



**INTERNATIONAL WORKSHOP
ON
PLANNING REGIONAL
TELECOMMUTING
PROGRAMS**

**Sponsored by the
U.S. Department of Transportation
TRB TDM Committee
TRB Telecommunications and Travel Behavior Committee**

International Workshop on
Planning Regional Telecommuting Programs

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Workshop Proceedings

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WORKSHOP OVERVIEW

Edward Weiner, United States Department of Transportation
Katherine F. Turnbull, Texas Transportation Institute

The *International Workshop on Planning Regional Telecommuting Programs* was held at the Arnold and Mable Beckman Center in Irvine, California on November 3-5, 1997. The Workshop was sponsored by the Telecommunications and Travel Behavior Committee and the Travel Demand Management Committee of the Transportation Research Board (TRB) of the National Research Council and the U. S. Department of Transportation.

The Workshop brought together individuals responsible for telecommuting programs at the national, state, regional, and local levels. Representatives from federal agencies, state departments of transportation, metropolitan planning organizations (MPOs), transit agencies, cities, transportation management associations (TMAs), universities, consulting firms, private businesses, and other groups all participated in the Workshop.

The Workshop provided a forum for these individuals to share information on their experiences with telecommuting programs, the use of different educational and outreach techniques, and the benefits and costs associated with telecommuting and telework centers. Common issues were identified and areas for additional research were discussed.

To accomplish these objectives, the Workshop included a combination of general sessions and breakout groups. This format provided the opportunity for participants to learn from each other, to share ideas, and to discuss common issues and concerns.

The Workshop started with an overview of telecommuting programs throughout the country and activities at the federal level. Regional programs in the Washington, D.C. area, Phoenix, Nashville, and Southern California were described, along with state activities in Washington and Colorado, and local programs in California.

Other sessions highlighted the experiences with telework centers in California and Minnesota, and current research. The results from the Workshop will be of benefit to many groups and numerous opportunities exist to advance the activities started at the Workshop. The two TRB Committees co-sponsoring the Workshop can use the results to help identify future projects and activities. The issues discussed in the breakout groups can be developed into problem statements for projects or research studies. Potential funding sources for these efforts include the

on the transportation and land use impacts of telecommuting. Finally, the future of telecommuting from both the private and public perspective was presented. The Open Space format was used in the breakout groups. This technique allowed the workshop participants to identify the topics, lead the discussion, summarize the key issues and elements, and present the results. The following nine topics were identified by participants and discussed in the breakout groups.

- Beyond Telecommuting: Reducing Other Types of Trips.
- Measuring the Productivity of Telecommuters.
- Providing a Better Bottom Line to Employees in Justifying Telecommuting Programs.
- Estimating the Potential for Telecommuting in an Area.
- The Impacts of Labor Issues on Telecommuting.
- Institutional Support of Telecommuting.
- Regionalizing and Effectively Marketing Telecommuting Programs.
- Hidden Motivators in Telecommuting.
- Telecommuting Technology Spectrum: Assessing the Real and Perceived Technology Needs for Telecommuting.

The issues associated with each of these topics were discussed in the breakout groups. The participants also identified action steps, additional research, and other activities to help address these concerns.

The results from the Workshop are summarized in these proceedings. The presentations are highlighted first, followed by the breakout group discussions. The Workshop and these proceedings help facilitate the sharing of information among the various groups responsible for national, state, regional, and local telecommuting programs. The proceedings are also intended to help advance the state-of-the-practice related to planning, implementing, marketing, monitoring, and evaluating telecommuting programs.

Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), the General Services Administration (GSA), the National Cooperative Highway Research Program (NCHRP), the Transit Cooperative Research Program (TCRP), individual states, metropolitan planning organizations (MPOs), transit agencies, local jurisdictions, private businesses, and other organizations.

A consensus emerged among the participants that a second *International Workshop on Planning Regional Telecommuting Programs* should be held. Providing ongoing opportunities to share experiences and to learn from each other was voiced as a priority by the workshop participants. An 18-month time frame, or the Spring of 1999, appeared to be the schedule preferred by most attendees for the next workshop.

OPENING SESSION

Edward Weiner, United States Department of Transportation—Presiding

Workshop Welcome

Edward Weiner, U. S. Department of Transportation

Good morning and welcome to the International Workshop on Planning Regional Telecommuting Programs. This Workshop is sponsored by the Transportation Research Board (TRB) Committee on Telecommunications and Travel Behavior and Committee on Travel Demand Management, as well as the U. S. Department of Transportation.

The concept of telecommuting has been around for at least a couple of decades. Telecommuting has only recently become an important strategy, however, with the substantial advances in computers, telecommunications, and the emphasis on organizational restructuring. Today, it seems like half the words in the English language have a tele-version. We have teleshopping, tele-education, telemedicine, and telesprawl, to name just a few. Fortune magazine recently sponsored a conference on Business and The Telecosm — the entire world linked by telecommunications.

Telecommuting has been advanced by a broad coalition of individual groups for a variety of reasons. Telecommuting can have impacts at the community level, at the organizational level, and at the individual level.

From a community's perspective, telecommuting can reduce traffic congestion and travel time losses due to congestion. It can have positive impacts on reducing air pollution, greenhouse gas emissions, energy consumption, accidents, and the need to construct new transportation facilities or to expand transportation capacity.

From an organizational point of view, telecommuting can improve the productivity of employees. It can also reduce operating expenses by lowering office space and employee support requirements.

And from the employee's point of view, telecommuting can provide extra time that otherwise would be spent traveling to and from work. Telecommuting also provides flexibility in scheduling work and personal time, as well as lowering commuting costs.

These represent just a few of the topics to be addressed at the Workshop. We have an excellent group of speakers

Telecommuting can also provide an important option during times of natural or man-made disasters, allowing organizations to continue functioning and employees to continue working. For example, telecommuting was used here in California to help respond to the Northridge earthquake.

On the downside, concerns have been raised about the potential impacts of telecommuting on urban sprawl. If telecommuters can reduce the number of days that they commute, will they choose to move further out of town? If this telesprawl occurs, will it detract from the economic viability of central cities and the supporting transit systems?

There are also questions relating to the impact of telecommuting on the transportation system. For example, the congestion reduction effects of telecommuting may be influenced if additional travel is induced or if telecommuters make trips during the day for non-work purposes. We have only begun to scratch the surface of potential issues associated with electronic travel for other trip purposes, such as shopping and school, as well as questions associated with the permanence of telecommuting programs.

The focus of this Workshop is on telecommuting at the regional level. There is a great deal of useful information and guidance for establishing and managing telecommuting programs within individual companies and organizations. There is little information available on how telecommuting can be promoted at the regional and local scale.

The Department of Transportation has had inquiries from states, metropolitan planning organizations (MPOs), local communities, and other groups who would like to consider telecommuting options in the long-range planning process. These organizations are seeking techniques for developing, forecasting, and analyzing the impacts of state, regional, and local telecommuting options.

There is also interest in how regional organizations can develop regional telecommuting programs integrating and reinforcing the efforts of individual companies and organizations. In other instances, the regional organization would like to initiate region-wide telecommuting programs.

and participants for the Workshop. I hope you will find the sessions stimulating and helpful. Thank you.

Welcome from the TRB Telecommunications and Travel Behavior Committee

Patricia Mokhtarian, University of California, Davis

It is a pleasure to welcome you to the International Workshop on Planning Regional Telecommuting Programs. It seems appropriate that I have the opportunity to open this Workshop on telecommuting and regional planning since I started my career as a Post Doctorate student at the University of California, Irvine and then went to work for the Southern California Association of Governments (SCAG). One of the first projects I worked on focused on telecommuting and I have continued to be involved in research projects related to telecommuting for the past 15 years.

I was hired at SCAG in 1982 to work primarily on traditional transportation planning projects. I was told that I would be spending a small amount of time on telecommuting projects, however. That small amount of time turned into an almost full-time focus on telecommuting in the six years I worked at SCAG.

This story shows that SCAG and Southern California were at the forefront of the telecommuting movement. For example, telecommuting was officially included in the regional transportation plan in 1984. Although the projection that 12 percent of all work trips would be replaced by telecommuting by 2000 may have been overly optimistic, SCAG certainly recognized the potential of telecommuting alternatives.

The interest in telecommuting has grown among public agencies and private businesses in Southern California and throughout the country. Telecommuting programs have been implemented at the state, regional, and local levels. I think these efforts indicate that telecommuting has come of age. Telecommuting is on public policy agendas at many levels and is being embraced by businesses and private sector organizations.

It is much more common today to see telecommuting as part of state and regional transportation or air quality plans, as well as trip reduction ordinances. At least eight states have policies related to telecommuting and there are a number of federal policies and programs supporting telework options.

It is a pleasure to welcome you to the Workshop on Planning Regional Telecommuting Programs. I look forward to hearing about the programs and activities underway in other areas.

Telecommuting has come of age and is considered a realistic and practical alternative. I am delighted to be participating in this Workshop and I look forward to hearing your experiences.

Again, let me welcome you on behalf of the TRB Telecommunications and Travel Behavior Committee. I hope you will find the Workshop to be beneficial and enjoyable.

Welcome from the TRB Travel Demand Management Committee

Phillip Winters, University of South Florida

I would like to welcome you on behalf of the TRB Travel Demand Management (TDM) Committee which is one of the co-sponsors of this Workshop. Telecommuting is one of many TDM strategies that can be used to better manage the transportation system. It is probably the one strategy that attracts the most positive interest among commuters.

The interest shown in Telecommuting America two weeks ago on the part of the public, the media, and policy makers indicates the wide-spread support for telework alternatives. Also, telecommuting represents one of the few TDM strategies that has documented impacts not only on the transportation system, but also on businesses. The positive impacts of telecommuting on increasing employee productivity, reducing absenteeism, and saving office space and real estate costs have all been documented. The benefits to the transportation system have also been evaluated.

I think the TDM community can learn from you about how best to present telecommuting programs to the public and private sectors. For example, telecommuting is just beginning to be introduced in many areas of Florida and to date the state has not taken an active role in promoting telecommuting as a travel reduction strategy. There is a great deal of potential for telecommuting, however, and I hope to learn from the experience in other states over the next few days.

This Workshop provides the opportunity to share your ideas with other professionals. You will also be able to help identify critical topics that need to be addressed in the Open Space breakout session on Tuesday afternoon.

National Overview of Telecommuting

Katherine F. Turnbull, Texas Transportation Institute

It is a pleasure to welcome you to this Workshop and to have the opportunity to provide a national overview of

telecommuting. We are fortunate to have an excellent group of speakers and participants. I hope you will find the Workshop to be informative, challenging, and enjoyable.

I would like to thank the U. S. Department of Transportation and the TRB Telecommunications and Travel Behavior Committee and the TDM Committee for sponsoring the Workshop. Ed Weiner, Pat Mokhtarian, and Phil Winters, along with Rich Cunard and his staff at TRB, deserve thanks for helping organize and coordinate the Workshop.

My comments will focus on the various activities underway throughout the country related to telecommuting. I would also like to provide an overview of the scope and format for the Workshop. We have national experts on telecommuting participating in the Workshop and they will be providing more detail on many of these topics.

As a starting point, it is important to focus on the factors influencing and encouraging telecommuting. A number of elements appear to be promoting more widespread interest in telecommuting alternatives. Certainly, concerns related to the transportation system and the environment have been driving factors behind recent interest in telecommuting. Telework alternatives represent possible approaches to help address traffic congestion and air quality issues.

In many respects, however, the strongest interest in telecommuting is coming from non-transportation related sources. Placing too much emphasis on promoting telecommuting for transportation reasons may lose some of the key stakeholders. These include both employees and employers who see numerous benefits from telecommuting.

Individual interest in balancing work and home responsibilities is a major factor influencing telecommuting. Employees in many areas are promoting telework options to better meet their personal needs. Telecommuting can help us address our "just in time lives" as we all try to balance competing demands.

The President's Council on Management Improvement initiated the Federal Flexible Workplace Pilot Project (Flexiplace) in 1990. The Flexiplace program allows federal workers to telecommute from home and to use telework centers. The initial Flexiplace effort involved approximately 1,000 participants and 15 federal agencies throughout the country.

Businesses and public agencies are exploring telecommuting for a variety of reasons. These include office space and real estate cost savings, attracting and retaining personnel, dealing with special situations, and responding to natural disasters.

Telework options are also being considered to enhance the economy, human capital, environment, and quality of life in communities. For example, multipurpose centers that include telework facilities are being developed to provide resources to local residents. These interests are reflected in some of the state, regional, and local policies on telecommuting.

The rapid advancements in technology represent another major factor influencing telecommuting. Computers, faxes, and other technologies make it much easier for individuals to work from home or other remote job sites. Although telecommuting does not always depend on technology, continued advancements will certainly help encourage telework options.

There are a number of activities at the national, state, regional, and local levels that are influencing telecommuting. Many of these topics will be covered in more detail by other speakers, but I would like to highlight a few examples.

At the national level, both the Clean Air Act Amendments of 1990 and the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 provide support for telecommuting. For example, telecommuting is one of the transportation control measures identified in the Clean Air Act Amendments that can be used to help air quality non-attainment areas meet the national ambient air quality standards.

The ISTEA provides greater flexibility for state and local agencies in the use of federal funds to address specific problems. Telecommuting programs and related activities may be eligible for funding through the Surface Transportation Program (STP) and the Congestion Mitigation and Air Quality (CMAQ) Program of the ISTEA.

In 1992 and 1993 Congress approved legislation authorizing the General Services Administration (GSA) to develop and operate telework centers for federal employees in the greater Washington, D.C. metropolitan area. Fifteen centers are currently in operation and additional facilities are being planned.

The National Performance Review designated the U. S. Department of Transportation as the lead federal agency on telecommuting activities. The charge to the Department included evaluating the potential for telecommuting, implementing a telecommuting program for Department employees, and encouraging, monitoring, and evaluating state, local, and private sector telecommuting efforts. The Department issued a policy on telecommuting and initiated a telecommuting program in 1994.

The President's Global Climate Change Action Plan includes telecommuting as one technique to help meet environmental goals and to enhance the quality of life in communities. The Action Plan identifies the U. S. Department of Transportation as the agency to lead federal efforts related to telecommuting.

Finally, in 1996 the President's Management Council approved the National Telecommuting Initiative Action Plan. The initiative includes a five-phased program to increase the number of federal employees telecommuting to 60,000 by the end of the 1998 Fiscal Year.

A number of statewide telecommuting programs have been developed and implemented. These include programs in Arizona, California, Hawaii, Minnesota, Oregon, and Washington. Examples of these programs and the keys to successful efforts will be presented in other sessions today.

One question for you to think about is how to enhance the sharing of information among individuals responsible for telecommuting programs in different states. A number of people have expressed interest in learning from their peers and exchanging information on a regular basis.

There are also a number of regional telecommuting programs. Speakers in the next session will highlight the efforts underway in the Washington, D. C. area, Phoenix, Nashville, and Southern California.

Local telecommuting programs and activities are beginning to emerge in many areas. In this region, the

Management resistance to telecommuting is still an issue in many public agencies and private businesses. Concerns related to supervising employees located at home or at telework centers is one of the major obstacles. How these issues are addressed is another topic for discussion during the Workshop.

Funding is another critical issue. Reauthorization of the ISTEA is still being discussed in Congress. As a result,

City and County of Los Angeles and the City of Mission Viejo are at the forefront of local telecommuting efforts.

A number of common elements can be identified from the successful programs at all levels. First, policies supporting telecommuting are evident with most successful efforts. Second, there is usually one lead agency. Third, although one agency has overall responsibility, most programs involve multiple agencies and organizations. Fourth, programs include a combination of public agencies and private businesses. Finally, successful programs include a mix of telework alternatives and promotional and educational efforts.

Examples of common program elements include education and outreach activities, seminars and training sessions, videos, handbooks, brochures, and ongoing technical assistance and coordination. Many of the speakers have brought examples of local brochures and training materials.

All of these activities indicate that telecommuting is an established work alternative in many areas. There are a number of successful public and private telecommuting programs, as well as federal, state, regional, and local activities. There are still a number of issues associated with telecommuting that need to be examined.

One issue is that we do not have an accurate assessment of the number of telecommuters and the extent of telework options. Different estimates are available based on 1990 Census data, as well as data from public and private sector organizations.

There has been a good deal of research on the transportation and air quality impacts of telecommuting. Pat Mokhtarian has been at the forefront of much of this research. For the most part, it appears that telecommuting has a positive impact on the transportation system. There are still a number of questions that need further examination. These include the impacts of telework centers, the impacts of telecommuting on land use and urban sprawl, and how telecommuting fits with the need for other transportation improvements.

the types of programs and the amount of funding available to support future telecommuting efforts is not known at this time. Maintaining ongoing funding for state, regional, and local programs is an important concern.

We are still learning about telework centers, especially the key elements of successful facilities. Issues that need further examination include locational concerns, the types of services that should be provided, and the development

of multi-use facilities. The experience with telework centers in California, Minnesota, and the Washington, D.C. area will be highlighted by speakers this afternoon and Tuesday morning.

The Workshop has been organized to provide a combination of presentations and discussion groups. Today and Tuesday morning you will be hearing from speakers presenting information on specific programs and research activities. There will be time for questions and discussion as part of these sessions.

The breakout sessions on Tuesday afternoon will provide the opportunity for discussion of issues and topics that you identify. The Open Space format allows you to decide the topics, lead the discussions, record the key elements, and present the results. A common reporting format, which includes the session title, convener, participants, issues discussed, and action items identified, will be used.

Topics you may wish to consider in the breakout groups include those related to support needed from the U. S. Department of Transportation or other public agencies, areas for further research, and ongoing communication methods. The breakout session summaries will be presented on Wednesday morning, along with the closing speakers discussing the future of telecommuting.

The Workshop provides you with the opportunity to learn from experts in telecommuting and to interact with your peers from throughout the country. I hope you will find the Workshop interesting, challenging, and enjoyable. Thank you!

Federal Telecommuting Activities

Mark S. Grisby, U. S. Department of Transportation

I appreciate the opportunity to summarize the recent federal activities related to promoting telecommuting. I would like to highlight the federal legislation and initiatives related to telecommuting, along with the activities of the various federal agencies.

We all know that telecommuting is not a perfect fit for every job or situation, and how often an individual telecommutes should be determined by what works best for the employer and employee. Factors that may influence this relationship include:

- The suitability of the job for telecommuting
- Employee characteristics
- Organizational support for telecommuting, including management support

In 1993, the U. S. Department of Transportation, in consultation with the Department of Energy and the Environmental Protection Agency (EPA), released its findings on the potential benefits and costs of telecommuting. The Congressionally-mandated report focused on the future impacts of telecommuting on transportation, environment, energy use, and safety.

Before we talk about the implications of telecommuting on transportation, we should first acknowledge some important information about telecommuting. Telecommuting activities are often carried out on an informal basis and are not always captured in any comprehensive statistical database. The 1993 study estimated that there would be between 7.5 and 15 million telecommuters by the year 2002. Estimates of current telecommuters suggest that this forecast may prove to be too low. The principal sources of information on the current level of telecommuting comes from pilot programs and a national survey.

Some of the estimated benefits of telecommuting include reducing traffic congestion and the associated loss of time, reducing automobile-related emissions, saving energy and petroleum consumption, and reducing highway accidents. Telecommuting is seen as a valuable travel demand management measure to reduce congestion and to meet existing national air quality goals. Furthermore, with the potential of more stringent air quality standards, telecommuting can make significant contributions to help reduce emissions.

As many of you know, telecommuting is still somewhat new. As a result, lessons are still being learned on the way in which jobs, individuals, and employers adapt to telecommuting. Most demonstration and pilot programs have been limited in scale, and have often involved carefully selected workers and managers. As a result, directly relevant data concerning travel behavior, emissions, and fuel use are not always available and may vary from region to region.

- Suitable home workplace environment, free of distractions
- Adequate equipment

Overall, a high level of trust is required between the worker and their supervisor. The trust factor may help overcome many of the problems just mentioned. Other factors which may motivate telecommuting in a region are traffic congestion, lack of public transit, and the cost of owning and operating an automobile.

Currently, in most situations few physical barriers exist relating to telecommuting. However, high-end telecommuting requiring large data or video transmission still have yet to be seen on a cost-effective basis due to the lack of infrastructure needed for this type of communication. Other possible concerns include liability considerations, zoning and tax laws, labor union issues, and occupational health and safety considerations.

After the 1993 study, two programs that have influenced the federal role in telecommuting are the National Performance Review and the Global Climate Change Action Plan. The National Performance Review (NPR) was led by Vice President Al Gore in 1993. The NPR was an intensive six-month study that focused on ways the federal government could reduce red tape to improve results and to create a government that works better and costs less.

As part of the NPR, the Department of Transportation and the EPA were directed to work together to promote home-based telecommuting and telework or satellite centers within federal agencies to reduce commuter travel and to make the workplace more efficient. Today, the Department of Transportation has a telecommuting program for employees and is continuing to evaluate the state of telecommuting in the private sector.

As President Clinton prepares to attend the Global Warming summit in Japan, the size and difficulty of global warming only underscores the need to not only work inside the U.S., but outside as well. Under the Global Climate Change Action Plan, the EPA in consultation with the Department of Transportation, was directed to issue guidance for states to take measures encouraging and promoting telecommuting. The following provide examples of approaches that could be taken:

The NPR and the Global Climate Change Action Plan spurred the Department of Transportation, in partnership with the General Services Administration (GSA), to move forward with the President's Management Council National Telecommuting Initiative (NTI) in January of 1996. The NTI builds on several successful government pilot projects over the past six years. The NTI calls for a five phase plan to be implemented over a three year period, beginning in January of 1996. The goal is to increase the number of federal employees involved in telecommuting to 60,000 by the end of the 1998 fiscal year.

According to the GSA, this level of telecommuting is expected to generate facility cost savings of some \$150 million annually. The GSA also estimates that federal telecommuting will rise to 15 percent of the workforce, or

- Modifying zoning ordinances that prohibit telecommuting
- Giving employers extra credit for telecommuting under trip reduction ordinances
- Creating business tax incentives
- Providing technical assistance
- Implementing telecommuting programs for state and local employees

The Department has and continues to encourage states to use ISTEA funds to initiate or expand telecommuting programs and to assist in establishing local pilot programs. The Department has also worked to implement a federal pilot project with the goal of having one to two percent of federal employees telecommuting at least one day per week.

In addition, the Department in conjunction with other agencies was directed to develop a national "work-at-home" campaign to promote part-time, home-based telecommuting to reduce traffic congestion and to promote energy conservation. The Department has cosponsored Telecommute America activities and promotions to assist with this effort.

We continue to look towards alternatives such as telecommuting for meeting the demand to reduce greenhouse gas emissions. However, existing preferences and travel behavior appear to be based on social, cultural, and other factors as much as considerations of economics and cost effectiveness. Successful telecommuting policies depend upon better knowledge of the factors influencing consumer behavior.

some 160,000 employees, during the next seven years. This could lead to a cumulative facility cost savings that would exceed \$2 billion by FY 2002.

Telecommuting is defined by the NTI as an employee working at an alternate work site such as the employee's home, a telework center, or other facility. To be considered telecommuting, the work must be done in paid status. This would not include working at home extra hours for which the employee is not paid. The five phases of the National Telecommuting Initiative include surveying of the status quo, logistical preparation, promoting the initiative, implementing the program, and evaluating the program.

Currently, we estimate that there are 20,000 federal employees telecommuting on a regular basis. This is up

from 3,000 in 1995 and 9,000 in 1996. The Department of Transportation continues to push forward with the NTI.

The Department is taking the following steps to increase the number of telecommuters.

- Developing a telecommuting Web Site
- Distributing the second report to Congress on the costs and benefits of telecommuting
- Working with MPOs to promote telecommuting
- Participating more actively in telecommuting workshops and conferences sponsored by other groups
- Working with state and local agencies in 18 cities to increase the number of regional telecommuters

The ISTEA offers greater flexibility for state and local agencies to fashion solutions to best suit their needs and objectives. The ISTEA authorized \$151 billion over six years for highways, mass transit and safety programs. The Act created a surface transportation program with flexible funding that opened the door to new opportunities to address transportation problems. In more poetic words, ISTEA is working to create a national intermodal transportation system that is economically efficient, environmentally sound, provides the foundation for the nation to compete in the global economy, and moves people and goods in an energy efficient manner.

The ISTEA also provided funding for telecommuting programs through the Surface Transportation Program (STP) and the Congestion Mitigation and Air Quality Improvement Program (CMAQ). The STP made funds available for a broad range of highway, mass transit, safety and environmental programs. It was authorized at \$23.9 billion over six years at an 80 percent Federal matching share.

The report recommends a number of activities to help support and promote telecommuting. These include supportive legislation and policies at the federal, state and local levels, public information and marketing campaigns, ongoing technical assistance, and providing incentives in the form of tax breaks, reduction in parking requirements, and zoning bonuses.

Currently, the Department is acting on the report's recommendations by spreading the word about telecommuting through workshops like this and promoting telecommuting through ISTEA. The Department will continue to act on recommendations in the report to Congress. The National Economic Crossroads Transportation Efficiency Act, also known as NEXTEA, would continue the programs that provide funding support for telecommuting. NEXTEA would also extend the eligibility to telecommuting equipment and telework

In addition, the CMAQ program was established for transportation projects that contribute to reducing pollution in ozone and carbon monoxide non-attainment areas, with an 80 percent Federal matching rate. Projects under this program must help an area meet the National Ambient Air Quality Standards. Many telecommuting activities are eligible for federal assistance under both the STP and the CMAQ programs. Equipment and physical facilities are not eligible under these programs, however.

In order for a telecommuting project to be funded, it must be part of the MPOs Transportation Improvement Plan (TIP) or the State Transportation Improvement Plan (STIP).

In August 1997, the Department of Transportation released a report to Congress regarding telecommuting, as required by Public Law 104-50. The study identifies successful telecommuting programs in the public and private sectors and reports on the benefits and cost of telecommuting.

The report documents the keys to successful programs. The keys include: top management interest, clear policies and guidelines, careful selection of managers and telecommuters, establishing adequate communication methods, providing needed equipment, and technical support.

The report also outlines the benefits and costs to employers, the telecommuters, and communities at large. The benefits include: reduced office space, increased employee productivity, improved ability to attract and retain employees, lower employee costs, reduced stress, better balance of job and family responsibilities, and reduced travel, air pollution, and energy consumption.

centers. Other proposals being considered by Congress also include provisions relating to telecommuting.

In closing, the Department of Transportation is proud of its progress in advancing telecommuting. The Department will continue to work with the GSA, other federal agencies, and state, regional, and local groups to promote telecommuting alternatives. Thank You.

GENERAL SESSION—REGIONAL TELECOMMUTING PROGRAMS

Lori Diggins, LDA Consulting—Presiding

Telework in the Nation's Capital

Harriet West, Metropolitan Washington Council of Governments

Harriet West discussed the telecommuting program being implemented by the Metropolitan Washington Council of Governments (WASHCOG). She summarized the development of the Telework Resource Center at WASHCOG and the telecommuting activities underway in the Washington, D. C. metropolitan area. Ms. West covered the following points in her presentation.

- The Washington, D. C. metropolitan area has the highest per-capita cost of commuting in the country, and the second longest average commute trip length. Automobile travel in the region is projected to increase by 70 percent by 2020.
- The Telework Resource Center was established by WASHCOG in 1996 as part of an expanded alternative commute program called Commuter Connections. Both Commuter Connections and the Telework Resource Center are key elements of the regional effort to improve air quality levels. The goal of the program is to decrease nitrogen oxide emissions by 0.73 tons a day by 1999 and 0.53 tons a day by 2020. Telecommuting emerged as one of the key strategies for the region based on an evaluation of over 50 potential transportation control measures and TDM strategies.
- The District of Columbia and the states of Maryland and Virginia are providing funding for the Telework Resource Center. In FY 1998, \$685,000 in funding was provided from the CMAQ program. The budget for the Center is projected at \$3.3 million over a six-year period.
- There are a number of groups involved in the program. Partners include the federal government, 18 jurisdictions, the Mid-Atlantic Telework Advisory Council, Transportation Management Associations, and 15 Telework Centers. Additional Telework Centers are in the planning stage.
- The travel modes of teleworkers and non-teleworkers appear similar. Slightly over 70 percent of both groups typically drive alone to work. Teleworkers reported slightly higher use of rail and bus services, while non-teleworkers were more likely to be carpoolers than telecommuters. For example, approximately 15 percent of the teleworkers reported using rail compared to 12 percent for non-
- A number of goals have been established for the program. For example, one goal is for 21,600 new teleworkers by mid-1999. Of these, 17,200 are projected to telecommute from home two days a week, with 4,400 teleworking from satellite centers five days a week. It appears that currently telecommuters work from home or satellite centers one or two days a week, so these goals may be difficult to achieve.
- A survey was conducted in 1996 to obtain baseline information on the extent of telecommuting in the region, the characteristics of current telecommuters, and the potential for increasing telework. The survey was conducted by the Greater Washington Research Center. A total of 1,025 surveys were completed and 54 teleworkers were interviewed. The definition used to define teleworkers or telecommuters was "wage and salary employees who at least occasionally work at home or at a local telework center during their normal work hours." The survey results were used to estimate the extent of telecommuting in the region. Approximately 151,000 workers, or six to eight percent of the workforce, were projected to be telecommuting on a full-time basis. Of these, some 59,000, or 2.6 percent of the workforce regularly telecommute two or more days a week.
- The survey results also helped identify the potential demand for telecommuting. Approximately 18.4 percent of the non-telecommuters identified an interest in telework alternatives and indicated that parts of their jobs could be done at locations other than their office. Based on these responses, it appears that there are some 382,000 potential teleworkers in the metropolitan area, including 149,000 who could telecommute two or more days a week.
- The surveys also identified other characteristics of telecommuters. The vast majority, some 92 percent, work from home on the days they telecommute. One percent use telework centers, two percent reported working from both home and telework centers, and five percent use other work arrangements. Thirty percent of the respondents telecommute one to two days a week.

teleworkers. Similarly, eight percent of the teleworkers take the bus compared to four percent for non-teleworkers. On the other hand, about five percent of non-teleworkers carpool on a regular basis, while no telecommuters reported using this mode.

- Information on travel times for telecommuters and non-telecommuters were also compared. Approximately 15 percent of the teleworkers reported commute travel times of over 45 minutes, compared to about 13 percent for non-teleworkers. On the other end of the travel time spectrum, 26 percent of the telecommuters reported travel times of 15 minutes or less, compared to 32 percent of the non-telecommuters.
- The overall travel characteristics of both groups were very similar. The average trip length for telecommuters was 13.4 miles, the average travel time was 27 minutes, and 73 percent drive alone to work. In comparison, the average trip length for non-telecommuters was 12 miles, the average travel time was 26 minutes, and 74 percent drive alone.
- In addition to the surveys, six focus groups were conducted in 1997. Two of the focus groups were held in Washington, D.C., two were conducted in Maryland, and two were held in Virginia. The focus group participants were high-level decision makers with public agencies, private businesses, and private non-profit organizations. Further, participants were selected to include a mix of groups with and without telecommuting programs. The objectives of the focus groups were to obtain a better perspective on employer perceptions relating to telecommuting, to identify barriers and incentives to telecommuting, and to identify the most effective ways to promote telework alternatives.
- The results from the focus groups provided a better idea of the characteristics of telecommuting programs. First, current programs appear to be primarily employee driven. Second, telework alternatives are only in limited use in both public agencies and businesses. Third, most employers view telework as being driven by technology. Fourth, many employers think telework is a timely concept, but noted that cultural change is needed within most
- The Telework Resource Center is currently sponsoring demonstration projects at eight public and private sector organizations. The Center is providing assistance to start new telecommuting programs or to expand existing efforts at these organizations. The demonstration also includes financial incentives to

organizations for telecommuting to become more widespread.

- The focus group participants identified a number of benefits to telework alternatives. These included the ability to attract and retain key employees, increases in worker productivity, and potential savings in office space costs. Telework was viewed as a good arrangement for the right employees. The participants also identified barriers to more widespread use of telecommuting. These included customer acceptance, effects on other employees, managing remote workers, and lack of information on telecommuting options.
 - The focus group participants suggested that WASHCOG was a logical and an objective organization to provide needed information and assistance on telecommuting. Some of the programs suggested for WASHCOG included employer and media education and outreach activities, fostering employee interest, targeting information and education programs toward top management and human resource personnel, providing relevant local examples for various types of businesses or public agencies, and providing information on both good and bad experiences. A barrier that may be somewhat unique to the Washington, D. C. area was the need to clarify federal-contractor requirements related to telecommuting.
 - A number of ideas were suggested to help promote teleworking among businesses and government agencies. These included introducing the telework concept through existing organizations such as chambers of commerce and trade associations, conducting seminars, providing training for employees and supervisors, funding demonstration projects, and increasing the awareness of telework centers.
 - The results from the surveys and focus group are being used to develop marketing and promotional materials. Examples of these include a brochure, an information kit and manual, a web site (<http://www.mwcog.org/commuter/ccindex.html>), and print advertisements.
- use the telework centers in the region. WASHCOG will monitor the use of different telework alternatives, the travel behavior of teleworkers, the costs and benefits, and other impacts.

- The Center will also be holding eight one-day employer seminars in FY 1998 to help promote telecommuting. The target is to attract 30 to 50 top managers to each session. The seminars will be provided for free, will be marketed through direct mail invitations, and will be interactive sessions featuring case studies and peer-to-peer speakers. A second set of seminars will be held for current teleworkers, individuals interested in becoming teleworkers, and home-based businesses. These seminars will focus on explaining the various telework options, the advantages and disadvantages of different approaches, how to introduce teleworking within an organization, and the keys to successful programs.
- WASHCOG and the Center also participated in Telecommute America in October 1997. Fifteen events were held throughout the region with over 620 people participating.
- An ongoing monitoring and evaluation program will also be conducted by WASHCOG. Elements of this program include regular surveys of participants in the seminars and demonstrations, telephone surveys of households in the region, and employer surveys.

Phoenix Regional Telecommuting Program

Randi Alcott, Regional Public Transportation Authority

Randi Alcott summarized the major elements of the telecommuting program in the Phoenix metropolitan area. The Regional Public Transportation Authority (RPTA) has developed a multi-faceted program to encourage telecommuting in the area. Ms. Alcott covered the following points in her presentation.

- The current population of the Phoenix metropolitan area is approximately 2.7 million. The population is projected to increase by some 37 percent by 2015, with some 3.7 million people expected to be living in the area. This population increase will result in more vehicles on the roadways and freeways. The vehicle miles of travel (VMT) are projected to grow from the
- A number of target marketing techniques have been used to promote telecommuting among employers and employees in the Phoenix area. Marketing focusing on employees included direct mail materials, advertisements in corporate publications, breakfast meetings with special speakers, and on-site management briefings. Marketing efforts aimed at employees and the public included radio and television advertisements, billboards, newspaper

current 58 million miles to 94 million miles by 2015, which represents a 62 percent increase. An acre an hour is being developed in the region and development is growing two and one-half times faster than the population.

- Phoenix is the sixth largest city in the country, but it has the fortieth largest transit system. The voters have turned down providing a stable source of funding for public transportation services three times in the past few years. Arizona does have mandatory trip reduction requirements, however, and the metropolitan area is one of two cities nationwide that is classified as a severe non-attainment air quality area for all three major pollutants.
- A number of factors are influencing the interest in telecommuting in the area. From a business perspective these include enhancing the ability to recruit and retain skilled workers, increasing worker productivity, reducing absenteeism, and reducing real estate and office costs. Employees are also pushing for greater use of telecommuting to reduce the time and stress associated with commuting, providing more time for family and other activities, and increasing productivity and job satisfaction.
- In 1989, the State of Arizona and AT&T sponsored a joint pilot telecommuting program. The project included a market research component. Information obtained through the market research indicated management support for telecommuting programs. Further, over half the companies pay for some equipment for telecommuters, 42 percent plan to expand existing programs, and 42 percent of households in the area currently have computers. The main barriers identified to expanding telecommuting programs were lack of work tasks appropriate for telecommuting and limited budgets. The primary factors for management consideration of telecommuting included the employee trip reduction requirements, employee interest, and lack of office space.
- From 1993 to 1997, the number of employers with telecommuting programs at businesses and agencies increased from 50 to 300, accounting for a 500 percent increase. The number of employees telecommuting in the region increased from two percent to six percent, with approximately 68,000 advertisements, a web site, and public affairs and public relations activities.

employees telecommuting one or more days a week.

This level of telecommuting has eliminated some 906,000 miles of travel daily.

- A new program, called Arizona Donates Office Products for Telecommuting (ADOPT) is underway. This program encourages employers to donate used computers, which will be refurbished at technical schools in the area and provided to employers starting telecommuting programs. Additional funding to support the telecommuting programs is also being sought through the MPO.

Telecommuting as a Travel Demand Management and Workplace Tool in Middle Tennessee

Diane Davidson, The TMA Group

Diane Davidson discussed the telecommuting activities underway in the Nashville metropolitan area. She described the preliminary results of a recent telecommuting pilot project. Ms. Davidson covered the following points in her presentation.

- There are a number of factors influencing the consideration of telecommuting in the Nashville metropolitan area. These include the development of a fiber optic infrastructure, the location of call centers for numerous companies, and the area's low unemployment rate and need for workers. Williamson County is the third fastest growing county in the country. Many of the new housing developments are being configured for telecommuting.
- A recent study was conducted by The TMA Group examining the impacts of telecommunications on travel behavior and workplace productivity. The study was funded by Williamson County through the Nashville MPO, the Tennessee Department of Transportation, and the Energy Division of the Tennessee Department of Economic and Community Development. In addition, a Tennessee chapter of the Telecommuting Advisory Council was recently established. The chapter is sponsoring speakers and other activities.
- A number of reports were prepared as part of the study. These included guides for establishing telecommuting task forces within agencies or businesses, guidelines to successful telecommuting programs, and guidelines for being a successful manager of telecommuters. These documents contain examples of questionnaires, worksheets, and other

information that can be used to develop individual programs.

- The study also includes a pilot telecommuting program at one company to test the various materials. Surveys of participants and other monitoring activities are part of the evaluation program. Preliminary results from the surveys indicate that most people are interested in telecommuting from home rather than a satellite center. The average weekly savings reported by telecommuters was \$50.00 from reduced driving, parking, and meal costs. A few respondents indicated they have relocated further from their workplace as a result of telecommuting, while others indicated they would consider moving. These results may indicate a potential negative impact of telecommuting.
- The TMA Group is sponsoring regular meetings with business and agency personnel to promote telecommuting. These outreach efforts also focus on working with chambers of commerce and other local organizations.
- The TMA Group and other organizations are pursuing other methods to help promote telecommuting. For example, some versions of the ISTEA reauthorization legislation include deploying fiber optic networks as an eligible use of transportation funds. If this element is included in the final bill it could further encourage telecommuting. The telecommuting efforts in Nashville are being coordinated with the Intelligent Transportation System (ITS) and sustainable development initiatives. The social justice impacts of telecommuting are also being explored to ensure that all groups have access to advanced technologies.

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Telecommuting in Southern California

Elham Shirazi, Consultant

Elham Shirazi described the various telecommuting activities underway in Southern California. She provided an overview of the Southern California Telecommuting Partnership and other programs. Ms. Shirazi covered the following topics in her presentation.

- A telecommuting initiative was implemented after the 1994 Northridge earthquake to help employers and employees respond to the damages sustained by the transportation system. The Southern California Telecommuting Partnership was created to help focus these activities. The Partnership is a consortium of public and private sector groups promoting telecommuting to enhance the economic development of Southern California. The Partnership includes a Board of Directors, a project manager, and a number of consultants responsible for conducting specific tasks.
- The initial work program included: a needs assessment, which conducted interviews with 70 to 80 key stakeholders, market research activities, marketing assistance, and training assistance. The services and resources offered include on-site assistance to develop and implement telecommuting programs, telecenter and telespace marketing, training seminars for managers and coordinators, a toll-free telephone hot line, a Web Site, a manual, a video, brochures, and case study summaries.
- The Partnership has an impressive list of accomplishments. First, the Partnership developed and implemented a bottom-line oriented sales and marketing system to promote telecommuting based on tested techniques, resource materials, case studies, and videos. Second, the market research results were used to tailor sales strategies to targeted groups. Companies with 250 to 500 employees represented the key target market.
- One out of three, or roughly 512 out of 1,647, employers contacted expressed interest in using the telecommuting services offered by the Partnership. Ten out of 55 groups targeted for alternative officing concepts expressed interest. Approximately 11,000 information brochures and other marketing materials were distributed. A total of 150 individuals from 100 different organizations participated in the training sessions, the Web Site has some 700,000 inquiries, 32 articles were placed in newspapers, a video-conferencing network was established, and numerous calls to the toll-free hotline were answered.
- A number of lessons can be learned from the experience in Southern California. First, employers are very interested in telecommuting. Second, marketing telecommuting using a business approach is effective. Third, it is difficult to market telework centers. Fourth, telecommuting programs have a long start-up period and take time to develop. As a result, on-going support is often needed. Fifth, there is a need to educate employers and policy makers on telecommuting and alternative officing concepts. Sixth, regional telecommuting programs need dedicated, ongoing, and stable sources of funding. Finally, although many federal, state, and regional polices and programs endorse telecommuting, formal implementation mechanisms are missing in most areas.

GENERAL SESSION—STATE AND LOCAL TELECOMMUTING PROGRAMS

Michelle Conkle, Texas Department of Transportation—Presiding

Telecommuting Activities in Washington

Scott Decker, Washington State University

Scott Decker described the various telecommuting efforts underway in Washington State. He discussed the Puget Sound Telecommuting Demonstration project and other activities. Mr. Decker addressed the following topics in his presentation.

- The Governor's Conference on Telecommuting in 1989 helped promote awareness of telecommuting alternatives. The conference brought together representatives from public agencies and businesses in the state to discuss telecommuting, which was being considered primarily to reduce energy consumption and traffic congestion.
- The Puget Sound Telecommuting Demonstration Project was conducted from 1990 to 1992. The project objectives were to demonstrate telecommuting as a work alternative, to develop policy recommendations for the state, and to research and evaluate the impacts of telecommuting on the environment, employers, and employees.
- Twenty-five public agencies and private businesses participated in the demonstration. A total of 286 employees from these groups telecommuted at least one day a week on average. A wide-range of monitoring and evaluation techniques were used as part of the demonstration. These included focus groups, surveys, and travel diaries. The results of the demonstration are documented in a number of reports.
- Other telecommuting activities in Washington include the State Telework Center and the development of a step-by-step telecommuting guidebook. The guidebook, which was developed in 1993 and updated in 1997, provides step-by-step assistance to employers interested in implementing telecommuting programs. It also documents the experience to date with telecommuting efforts at public agencies and businesses.
- In 1993, telecommuting programs were incorporated into the state commute trip reduction law, with an extra 20 percent credit applied to telecommuting.

However this change does not seem to have encouraged greater use of telecommuting programs.

- The Telecommuting Technical Assistance Program was conducted from 1992 and 1997. This program focused on promoting telecommuting on a state-wide basis. It offers consulting services to help establish new telecommuting programs, provides training for supervisors, and maintains a Web Site. Washington also established the Telework Collaborative with Oregon, Arizona, and California to coordinate the development videos, brochures, and case studies.

Telecommuting Activities in Colorado

Rene S. Ryman, Colorado Department of Transportation

Rene Ryman provided an overview of the telecommuting efforts underway in Colorado. She described the results of a study conducted by the Colorado Department of Transportation and other activities promoting telecommuting. Ms. Ryman covered the following points in her presentation.

- Telecommuting is still relatively new in Colorado. Many public agencies and businesses are just beginning to consider telecommuting as a work alternative. The Colorado Department of Transportation (CDOT) initiated a study to help identify the benefits of telecommuting, as well as some of the issues that may need to be addressed in developing successful programs.
- The study identified a number of benefits from telecommuting. These include reducing traffic congestion and energy consumption, improving worker productivity, providing a better balance between work and home responsibilities, and enhancing the quality of life.
- Potential obstacles to telecommuting programs were also identified. These include management concerns about losing "line of sight" supervision and telecommuters' concerns related to possible loss of visibility, missing out on group activities, and being passed over for promotions. In addition, it may be hard to measure specific changes in the productivity of telecommuters.

- Currently, efforts are underway to better identify employers that would be good candidates for telecommuting programs, employees who are interested in telecommuting, and specific geographic areas with high concentrations of potential employers. Attention is also being given to developing baseline measures of employee productivity and designing programs for various types of organizations.
- The Department sees telecommuting as the “way of the future.” The program in the state is still in the early stages of development. Learning from experiences in other states will be of help as CDOT moves forward with a comprehensive telecommuting program.
- The city agencies are using advanced technologies in a number of ways. First, city staff are proficient in the use of a wide-range of computer technologies and programs. Second, the city has a Web Page and uses it and e-mail to communicate with residents and other groups. Third, the city contracts for many services and uses e-mail, teleconferences, and other techniques to communicate with consultants.
- The new library includes telecommuting and teleconferencing facilities. The library, which was just opened, will be used for distance learning, teleconferences, and a wide range of other activities. It is intended to be a multi-purpose facility. More information on the library will be presented on Tuesday morning.

Telecommuting and Telecommunications in the City of Mission Viejo

Shirley Land, City of Mission Viejo

Shirley Land described the telecommunications system being developed in the City of Mission Viejo, California.

She provided an overview of the transportation system, the Intelligent Transportation System (ITS) program, and the telecommunication components. The following points highlight the topics covered by Ms. Land.

- The City of Mission Viejo is located in Orange County, California. The city encompasses approximately 18 square miles and has a population of 92,000. The city was developed initially as a planned community and was incorporated in 1988. One of the reasons for incorporation was to improve the services available to residents.
- The transportation system in the city includes arterial roadways and traffic signals. The city is aggressively developing a number of ITS components to better manage the transportation system. These include a communications infrastructure owned and operated by the city. This system will link major activity centers such as the 24 schools, city hall, the new library, the recreation center, the senior center, the community college, and other public buildings. It is also used to operate the traffic signals in the city.
- The city’s 100 traffic signals are operated by a central traffic signal master control. Closed circuit television cameras are also being installed along the I-5 Freeway in coordination with Caltrans. The information available from the cameras will be used by both the city and Caltrans.
- A series of kiosks are also being developed to link into the communications infrastructure. It is envisioned that these will be located at strategic points throughout the community, such as city hall, shopping centers, and other activity centers. The kiosks will provide links to city services, transit and transportation information, and other services.
- There is a great deal of interest in distance learning in the community. The ability to link into a wide range of training courses, educational activities, speakers, and other events will enhance the quality of life of area residents and provide new opportunities. It is envisioned that these approaches will help broaden the user groups involved in telecommunications and telecommuting.

GENERAL SESSION—TELEWORK PROGRAMS AND CENTERS

Katherine F. Turnbull, Texas Transportation Institute—Presiding

The Federal Telework Program

Kathrene L. Hansen, Greater Los Angeles Federal Executive Board

Kathrene Hansen described the various elements of the Federal Telework Program. She provided an overview of the Federal Executive Board, the current status of Federal Telework Centers, and activities in Southern California. Ms. Hansen covered the following points in her presentation.

- The Federal Executive Board was established in 1961 by President John F. Kennedy. The intent of the Federal Executive Board is to better coordinate the activities of the federal government in individual states and communities. There are 28 Federal Executive Boards throughout the country. The Los Angeles Federal Executive Board is the largest. The mission of the Federal Executive Board is to strengthen the administration of federal activities and to improve intergovernmental coordination.
 - A number of federal agencies and groups are involved in various telecommuting programs and activities. These include the General Services Administration (GSA), the Presidents Management Council, the Secretary of Transportation, the Office of Personnel Management, the Federal Executive Boards, and federal employees. There are almost 60 Telework Centers nationwide operated by GSA or with negotiated memorandum of understandings that allow access to federal workers. There are currently 15 Telework Centers in the Washington, D.C. area funded by Congressional action. These centers are available to federal employees as well as staff from other public agencies and private sector employees. Additional centers are being planned.
 - Information from GSA indicates that 40 organizations representing 17 different federal agencies or departments are using the Telework Centers. Approximately 400 employees regularly work out of the centers, including 24 private sector employees. Federal agencies pay \$100 a month per work site, while private sector employees pay the local market rate. The fees charged to federal agencies will be increased to meet the self-sufficiency guidelines established by Congress.
- Peter Valk discussed the experience with telecenters in California. His comments were based on the results of surveys, evaluations, and interviews conducted as part of a study sponsored by Caltrans. He also provided his own perspective of factors contributing to the success and

rate. The fees charged to federal agencies will be increased to meet the self-sufficiency guidelines established by Congress.

- At the national level, a number of initiatives have helped promote telecommuting. The President's Management Council developed the initial Telecommuting Initiative. Telecommuting was also referenced in President Clinton's June 21, 1996, Letter on Federal Family Work Arrangements. Telecommuting is also identified as one technique to help achieve the environmental goals in the President's Global Climate Change Action Plan.
- The Department of Transportation reported that 3,000 federal workers were telecommuting on a part-time or full-time basis in 1995 and 6,000 were doing so in 1996. A 1996 article *Government Executive* suggested 10,000 federal employees were telecommuting.
- There are a number of ways to help achieve the federal goals related to telecommuting. These include increasing the accuracy of reporting methods, education and outreach programs aimed at managers within federal agencies, developing partnerships with other public agencies and private businesses, and promoting flexibility in the programs offered.
- The Los Angeles metropolitan area has the worst traffic congestion and air quality levels of any region in the country. Los Angeles also has the largest number of federal employees outside of the Washington, D. C. region. The Southern California Telecommuting Partnership offers the opportunity for federal agencies and federal employees to become more involved in telecommuting activities. There is a need for more coordination and cooperation among agencies and groups at all levels to support regional telecommuting efforts.

Experience in Southern California: Searching for the Holy Grail

Peter Valk, Transportation Management Systems

failure of telecenters. Mr. Valk covered the following points in his presentation.

- For the purpose of the presentation, telecenters are defined as a "place to conduct work in an office

setting, away from the office, but not at home.” In almost all cases, the telecenters in California were started with public funding to address transportation and air quality concerns, or in response to natural disasters such as the Northridge earthquake. It was anticipated that the centers would become self-sufficient over time, however. The telecenters were thus intended to reduce long distance commute trips, to help improve air quality, to reduce congestion, and to enhance the quality of life. They were not anticipated to be profit making enterprises.

- At least 30 telecenters were started in California, primarily in the San Francisco Bay area and in Southern California. The centers were located in many different types of facilities and there was no uniformity among them. Twelve of the telecenters have been closed due to lack of use. Funding for the telecenters comes from a variety of sources including the Caltrans, TMAs, and other agencies.
- The Residential Area-Based Office (RAMBO) project was conducted by the University of California, Davis and Caltrans. The project included an examination of the telecenters. Findings from the study provide a preliminary indication of use levels, transportation impacts, and possible issues. First, the average frequency of use for the centers was 1.25 days a week. Second, many centers experienced high turn-over in users. Third, overall occupancy rates for the centers ranged from one-third to two-thirds. Finally, most users drove alone to reach the centers.
- In addition to the telecenters in California, satellite work facilities or centers have been or are in operation in the Washington, D.C. metropolitan area, Hawaii, Minnesota, Seattle, and Kentucky. A number of factors that appear to influence the success of telecenters can be identified from the experience with the use of these centers.
- Telecenters seem to be more successful where they have the undivided attention of potential user groups, operate as a business, have a clear sense of services and market niches, develop services to meet identified needs, maintain close ties with constituency groups, have at least one or two long-term anchor

Mn/DOT's Telework Program and the Cambridge Telework Center

Darryl Anderson, Minnesota Department of Transportation

Darryl Anderson provided an overview of the Telework Program being implemented by the Minnesota Department

tenants, and provide flexible pricing, marketing, and operations. Telecenters appear to be less successful when they are product service driven, are located in less than professional environments, have an out-of-community orientation, and have fixed products, services, and operations.

- One suggestion is that telecenters should focus on their unique selling points based on the needs of different customers. These may include providing “just in time” officing, access to specific equipment and facilities, opportunities for social interaction, and technical support. For example, many telecommuters do not have a wide-range of equipment available at home, nor do they have space to hold meetings. Telecenters that provide access to equipment, technical assistance with the technology, and meeting space may be better able to establish a market niche.
- To date, telecenters have not focused on home-based, self-employed workers as possible users. It may be appropriate to examine this group as a potential market for use of telecenters. Surveys indicate that some 13 percent of this group would use a center one day a week, while 21 percent would use them occasionally. A big question with promoting telecenters to home-based, self-employed workers is the impact their use would have on air quality.
- Limiting factors to the use of telecenters from an employee's perspective are the costs and not perceiving any difference from working at home. Positive factors which may influence greater use include providing facilities and access to equipment for individuals who spend most of their time in the field or on the go, as well as providing a distraction-free work environment.
- Expanding telecenters into more of a community-based resource may broaden and influence the future direction of these types of facilities. Examples of this expanded approach includes teleworking, democratizing local governments, linking to out-of-area resources, and providing “high tech” virtual communities.

of Transportation (Mn/DOT). He showed a video of the Cambridge Telework Center and described the development and basic elements of the program, the current activities being conducted by the Department, and future plans. Mr. Anderson covered the following points in his presentation.

- The Department established a Telework Task Force in 1995 to explore the potential for telecommuting and alternate work arrangements. The results from this Task Force led to the creation of a working group charged with intensifying the use of teleworking within the Department, as well as promoting telework alternatives with other public agencies and private businesses. The Telework Program at Mn/DOT is part of the Sustainable Transportation Initiative, along with the bicycle, pedestrian, and community transportation planning sections. A vision, goals, and a business plan for Mn/DOT's telework efforts were developed by the group. The Department's telework vision incorporates telecommunications as a transportation mode which can have positive implications in the multimodal transportation management environment.
- Currently, approximately 10 percent of Mn/DOT's employees in the Minneapolis-St. Paul metropolitan area telecommute on a part-time basis. The Department has set goals to increase these percentages to 25 by 1998 and to 35 by 2005. Mn/DOT's telecommuting policy, marketing and outreach efforts, and training programs all support telework alternatives.
- In 1996, Mn/DOT opened a Telework Center in Cambridge, which is about 45 miles north of the Minneapolis-St. Paul area. The Center, which has 24 work stations, is available for Mn/DOT and other public agency employees. Approximately 200 Mn/DOT employees live in the Cambridge area. Initially, 17 employees telecommuted from the Center one or two days a week. Use of the Center has increased over time and daily occupancy levels are about 60 percent. An initial evaluation of the Center indicates that approximately 125,000 vehicle miles of travel a year are saved by users of the facility.
- The Department participated in Telecommute America week in October. Activities included a proclamation by the Governor and various outreach and education programs.
- The Department is exploring the development of additional telework centers, which might be located at existing Mn/DOT regional facilities. Mn/DOT is also working with the University of Minnesota and other groups on a Telecommunications Partnership Policy. This effort is funded through Guidestar, Mn/DOT's ITS program.

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GENERAL SESSION—TRANSPORTATION IMPACTS OF TELECOMMUTING

Diane Davidson, The TMA Group—Presiding

Estimating the Transportation Impacts of Telecommuting

Patricia Mokhtarian, University of California, Davis

Patricia Mokhtarian discussed the transportation and air quality impacts of center-based telecommuting. She recognized the assistance of Krishna Varma, a graduate student at the University of California, Davis on the research project. Dr. Mokhtarian covered the following topics in her presentation.

- Telecommuting is becoming more widespread. The transportation and air quality impacts of telecommuting are complex, and not necessarily all positive. Although several studies have identified positive short-term impacts from home-based telecommuting, the impacts of center-based telecommuting have not been explored in as much detail. Center-based telecommuting, which usually still requires a commute trip, may have different air quality and transportation impacts.
- The Neighborhood Telecenters Study was conducted over a five year period from 1993 to 1996. The project, which was funded by the California Department of Transportation (Caltrans), examined the travel behavior of 72 center-based telecommuters. Sixty percent of the sample were females, 50 percent were in the 35 to 44 age group, the average individuals in the household was 2.7, 55 percent were classified as professional or technical staff, and 20 percent were managers.
- The study results provide a better understanding of the possible impacts on air quality levels and the transportation system from center-based telecommuting. As part of the study, individuals completed three-day travel surveys before they started working from the telecenters and after several months of telecommuting from the centers. The travel and vehicle information from the surveys was used to customize the emissions inventory model used in California. The default variables in the model, which are based on the regional emission inventory, were replaced with the survey results. The model was then used to compare drive-alone trips on non-telecommuting days with those on days the individual worked in the telecenter.
- The results present some interesting trends. The vehicle miles of travel are lower on those days that individuals worked from the telecenters, but the number of commute trips increase. These figures appear to reflect people going home for lunch on the days they use the telework centers. The reduction in vehicle miles for both commute and non-commute trips on telecommute days is consistent with study results of home-based telecommuters. The increase in the number of commute vehicle trips is different, however. The impact of this trend on cold starts and other emission related issues needs to be examined in more detail.
- Overall, the results show a substantial (53 percent) decrease in vehicle miles traveled on the days the telecenters are used, but a slight (10 percent) increase in vehicle trips. These results represent the net of a large (58 percent) increase in commute trips and a small (22 percent) decrease in non-commute trips. All pollutants — nitrogen oxides, particulate matter, total organic gases, and carbon monoxide — show a reduction of 15 to 51 percent.
- More analysis is needed to determine the potential system-wide impacts of telework centers. This analysis should examine the frequency of telecenter use, the portion of telecommuters in the workforce, and trips made by other members of the household on telecommute days. Overall, it appears that the aggregate impacts are small and are likely to remain small in the near future.
- Further research is also needed on the travel patterns of home-based workers. In addition, most of the case studies to date have focused on public sector employees. More information on private sector telecommuting programs and the travel patterns private sector of employees is needed.
- The overall conclusions from this study indicate that transportation and air quality impacts of telecommuting alternatives are positive and are comparable or better than those obtained with other TDM strategies. Thus, both center-based and home-based forms of telecommuting are beneficial. The attractiveness and cost-effectiveness of telecenters remain important questions to be explored.

Telecommuting as an Incentive for Ridesharing

Philip Winters, University of South Florida

Philip Winters discussed a project being conducted for the Florida Department of Transportation exploring telecommuting, compressed work weeks, and other alternatives as incentives to increase carpooling. He summarized the background and preliminary findings from the study. Mr. Winters covered the following points in his presentation.

- The objective of the study was to determine how commuters in three areas of Florida would react to the same mix of potential strategies. The effect transit pricing levels, vanpool pricing levels, opportunities for telecommuting, and opportunities for compressed work weeks would have on mode choice were explored. Surveys were conducted in the three metropolitan areas of Miami, Tampa, and Jacksonville. Individuals were selected through the use of random digit dialing. A scratch off lottery ticket was offered as a incentive to complete the survey. Three hundred surveys were completed in each metropolitan area for a total sample of 900 individuals.
- Individuals were provided with nine different scenarios. The telecommuting and compressed work week option allowed respondents to select the telecommuting alternative, the compressed work week option, or neither. Three different transit and vanpool pricing levels were provided. These were free, \$25 a month, and \$50 a month. In addition, three alternative vanpool pick-up options were included. The telecommuting option required the individual to use a carpool or other alternate commute mode at least twice a week to be able to telecommute once a week. The use of alternative commute modes was also required for the compressed work week alternative. Telecommuting and compressed work weeks were mutually exclusive, so both were tested as separate options.
- Respondents were allowed to select among the described choices. Each scenario was provided on a separate page, so each participant received a total of nine pages. Respondents were also given the option of indicating how many days a week they would be willing to use the various options. This approach allowed individuals to select part-time use of different modes and strategies.
- A study was recently conducted to examine the characteristics and travel behavior of a pilot group of telecommuters in Southeast Queensland. The study

- The preliminary results indicate that the ability to telecommute does not appear to make a difference in mode choice selection. The opportunity to use a compressed work week does appear to make a difference in mode choice behavior, however. The complete results and final report will be available within the next four months. The preliminary results indicate that in addition to being good stand alone measures, telecommuting and compressed work weeks may also be good incentives to encourage greater use of alternative commute modes.

Queensland Experience with Telecommuting

Luis Ferreira, Queensland University of Technology

Luis Ferreira discussed the extent of telecommuting in Queensland, Australia and the impact of telecommuting on the transportation system. He described the current telecommuting programs in the Southeast Queensland Region and recent research examining the impacts of these efforts. He noted that Michelle Manicaros was involved in the study and was a co-author on the abstract. Dr. Ferreira covered the following points in his presentation.

- The extent and scope of telecommuting in Australia is not well known. Estimates indicated that approximately 10 percent of employees in Australia work from home, with 2 to 3 percent of these individuals being classified as telecommuters.
- There is growing interest in telecommuting among businesses and government agencies in Australia, especially in the major urban areas. This interest is based on a need to address increasing levels of traffic congestion and a desire to provide more flexible work arrangements for employees. Most of the interest to date has come from the Office of Public Service and concerns related to work place reform, rather than from transportation agencies.
- Southeast Queensland is Australia's fastest growing metropolitan area. The region, which encompasses Brisbane, the Gold Coast, and the Sunshine Coast, is home to approximately 2 million people. The population of the area is projected to increase, as are vehicle kilometers of travel and traffic congestion.

included a survey of 42 telecommuters. Questions in the survey obtained information on the characteristics of the telecommuters and their travel behavior.

- The 42 telecommuters were mostly managers, administrators, professionals, or paraprofessionals. Most of the pilot telecommuters were with public agencies, but about 15 percent worked in the private sector. In addition, the majority of the pilot group telecommuted one or two days a week. More females than males were represented in the group.
- Most of the pilot group normally drove to and from work on non-telecommuting days. In addition, the private automobile was usually used for trips made on telecommuting days. The average round-trip work distance for the study group was 67 kilometers. On telecommuting days, participants reported saving an average of one and one-half hours in travel time. The average vehicle travel distance saved was 53 kilometers, indicating that some participants still made trips on telecommuting days. Most of these trips were local in nature, however.
- Participants reported a number of benefits from telecommuting. These included reducing stress levels, decreasing the time spent commuting and increasing the time available for family and other activities, increasing productivity and morale, and improving the quality of their lives. Some disadvantages were also reported by telecommuters, however. These included reducing opportunities for professional and social interaction, as well as the potential risk of limiting career advancements and being viewed negatively by management.
- A more detailed second phase of the study is currently underway. This phase is examining the potential impacts on the transportation system by time of day, as well as a more detailed assessment of possible affects on the environment, energy consumption, land use patterns, and the need for investments in the transportation infrastructure.

GENERAL SESSION—TELECOMMUTING AND LAND USE, NEIGHBORHOODS, AND ECONOMIC DEVELOPMENT

Mark Grisby, U. S. Department of Transportation—Presiding

Metro Blue Line TeleVillage

Wally Siembab, Siembab & Associates

Wally Siembab discussed the TeleCity concept and the Blue Line TeleVillage in Compton, California. He provided an overview of the TeleCity strategy, the elements included in the Blue Line TeleVillage, and the experience to date with the facility. Mr. Siembab highlighted the following points in his presentation.

- The TeleCity strategy includes five basic elements. These are organizations, urban form, the telecommuting network, the transportation system, and the institutional infrastructure. A key question is how to move toward distributed organizations. This process involves moving organizational functions out of building and onto the communications network. The TeleCity strategy focuses on the multiple use of buildings and the rebirth of urban design.
- In Southern California a basic fiber optic backbone communication network could be developed along the Metro rail lines. This network would increase the functionality of stations by creating TeleVillages at each station. The stations would become destinations for multiple user groups. The backbone fiber optic network could also be expanded to other locations such as schools, civic buildings, and libraries. The links into private homes would be left to the private sector, however.
- Urban TeleVillages would provide livable communities with enhanced mobility and social equity for residents and increased opportunities for economic development. The information technologies would allow residents to make fewer trips, while providing increased access to employment, education, and other services.
- The Blue Line TeleVillage, which is located in Compton along the Metro Blue Line, was initiated as a demonstration project in March of 1996. The project included six functional elements. These were a distance learning center, a computer center, a telework center, information kiosks, a community room, and a circuit rider work station.

The Mission Viejo Library

Gail Shiomoto-Lohr, GSL Associates

- The distance learning or video conference portion of the facility was well utilized. Links to education programs, library services, and other video connections were provided. The facility was used by high school groups, a story teller for children, and business groups.
- The computer center included 12 computer stations that could be used by the public during certain times. Classes were also provided, and the facility could be leased for specific activities or user groups. This portion of the center was also well utilized.
- The telework center included two work stations. Supporting equipment, such as a printer, telephones, a fax machine, and a desktop video conference were provided. One individual who started using the space now has his own office and employs five people.
- A Housing Authority information kiosk and a kiosk with AIDS information from the Science and Industry Museum were provided. One automatic teller machine (ATM) kiosk was initially located in the building. A second ATM was added by another bank and the MTA provided a telephone hot line for transit information.
- The community room was used for lectures, workshops, meetings, and other activities. One work station was provided for agency circuit riders. These were agency personnel who used the work stations as an on-site office to provide specific services.
- The TeleVillage provides access to a number of urban functions that were not previously available in the community. The project provides an example of the types of services and functions that can be incorporated into a multiple use facility.
- The future of telecommuting will be influenced by the political arena. For telecommuting to become more widespread there will need to be a change in our cultural focus from "automobility" to "telemobility."

Gail Shiomoto-Lohr discussed the development of the new library in the City of Mission Viejo. She provided an overview of the multi-faceted concept for the library, the

planning process, and the current status of the facility. Ms. Shiomoto-Lohr covered the following points in her presentation.

- The concept for the facility was to combine transportation and air quality planning with the development of a new library. The new library represents a multi-use facility, rather than a stand-alone telework business center or library. The facility is intended to provide services to enhance business efficiency, to promote life-long learning, and to provide opportunities for personal growth for area residents and workers. The library represents a commitment on the part of the city to invest in a communications infrastructure within a community facility.
- The multipurpose use nature of the library provided opportunities for the use of different funding sources, including those related to air quality and transportation. It also made it harder to obtain funding from traditional library programs, however. These funding sources were less interested in a multi-use facility located in what is considered to be an affluent community.
- There was support for the multi-use library concept among City Council members. One City Council member, who had a 60 mile daily commute by train to Los Angeles, was an especially strong proponent of the project. He noted all the people working on laptop computers during his daily train rides and got interested in telecommuting for personal reasons. The library proposal was approved unanimously by the City Council. There was also strong community support for the project. For example, with over 90 percent of high school seniors going on to college, parents liked the idea of expanding educational opportunities for their children.
- A feasibility study was completed in order to obtain the needed funding. Although this study added time to the development process, it proved to be very beneficial to the project. The study examined the experiences with telework centers, surveyed community needs, and identified potential telecommuting functions.
- As part of the study, a random survey was conducted of some 700 residents to obtain information on the types of services that should be included in the library and the willingness to pay for these services. Elements that were rated highly included telework facilities, information and library services, distance learning capabilities, and access to job training and retaining services. Other elements noted as desirable were training on how to use advanced technologies, help with specific problems, and training for librarians on new technology. The survey results provided valuable information to help secure funding for the various services.
- The survey results indicated that although 85 percent of the respondents use computers on a daily basis, they still need help to become telecommuters. Further, the nature of libraries and the job functions of librarians are changing. These professionals may need help in the use of advanced communications systems. Finally, the needs of the aging population were examined, as this group is often less technology proficient than younger age groups.
- The library has been open for nine days. The various components of the library will be introduced over time. The focus is on achieving small steps and realistic goals. There will be an incubation period to develop and test new ideas. A diverse set of programs will be offered to introduce the community to the use of different technologies. Training and other services will be offered on telework technologies, with the realization that future telecommuters will span generations and that it will take time to develop extensive use of these elements. In addition, the library will use the telecommunications capabilities to support economic development, distance learning, job training, and retraining. Local measures of success have been defined for the library.
- A number of pivotal pieces can be identified as contributing to the success of the project to date. These include obtaining political support, acquiring additional outside funding, and conducting the feasibility study to identify the key community needs.

CLOSING SESSION—THE FUTURE OF TELECOMMUTING

Edward Weiner, U. S. Department of Transportation—Presiding

Boulevard into the City of Bits

Tom Horan, Claremont Graduate University Research Institute

Tom Horan provided an overview of a new book he has written with William J. Mitchell from the Massachusetts Institute of Technology. The title of the book is *Boulevard into the City of Bits*. The book focuses on the influence of technology on urban form. Dr. Horan covered the following points in his presentation.

- The book examines the influence of communications technology on the social and the built environment. Chapter titles are Painting a New Landscape, Recombinant Thinking, Starting at the Ground Floor, Walking Around the Corner, Hitting the Road, and Decisions for a Digital Age.
- The rapid advancements in communications technology are influencing both the social and the built environment. The fabric of communities will continue to change as new technologies, new communication links, and new services are introduced. The impact of these changes on urban form, individual behavior, and travel patterns are just beginning to be felt.
- Telecommuting and telework options will continue to expand as a result of advancements in technology, employee interest in balancing home and work responsibilities, and employer interest in reducing costs and maintaining competitive advantages. Other services will also be influenced by the rapid advancements in telecommunications technologies. These include banking, shopping, conducting personal business, distance learning, and other activities.
- The recent changes in the banking industry provide one example of how technology is influencing the built and the social environments. Historically, banks have been one of the mainstays of downtowns and other activity centers. Banks offered both a major physical presence, as well as a service function, in these areas. Branch banks started the trend toward decentralized banking. The introduction of Automatic Teller Machines (ATM) allowed basic
- NORTEL has one of the largest private sector telecommuting programs in the world. Currently, some 3,000 employees telecommute on a regular

banking functions to be provided in disperse locations, further reducing the need to travel to the main bank. On-line banking services are now available in many areas, eliminating any need to visit an actual bank.

- This example provides an idea of the interface between the built and the social environments, and the way advancements in communication technology are influencing both. These types of changes will continue at a more rapid pace in the future as homes and businesses continue to be linked by fiber optic and other communications technologies.
- These changes will influence the development of cities. The rapid development of communications technologies will also have societal implications. For example, low income individuals have less access to many advanced technologies. This “digital divide” may further separate economic and societal groups.
- All of these issues need to be considered by policy makers and transportation, land use, and other professionals. Ensuring that advancements in communication technologies benefit all elements of society and help knit together the urban and social fabric of the country will be important.

Telecommuting in the Private Sector - The NORTEL Example

Glenn Lovelace, NORTEL

Glenn Lovelace discussed the telecommuting program at NORTEL. He also provided an overview of the telecommunications services offered by the company and some of the key technology issues related to telecommuting. Mr. Lovelace covered the following points in his presentation.

- NORTEL has approximately 68,000 employees located in 150 countries throughout the world. The corporate headquarters is in Brampton, Ontario. About 25 percent of NORTEL’s employees work in research and development.

basis. The largest number of telecommuting employees are located in the New York/New Jersey area, Raleigh, Nashville, Atlanta, the Dallas area, the

San Francisco Bay area, Ottawa, and Toronto. Between 150 to 200 employees are becoming telecommuters each month. NORTEL surveys telecommuters three times a year and conducts other studies to document the benefits and costs associated with the program.

- Most NORTEL telecommuters are provided with the same equipment and support services. The system includes an ISDN line into the telecommuter's home, a computer, and telephone links. The system provides professional access in the home, and a customer is not aware that they are dealing with a telecommuter.
- There are a number of technical issues that should be considered in developing a telecommuting program. These include installing an ISDN line, linking the home and office computer systems, and troubleshooting hardware and software problems.
- The needs and requirements of telecommuters also need to be taken into consideration. These include transparent customer access regardless of employee location, reliable voice and data communications networks, access to equipment that functions the same at home as it does in the office, and access to information at multiple locations. In addition, most employers want multiple communication devices with advanced functionality at a minimal cost. A key point to successful telecommuting programs is that the customer interface must be the same regardless of whether the employee is in the office or at home.
- The telecommuting technology concept is to provide transparent and seamless communication. All communications must be equally professional, whether in the home or the office.
- The home office of the future will include a number of elements. In addition to computers and faxes, home video connections may also be possible in a relatively short time. Other technology changes will include much faster bandwidth to the home office, lower costs, video and screen sharing alternatives, and voice centric solutions. The emphasis will be on integrating all the various components.
- In addition, potential future changes include network management that is holistic and one-stop shopping for data, voice, and Internet access. Diagnostic tools should also improve, and service businesses will emerge to provide needed functions.
- NORTEL has a goal to have 20 percent of its workforce telecommuting. The program at NORTEL was started primarily to retain valued employees. Although the program provides significant cost savings, the major benefit is increased employee satisfaction and productivity.

SUMMARY OF BREAKOUT SESSIONS

BEYOND TELECOMMUTING: REDUCING OTHER TYPES OF TRIPS

Convener Dan Theobald.

Participants Wally Siembab, Gail Shiimoto-Lohr, Mark Joerger, and Phil Winters.

Issue Identification

The group discussed the use of communications networks and other technology to reduce non-work trips. Distance learning, video conferencing, teleshopping, and telemedicine were identified as just a few examples of using advanced technology to replace trips. These approaches provide individuals with access to a wider range of goods and services. The development of a fiber optic communications network was also discussed. The approaches being used in Oregon and the City of Mission Viejo were highlighted as two examples of this approach.

Action Approach

The group discussed the various actions and activities that could be undertaken to help promote greater use of communications technologies for these types of services. Actions for both the public and private sectors were identified. The following elements represent a few of the actions identified by the group.

- State departments of transportation and cities need a vision for the future that incorporates greater use of communications technologies. This vision can then be used to develop specific goals, policies, objectives, and plans. These can then be communicated to the public and to private sector groups that will be needed to develop the various system components.
- Public agencies need help in identifying possible approaches to developing fiber optic networks, especially related to sharing roadway rights-of-way. Developing best practice case studies and examples would be of benefit.
- The objective is to move urban function closer to people through communications technology. Involving all the public sector agencies that provide
- Many supervisors manage primarily by line-of-sight. These supervisors often resist telecommuting programs for fear of losing control over employees. Providing training on techniques for managing

services should be considered. In addition, a multimodal approach should be taken to information sharing. The transportation department or agency may take the lead, but other public and private groups will need to be involved.

MEASURING THE PRODUCTIVITY OF TELECOMMUTERS

Convener Rene Ryman.

Participants Kim Wells, Heidi Thibodeau, Scott Decker, Becky Johnson, Charlie Donovan, Gray Schultz, Debbie Zywna, Michelle Conkle, Darryl Fields, Bob Ancar, and Luis Ferreira.

Issue Identification

The group discussed a number of potential issues associated with measuring the productivity of telecommuters. There was agreement that some employers may be hesitant to implement telecommuting programs due to fear that workers will not be productive at home or at a remote location.

The group discussed the need for techniques to measure the work activities and products of telecommuters. Case studies of increases in productivity among teleworkers are also needed. These case studies can be used to promote telecommuting with additional businesses and agencies.

The following elements were discussed by participants in the group.

- Managers want specific techniques to measure the productivity of telecommuters. Developing measures for use by managers would benefit all groups interested in implementing telecommuting programs.
- Managers need guidance to implement telecommuting programs. This guidance should include techniques to manage telecommuters and to measure the productivity of teleworkers.

telecommuters and measuring their productivity would help these supervisors overcome these concerns.

- Quantitative benefits are achievable through telecommuting programs. Documenting these benefits in case studies could be used to promote telecommuting.
- Successful telecommuting programs need top-down support. Senior management support can help encourage mid-level supervisors to embrace telecommuting. Top management can also commit the resources needed for telecommuting programs.

Action Approach

The group identified the following action steps related to measuring the productivity of telecommuters.

- Develop case studies of top level management support for telecommuting programs. These case studies can be used throughout the country and shared with other agencies and businesses. Peer-to-peer networks of senior managers could be developed and used to encourage telecommuting programs.
- Develop case study examples of productivity measures used with telecommuting programs. These performance measures should include those used in traditional work settings, as well as new techniques associated primarily with telecommuters. Performance measures focusing on work output, rather than attendance are needed with telecommuters. For example, a daily planner or worksheet can be used to document work progress or the completion of specific tasks can be monitored. These measures can be provided to businesses or agencies considering telecommuting programs.
- Focus on building trust among managers and telecommuters through taking small steps toward success. It is important to not micro-manage telecommuters, however.
- Consider requesting telecommuters to provide an extra work product or professional development activity periodically with the time saved through

PROVIDING A BETTER BOTTOM LINE TO EMPLOYERS IN JUSTIFYING TELECOMMUTING PROGRAMS

Convener Dean Gillam.

Participants Karla Veatch, John Chiu, Fred Wegman, and Darryl Anderson.

Issue Identification

The group discussed the need to provide better information to employers on the benefits of telecommuting. An overview of all types of potential benefits should be provided. These should focus mostly on the cost savings to businesses and agencies and the increases in employee productivity. Other benefits, such as recruiting and retaining employees, enhancing employee satisfaction, and reducing commute trips should also be highlighted. Case studies for similar businesses or agencies should be developed and provided to state and regional agencies. The potential for telecommuting to reduce possible stress between some supervisors and employees was noted. Developing comprehensive "turn key" telecommuting programs for employers was suggested.

Action Approach

The following elements were discussed by the group to help promote telecommuting.

- Develop case studies on successful telecommuting programs in a wide range of business and agency types. These case studies can be used to promote peer-to-peer examples. The case studies should document the approaches used, the costs to implement and operate the program, and the benefits.
- Develop case studies that document accurate changes in employee absenteeism, turnover, and hiring due to telecommuting programs. Case studies are also needed documenting cost savings in office space, parking facilities, and transportation subsidies.
- Develop models on how organizations could implement three to four-day telecommuting programs, in addition to one to two-day programs. These models should focus on the cost savings associated with this approach.
- telecommuting. This approach would stress the additional benefits to employers.

- Develop case studies quantifying the stress reduction benefits of telecommuting in relation to use of sick leave and disability. This information could be compared to other benefits such as wellness programs or health club subsidies.
- Explore the potential for greater use of electronic filing systems with telework programs. These and other techniques using communications and advanced technologies could further enhance office and worker productivity.

ESTIMATING THE POTENTIAL FOR TELECOMMUTING IN AN AREA

Convener Wayne Bennion.

Participants Becky Johnson, Luis Ferreira, Fred Wegmann, Gary Schultz, Cory Irimes, and Mark Joerger.

Issue Identification

A number of issues were identified that may influence the potential for telecommuting in an area. These included the types of jobs and job mix, the nature of businesses and industries, and the number of public agencies and organizations. The existing and planned communications infrastructure may also influence the potential for telecommuting in a specific area. Other factors that may impact interest in telework alternatives include the level of traffic congestion, the air quality designation, environmental issues, and other local conditions.

The group discussed techniques that can be used to help identify the potential for telecommuting. These included examining current telecommuting programs, conducting focus groups and surveys of employers and employees, and meeting with key individuals and groups.

Action Approach

The group outlined a proposed methodology for estimating the potential for telecommuting in an area. The following steps were identified in this process.

- Identify companies and agencies with telecommuting programs and determine the percentage of telecommuters.
- Conduct focus group with representatives of businesses and public agencies. These focus groups should include individuals from the major types of employers in the area. They should also include a mix of organizations with telecommuting programs and those without.
- Conduct surveys of employees at selected businesses and agencies to identify interest in telecommuting.
- Analyze the results of the previous three steps to develop an estimate of the potential for telecommuting within the targeted organizations.
- Extrapolate this estimate to the entire region.
- Project future telecommuting levels based on the above estimate and the projected employment growth in the area.

The groups also identified the following research needs to enhance the ability to estimate the potential for telecommuting in different areas.

- Develop a national database on existing telecommuting programs. The database should include the type of public agency or private business, the number and percent of telecommuters, the nature of the telecommuter's job responsibilities, and other characteristics of the programs.
- Conduct research on changes in the number and nature of telecommuters at different agencies and companies over time. This information should be added to the national database to identify trends among different types of organizations, as well as with various approaches to telecommuting.

THE IMPACTS OF LABOR UNION ISSUES ON TELECOMMUTING

Convener Bob Ancar.

Participants Rene Ryman, Mark Grisby, Darryl Fields, and Karla Veatch.

Issue Identification

The group discussed a number of issues often raised by labor unions associated with telecommuting programs. Participants described experiences working with labor unions in the development and implementation of telecommuting programs. The following labor union concerns were identified as potential problems in implementing telecommuting programs.

- All guidelines, policies, and elements of telecommuting programs are negotiable items with unionized workforces. Any change in workplace arrangements must be negotiated with the union.
- Some organizations and agencies have little or no union representation. If the labor force is not unionized, organizations usually have fewer labor and management issues to address with telecommuting programs. These organizations also have greater flexibility in addressing potential issues and establishing telecommuting policies.
- Many labor unions strongly support the telecommuting concept and other alternative workplace arrangements, but also strongly support the in-office status quo. Support of current policies is especially strong in regard to issues such as measurement of employee productivity, performance, and effectiveness.
- Agencies and organizations tend to use subjective and intuitive assessments rather than objective rating systems and scales to measure employee productivity, performance, and effectiveness. This approach may be an issue with unions and a large hurdle for unions to overcome.
- Home workplace safety issues may be a concern with unions, as are safety issues at telework centers. Potential concerns include sufficient lighting, adequate office furnishings, and ergonomic
- There is a need to get stakeholders at all levels more involved in supporting telecommuting alternatives. These include policy makers, top managers, supervisors, and other groups. Educational and

considerations. These issues can be addressed through policies, memorandums of understanding, and other techniques. These methods may be difficult to enforce, however.

Action Approach

The group identified the following action steps to help address potential labor union concerns with telecommuting.

- Be proactive in the development of telecommuting programs to ensure that all issues are addressed in the labor management forum.
- When measuring employee productivity, performance, and effectiveness, use monitoring guidelines as a rule-of-thumb rather than benchmarks. Conduct research on performance measures for telecommuters and develop guidelines and best practice case studies that can be used throughout the country.
- Develop best practice case studies of telecommuting programs with unionized labor forces. These case studies should include how the program was developed, how specific issues were addressed, and ongoing monitoring and evaluation efforts.

INSTITUTIONAL SUPPORT OF TELECOMMUTING

Convener Charlie Donovan.

Participants Randi Alcott, Scott Decker, Peter Valk, Michelle Conkle, Phil Winters, John Chiu, Dean Gillam, and Heidi Thibodeau.

Issue Identification

The group discussed the need for institutional support of telecommuting programs. A number of issues were identified that may be limiting broader institutional support for telecommuting. The following points highlight the topics discussed by the group.

outreach activities are needed to explain the benefits of telecommuting and to obtain the support of these individuals.

- Better information is needed on the benefits and costs of different telecommuting options. Examples by industry groups are needed to provide direct comparisons. Case studies on different public and private sector programs should be developed.
- Ongoing promotion and technical assistance is needed. It takes time to develop telecommuting programs, and ongoing support and technical assistance will be needed from public agencies to nurture telecommuting. Ongoing funding will be needed for these efforts.
- Outreach efforts should also focus on groups that may not have been involved to date in telecommuting activities. These include chambers of commerce, economic development groups, traffic organizations, downtown associations, environmental groups, and other individuals.
- There is a need to raise the visibility of telecommuting with all groups and at all levels. Educational and outreach efforts should be targeted at elected and appointed officials, public agencies, businesses, and other organizations.

Action Approach

The group identified the following action steps to help develop stronger institutional support for telecommuting.

- Develop best practice case studies highlighting institutional support in both the public and the private sectors. Examples are needed by industry groups to provide peer-to-peer comparisons. These activities can be used to help replicate successful programs. This effort should be supported by funding at the national level, as well as at the state, regional, and local levels.
- Provide “on demand” experts and peer-to-peer networking for public and private groups interested in developing or expanding telecommuting programs. This program could be modeled after the Public Private Transit Network (PPTN).
- Develop and implement an outreach effort with other groups to obtain their support for telecommuting efforts. These may include the International Downtown Association, the Urban Land Institute, environmental groups, and other organizations. The Telecommuting Advisory Council, Association for Commuter Transportation, the TRB Committees, and

the U. S. Department of Transportation could all support these efforts.

- Develop ongoing stable sources of funding for state, regional, and local telecommuting programs. A mix of federal, state, local, and private funding should be considered.

REGIONALIZING AND EFFECTIVELY MARKETING TELECOMMUTING PROGRAMS

Convener Becky Johnson

Participants John Chiu, Randi Alcott, Darryl Anderson, Paul Theobald, Wayne Bennion, and Cory Irimes.

Issue Identification

The groups discussed a number of issues related to developing, implementing, marketing, and monitoring coordinated regional telecommuting programs. The following major points were discussed during the session.

- All public sector groups should be involved in regional telecommuting programs. These include the state, MPO, transit agency, cities, counties, and other groups. Private sector involvement is also critical for successful programs. Businesses, telecommunication companies, transportation management associations (TMAs) chambers of commerce, and other organizations should all be included.
- One agency needs to have overall responsibility, but all groups need to be involved. Ongoing funding will be needed to support the program.
- Telecommuting should be promoted as one technique that provides multiple benefits. It should not be marketed as the solution to all transportation, environmental, and worker issues.

Action Approach

The following action steps were identified by the group to develop, market, and monitor regional telecommuting programs.

- To start the planning process, a letter should be sent to possible partners, including the MPO, the state department of transportation, transit providers, TMAs, large employers, telecommunications providers, chambers of commerce, elected officials, and other groups. This letter should come from an individual and agency with credibility in the area, such as the city manager, county executive, MPO director, or head of the state department of transportation.
- Conduct an inventory of existing telecommuting programs. Work with a committee comprised of representatives of all appropriate groups to develop this inventory. Decide by consensus on the lead agency, and then decide who will perform the inventory. A number of techniques can be used to conduct the inventory. These include telephone or mail surveys of large employers, cities, counties, and state agencies. Information on the nature and scope of existing programs should be collected, including incentives, such as employers who offer interest free loans for computer hardware and telecommunications companies offering free or reduced services.
- Analyze the survey findings to identify industries, job types, demographics, socioeconomics, geography, levels of congestion, transportation infrastructure, and other factors that are conducive to possible telecommuting programs.
- Establish a program to promote telecommuting with companies and agencies based on the factors identified in the previous step.
- Convene information sessions with employers who have successful telecommuting programs. Most employers would be more than willing to open up their facilities and share this kind of information — it lets them show off a little. Note that telecommuting may not be the solution to the world's problems, but when used in conjunction with other strategies, it's a good way to accomplish the goals.
- Distribute informational kits to employers and managers on telecommuting. Everyone is too inundated with scads of manuals. Produce brief, informative, and visually appealing materials.

Consider providing the materials on disk to allow individual companies to customize their own programs.

- Follow up with employers to gauge the success of the program. Use success stories as testimonials to recruit other telecommuting prospects. Ask participating agencies and businesses for referrals to expand the program.
- Use corridor issues, construction hindrances, and special events to promote telecommuting and other TDM strategies. The Los Angeles and Atlanta Olympics, the BART strike, and the Northridge earthquake are good examples of special situations. People tend to be more willing to try new approaches in response to a crises or major event.
- Follow up after the crisis or special event by emphasizing benefits gained while telecommuting or using alternative modes. Highlight factors such as increased productivity, reduced stress levels, and any cost savings to the employee and employer.

HIDDEN MOTIVATORS IN TELECOMMUTING

Convener Mark Joerger.

Participants Luis Ferreira, Mark Grisby, Jim Eshelman, Phil Winters, Darryl Fields, and Heidi Thibodeau.

Issue Identification

The premise of the session arose when the convener overheard a remark that someone naturally supported telecommuting because, "...that way you can stay at home and smoke." The idea that there may be "hidden" motivators that apply to some individual's interest in telecommuting seemed to require discussion.

Action Approach

The group brainstormed a list of 25 things that might possibly be motivating factors to individuals to telecommute that were all outside the usual list of reasons cited as beneficial. This initial list was narrowed down to six general factors that may encourage telecommuting. Those six motivators are:

- Control of the physical environment.
- Reduction of external distractions.

- Improved work-related task control.
- Improved non-work task control, such as fitting in small personal and household tasks.
- Reduction of office related stress.
- Personal control of time management.

One member of the group summarized these in the acronym "Coordination", which stands for Coordination Of Outside Requests, Distraction, Interruption, Non-important meetings, Amount of stress, Time, Innovation, Operation, and Networking.

and satellite entertainment systems fit into telecommuting technologies?

TELECOMMUTING TECHNOLOGY SPECTRUM: ASSESSING THE REAL AND PERCEIVED TECHNOLOGY NEEDS FOR TELECOMMUTING

Convener Gary Schultz.

Participants Fred Wegman, Dean Gilliam, Dan Theobald, and Mark Grisby.

Issue Identification

The group discussed the technology needs associated with various types of telecommuting programs. The following two key issues were identified related to telecommuting and technology:

- **Communications Management.** Will fundamental changes in communications take place as communications technology advances?
- **Document Management.** What level of technology will be needed as people change the way in which documents are managed?

Action Approach

The group identified the following steps to help address the technology issues that may be associated with telecommuting programs.

- Educate employers and employees to understand that telecommuting is served by technology and not driven by technology.
- Take technology from the forefront of the telecommuting discussion and place it into the context of organizational technology assessment.
- Conduct research to determine what place current and future technologies have in the telecommuting spectrum. For example, where does cable television

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