months we have been attempting to define a role for emerging transportation technology applications in creating a more sustainable global future. With the assistance of the Minnesota Department of Transportation, research team of the Humphrey Institute at the University of Minnesota, the Claremont Graduate School in Claremont, California, and the Surface Transportation Policy Project, has tackled this task. Like many others, we are using a working definition for sustainability that includes consideration for economics, environment, and social equity issues at the community scale.

That’s the easy part. The difficult task is to operationalize the concept of sustainability into an actionable agenda for the development of Intelligent Transportation Systems. STPP has been involved in a number of national initiatives on sustainability, such as the President’s Council on Sustainable Development and the White House Dialogue on Greenhouse Gas Emissions from Personal Motor Vehicles. Both of these present opportunities to operationalize the concepts that we’re talking about. In each, we’ve worked with others to develop a good set of VMT reduction policies, all designed to operationalize sustainability in transportation.

When I think of sustainability, I look to systems theory as a helpful tool. Although we tend to refer to the transportation system as a system, we don’t usually think of it as a system. This is one of our key problems, because transportation is indeed a large
complex system that integrates people, modes and land uses. Instead, we think of single modes -- we think of driving as separate from bicycling or transit, and we think of walking as something that we did when we were children. As a result, we don't know how to manage transportation as a system. Rather, we manage it as a series of incremental parts. We claim to understand the connections between all these parts, but that still doesn't seem to help us either.

We even have a hard time collecting the data. The data that we do collect shows us that then situation us not improving. VMT in the United States during the 1980s grew by 4% a year, and from 1983 to 1990 VMT increased by over 40%. Travel surveys in most metro areas from the 1990s show that we're driving more miles and spending more time driving. Also, utility is decreasing because we're making fewer trips. The increase in travel was formerly related to an increase in drivers licenses and automobiles per capita, probably a sign of economic health. Now it's more like dropping a bag of marbles, because our population and uses are spreading out, requiring us to travel farther to get the same things.

Our second key problem is greenhouse gases. Carbon dioxide emissions are increasing as we travel farther and farther every year. Today, 30% of our greenhouse gas emissions comes from motor vehicles. And consider the worldwide problems as we export inefficient technologies and management systems to the developing world. If a billion Chinese convert from bicycles to cars, we're in trouble.

A third serious issue is that there are increasing inequities in the distribution of transportation resources. One study by Michael Cameron of the Environmental Defense Fund looks at this issue. Cameron divided the population of Southern California into five income quintiles and calculated their transportation costs and benefits. He found that low-income people pay disproportionately more for the services they receive and receive fewer benefits than wealthier individuals. He then goes on to argue that pricing systems help us achieve a more equitable outcome.

Fourth, many people lack access -- to jobs, health care, education, social services, shopping, and other destinations. Demographic trends seem to be exacerbating this. For example, working mothers are particularly hard hit by relying on cars, because research shows homes are located closer to where husbands work. Meanwhile, many women are saddled with child care, soccer games, and other responsibilities that make transportation a critical issue for them. Older persons also face dramatic challenges, as many age in place in the suburbs, which aren't dense enough to support transit, and where people can't get around without cars. Many rural populations are characterized by increasing isolation. And the little that we know about the travel patterns of the very poor and zero-vehicle households is also troubling. Their transportation burdens are such that after spending all their time getting to and from places, they barely have time to look for work.

We don't understand that transportation plays a role in these issues. Transportation decisions are made in relation to other transportation factors, such as bottlenecks and
roadway design, and not to accommodate the needs of people and communities. There are few effective ways to build external signals into our decision-making processes, no feedback loops to tell us how we’re doing. Also, the segmentation in the management of the system is one of our most formidable obstacles. Currently, each owner operator is asked to optimize travel in their respective modes, whether it’s freeway or a transit system they’re trying to optimize. A land use planner tries to optimize tax revenues. Transportation users all try to optimize their efforts too. Freight operators will ship goods long distances because they can take advantage of lower wages elsewhere. In other words, all actors try to optimize the cheapness of the transportation system, and the result is system inefficiency and waste. Technology can help us solve some of these problems, by helping to provide feedback, giving us alternatives for dealing with problems, and showing us how our transportation can truly work as a system.

What we need is a goal framework, complete with examples of technologies that support sustainable development for communities. The main challenge is how to reconstruct the transportation system to better serve sustainable communities. Here are three ideas.

First, transportation should be conservative in nature. Natural systems are typically conservative -- change slowly, evolving to changing conditions to maximize flexibility while minimizing risk. In our transportation construction era, the main priority has been the throughput of the system. We’re now at a stage where we can no longer build our way out of congestion and other problems, so throughput must be managed. Technologies can start to provide alternatives to the built options. They can also show us where we maintain what we have before we build something new. Advance public transit dispatching, scheduling and vehicle locating systems.

This also involves reducing the use of nonrenewable resources. Life cycle costing is part of that, as is the use of recycled materials. This is becoming a big part of the asphalt industry, and the application of technology in quality control has proven critical to this. This also involves reducing the use of nonrenewable resources. Life cycle costing is part of that, as is the use of recycled materials. This is becoming a big part of the asphalt industry, and the application of technology in quality control has proven critical to this. Alternative-fueled vehicles, mobile air quality monitoring, and roadway pollution run off monitoring also help.

Second, instead of mobility being the end all and be all of our transportation system, the main goal should be accessibility. We should look at how well we’re making opportunities available to people and communities. This is where we begin incorporating social equity and social justice into our working concept of sustainability. Technology can help us measure our performance in delivering these services to people. Microsimulation and other activity-based modeling, for example, can help us reveal the number of opportunities that exist within a 20-minute walk or bike ride. We can also explore the potential of telecommuting and teleshopping to provide better access. Technology can provide us with a more comprehensive understanding of our data. For example, you could measure access to jobs for various communities, going beyond simply showing where jobs exist, to showing what kinds of skill levels are required of workers and how one could get to those jobs.
Third, transportation policy needs to be considered as strategic investment. People on both sides of the aisle are questioning the long-held assumption that transportation means jobs. Now they’re asking if a given project provides more jobs than simply digging a big hole and filling it back up again. We need to target investments to make sure that they’re paying off. There are two ways that investments can make a payoff.

The first is illustrated by a recent German study on global climate change. Researchers were concerned about the sustainable development impacts of the new European economic union. They started by looking at the total economic, environmental, and energy balance of creating one tin of yogurt at a local factory. They found that materials came from all over the world, and that the total social costs for creating that one tin were enormous. So part of targeting our transportation investments is considering those social costs when we develop our regional economies. There is a need to push for a regional balance that favors the local production of goods. ITS technologies such as traffic management and traveler information which maximize system efficiency without incurring major capital and operating expenses can be considered a very good investment.

The second investment rationale goes in the opposite direction. We should acknowledge that we are dealing in a global economy, and that some things need to happen to facilitate the transformation of our freight movement system into that economy. That’s where intermodalism helps us the most through we maximize connections between all haulers, especially rail freight and shipping, and move freight systems closer to regions.

Providing an informed and integrated goods movement infrastructure is an essential step to ensuring the full participation of regions in this economy in an environmentally efficient manner.

Beyond showing how technology can better serve sustainable communities, there’s a second set of broad goals -- making the transportation system work better. That’s the only way we’re going to move into the future. We’ve already built nearly all of the highway systems in the United States that we’re going to build in this century. Now our challenge is evolving from builders to managers. Part of this is employing technologies such that our transportation system meets our national goals. The traditional presumption that increased throughput is good needs to give way to the view that providing good access is the main goal and that throughput is just part of that mission. Technology should enable you to meet a balance, especially if it is put at the service of a public process that has a set of social goals. If you want to maximize throughput, it has to have a proven goal, such as diverting traffic away from historic neighborhoods.

The first of these goals is system integration. Technology can also help us better integrate and manage the transportation system, by linking freeways to transit, bikeways to local roads, etc. What we want is the ability to manage traffic dynamically in real time. Other developments, like smart cards and smart billing, could further increase intermodal connections. Smart cards will enable people to use one payment medium for all fares and smart billing means you only write one check. Rural mayday systems will eliminate
some of the sense of isolation in rural communities. Navigational technologies can help everyone from out-of-town tourists to folks looking for parking.

A second key goal is to promote redundancy and flexibility in the transportation system. Systems theory tells us that the healthiest systems are the ones that are most robust, ones that can accommodate unexpected changes, ones that can adjust quickly without failing. Take the telephone system, for example. The telephone signal don’t care if it’s traveling by an NHS route, or through little street route, or by bike or by foot. What counts is that it gets the caller there. Together, these developments mean that telecommuting, rideshare matching, and other forms of information-sharing can enhance the performance of the system.

A third key goal is incorporating the notion of feedback into the transportation system. In other words, users of the system should be aware of the applications and implications of various strategies. This works for freight information systems, rural mayday systems, transit and traffic systems. In a way, it requires us to think forty miles upstream. I like to be able to turn on my cable TV system and see what travel conditions are going to be before I actually leave the house with a vehicle. I would like even better to be able to compare travel times under current conditions by transit with travel times by alternate auto routes. Feedback is also an important concept for traffic management and incident management.

Finally, a fourth key goal is promoting peoples’ right to know. Transportation policy should be transparent, and people are entitled to understand where their investment dollars are going. Technology applications, particularly the internet, can increase the accountability of transportation institutions to the taxpayers public.

How we can operationalize all of these goals? This is a difficult task, but here are two suggestions:

1) Develop an architecture that is ends-oriented and not means-oriented. The architecture currently being developed is listed in terms of user services, but those things are virtually impenetrable to users. Instead, the architecture should be developed in terms that users understand and framed in terms of what it should deliver for users and customers.

2) We need to measure transportation system performance. We might look at carbon dioxide use per capita and accessibility indices by income, geography, and other factors using GIS software. In addition to measuring access to jobs, shopping, and other destinations, we might want to look at accessibility to markets, and link up business location to other factors. We could also look at percentages of land devoted to transportation and try to bring that number down. Or we could look at the percentage of gross domestic product devoted to transportation. Is a bigger percentage good or bad? The answer is that it’s both, and the answer depends on what you’re spending your money on and what you’re getting in return. There are many other things we can look at: system
condition, life cycle costs, pavement condition, water quality, energy intensity, transportation costs by income, etc. But together, these performance measures could constitute benchmarks for sustainable transportation.

I’d like to close by quoting Gregory Bateson, who was a leading systems thinker, as well as a psychiatrist and an anthropologist -- which is what we all need to be to work in transportation field. He says that “the goal of our society should be a single system of environment combined with high human civilization, in which the flexibility of the civilization shall match that of the environment to create an ongoing complex system, open-ended for slow change of even basic characteristics.”

This could be an alternate definition of sustainability. That’s where we get back to the principle of being conservative. Because our experience with the building era has shown us that we’ve been having fast change of basic characteristics, and we don’t know what the consequences are. Fast change is due to the introduction of technology without a value set, a needs set, or an ethics set that allow it to be applied to meet social goals. And transportation has been as much a victim of this as any other sector of our society.

About STPP
Formed in 1990, the Surface Transportation Policy Project (STPP) is a coalition composed of public and private organizations and grassroots groups who believe that a comprehensive transportation policy - that serves a broad array of national goals - is critical to the vitality of our communities. The goal of the Surface Transportation Policy Project is to ensure that transportation policy and investments help conserve energy, protect environmental and aesthetic quality, strengthen the economy, promote social equity, and make communities more livable. We emphasize the needs of people, rather than vehicles, in assuring access to jobs, services and recreational opportunities.
What is sustainable development?

Brundtland Commission (Our Common Future)
Sustainable development is defined as "meeting the needs of the present without compromising the ability of future generations to meet their own needs."

What does it mean for transportation?
Hank Dittmar
Two approaches: 1) What does transportation do for society? Transportation should promote (or at least not hamper) social goals, including environmental quality, economic development, equity, etc. 2) Is the transportation system itself sustainable? Decisions and investments should focus on improving total system performance.

Tom Horan and TRB Working Group on Sustainable Development
Focus on transportation's relationship with a sustainable environment rather than on transportation as a sustainable entity in its own right. Distinction drawn between concentrating on long-term environmental impacts, and adopting a broad definition of sustainability that includes short-term environmental and health issues, land use, social equity and cultural issues.

Battelle
"Sustainable transportation may be defined as an anticipative and adaptive system for meeting the mobility and access needs of all segments of society over the long-term, without compromising the ability of future generations to meet their own transportation needs, and without jeopardizing the energy resource base, the quality of the environment, and the quality of social life with which these systems interact.

Schipper, Deakin, Sperling
"[Sustainable transportation is defined as] providing transportation services as long as those using the system pay the full social costs of their access, without leaving unpaid costs for others (including future generations) to bear."

Sweden study
Influence of transportation on the environment include: 1) emissions that affect long-term health of earth's living systems, 2) emissions that affect short-term health of biological systems, 3) negative impacts on society, 4) personal injuries from accidents, 5) depletion of non-renewable resources.

Per Kageson
"Formulating a policy for sustainable transport can in practice hardly be done without addressing...three issues: the basic needs for mobility today, the environment and the resources of the future, and health hazards today." Kageson recently proposed calling this "environmentally responsible transportation (not sustainable transportation)."
What Do the Decision Makers Say?

President's Council on Sustainable Development

Broad goals include:

Curb Sprawl Development
Provide of Environmentally Safe and Healthy Communities
Promote of Community Economic Development through Land Use, Pricing, Investment, and Technology Policies
Create of Mixed-Use, Non-Automobile Access-Oriented Communities
Ensure that Pricing Reflects Full Economic and Social Costs
Increase Economic and Resource Efficiency of Existing Transportation System
Promote of Equitable Distribution of Costs and Benefits of Transportation, Especially for Poor, Rural, Elderly, Disabled.
Increase Public Participation
Decrease Energy Consumption by Increasing Efficiency of Vehicles and Systems and Decreasing VMT.
References


ISTEA and the Community Benefits of Technology: A Case Study of Santa Monica, California

(Draft)

Thomas A. Horan
Daniel R. Jordan

The Claremont Graduate University Research Institute
Introduction: ISTEA, Communities and the Information Revolution

Communities throughout America are attempting to revitalize the economy and overall quality of life within their downtown districts. Many such strategies involve creating a more pedestrian-friendly atmosphere, re-arranging traffic circulation and improving transit services, and mixing residential, retail, and commercial uses. This comprehensive policy approach envisions the downtown as a center for commerce and community interaction, and, ideally, can simultaneously promote economic development, environmental quality, and an overall improved quality of life for all members of the community.

Promoting this kind of comprehensive, "holistic" approach to urban areas was one of the fundamental principles underlying passage of the federal Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991. While focused on transportation, ISTEA presented an integrated policy vision that placed traditional transportation goals (i.e. moving people and goods) within the context of achieving broader urban objectives to create more vibrant, "livable," and economically successful communities. ISTEA, in other words, stressed the importance of place, in addition to movement between places, as a central concern for federal transportation policy.

The policy revolution ISTEA engendered in urban transportation is taking place alongside another revolution: the revolution in telecommunications and information technology. This revolution is manifesting in transportation through technologies such as Intelligent Transportation Systems (ITS), but its implications for the entire economic, social, and physical landscape rivals that of other technological advances such as the automobile. Unlike the impact of the automobile, however, this "invisible" revolution has a more diffuse impact on the physical and social character of communities.

How are communities responding to the "dual revolution" of ISTEA and information technology? Does the approach certain communities are taking provide lessons for other communities confronting similarly complex issues surrounding transportation, information technology and community quality of life? In an effort to provide insight into these questions, this report presents three case studies of communities across the nation taking innovative approaches to these issues. The first case study is of
Santa Monica, California, a city of roughly 87,000 people located just west of Los Angeles. Santa Monica has several initiatives underway related to technology, transportation and urban design, and is making extensive efforts to assure these initiatives contributes to broad community goals related to economic development, environmental quality, and a strengthened “sense of place” within its downtown district.

Current Initiatives Underway in Santa Monica

Santa Monica is undertaking several technology, transportation and urban design initiatives that will profoundly shape the future of its community, particularly within the downtown district that includes Third Street Promenade. These initiatives were the focus of discussion during the project-sponsored Policy Consultation held in Santa Monica on September 11, 1997. It brought together roughly 30 individuals -- including elected, appointed and staff officials from the City of Santa Monica, community representatives, and regional transportation and environmental experts -- knowledgeable about the technology, transportation, and urban design initiatives discussed above. The primary goal was to develop and clarify policy options for integrating these initiatives, particularly through the use of technology, in order to maximize the economic, environmental and community benefits they provide.

An overview of the issues discussed during the Policy Consultation is provided below.

The Downtown Urban Design Plan

In an effort to address the increasing problem of downtown traffic congestion, together with the desire to expand the economic success and pedestrian-oriented character of Third Street to the entire 28-block downtown area, the City adopted the Downtown Urban Design Plan in July, 1997. The Plan addresses traffic circulation, pedestrian amenities, transit, and numerous aesthetic upgrades to the downtown “streetscape.” The Plan is notable both for the theory of streets it expouses and for its specific proposals to put that theory into practice.
Downtown streets, according to the plan, should serve three purposes: they must provide a transportation system that provides downtown access for all modes of travel; a public space system that "is the primary setting for social exchange and community interaction"; and act as an organizing framework that "orients and structures one's experience" while in the area. The net effect of the street system should be to emphasize downtown "as a primary travel destination...rather than being merely service roads that divide and deaden the area."

The Plan's holistic theory of streets informs its specific proposals. These include:

- widening sidewalks throughout downtown
- converting two one-way streets to two-way
- creating more on-street parking (and thus removing one traffic lane) on a main downtown street
- creating a downtown "transit mall" by converting two existing traffic lanes to transit-only and providing more sidewalk benches and bus shelters
- enhancing the aesthetics of the downtown streetscape with tree planting, new street lights, and public art

Particularly striking is the Plan's approach to combating traffic congestion. In essence, the Plan makes almost no effort to "build its way out of congestion (i.e. add more physical capacity for automobiles). Instead, it does precisely the opposite: it reduces downtown automobile carrying capacity by decreasing the amount of downtown street space available to -- or that gives first priority to -- automobiles. In doing so, the Plan assumes that "a certain amount of congestion is appropriate in a thriving downtown." The goal, therefore, is to minimize the disruptive effects of traffic congestion, not eradicate it. Moreover, by increasing the "friction factor" exerted on cars - the new impediments to driving caused by the relative shift in convenience to bicyclists, pedestrians and transit -- the Plan will "encourage any through traffic to seek less congested alternative routes on peripheral streets." Finally, the Plan assumes that some downtown travelers will shift from automobiles to other travel modes. The Plan gives pedestrians wider sidewalks, bicyclists will receive a new Class 2 bikeway, and transit
patrons a new "transit mall" and an increase in transit service. All of these things, according to the current mayor of Santa Monica, will make downtown Santa Monica a place where "you don't have to get out of your car; you'll want to."

Parking Management

The City is also undertaking a study of the downtown's current parking capacity and expected future parking needs to developing a parking management program. A major goal of the study is to find ways to best utilize existing parking capacity, rather than have to construct new parking facilities. The City is also considering the use of real-time parking information that would direct drivers to available spaces within the City's six downtown parking structures.

Telecommunications Master Plan

Given recent advances in telecommunications and the profound regulatory changes stemming from the federal Telecommunications Act of 1996, the City is assessing Santa Monica's current telecommunications abilities, future telecommunications needs, and potential ways to meet those needs.

The PEN System

One of Santa Monica's innovative current uses of telecommunications is its Public Electronic Network (PEN), which began in 1989. PEN provides free electronic services for those that live, work and attend school in Santa Monica. It allows anyone with computer access (including those using public terminals in the City Library or various community centers) on-line access to numerous city services, city government information (i.e. meeting schedules and agendas, staff reports, city ordinances, etc.) PEN also provides a forum for community members to discuss issues with each other and with elected officials and city employees. Transportation-related information on PEN includes transit schedules, bus trip itineraries, and neighborhood traffic reports.
SMART Corridor Extension Project

Santa Monica has been a leader in using ITS to improve the efficiency of its transportation system, the best example of this being its SMART Corridor Extension Project. Designed to improve traffic flow and reduce congestion-related emissions from vehicles, the Project integrates traffic management and control functions along the 3.3 mile portion of Interstate 10 that traverses Santa Monica with two major arterial streets that parallel the freeway. The Project provides traffic and travel route information to both drivers and traffic managers, especially during heavily congested periods or during traffic incidences.