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Case Study No. 3

What Needs to be Done to Promote Bicycling and Walking?

U.S. Department of Transportation
Federal Highway Administration

National Bicycling And Walking Study

Foreword

This case study was prepared under contract for the Federal Highway Administration by David Evans and Associates, Inc.

Notice

WHAT NEEDS TO BE DONE TO PROMOTE BICYCLING AND WALKING?

National Bicycling and Walking Study

Case Study No. 3

Prepared for:
Federal Highway Administration
Washington, D.C.

February 26, 1992

EXECUTIVE SUMMARY

Bicycling and walking, the two primary nonmotorized transportation choices in the United States, contribute a small fraction of their potential. This study explores ways to promote them as partners in a balanced, diversified transportation system.

Market research provides a way of analyzing the many factors involved so that actions can be taken that will cause people to switch from automobiles to bicycling and walking. The study examines existing literature with a detailed look at the successful promotional programs undertaken by Portland, Oregon, over the last two decades.

Automobile Dominance

Three aspects of automobile dominance must be recognized: it is the popular choice by a great margin, it has a profound effect on our economy, and it has shaped our cities and landscape. Reversing the decades' old land-use pattern of urban sprawl is a fundamental problem that must be addressed if bicycling and walking are to become widespread options; encouragement alone will have limited effectiveness.

Factors Identified

A variety of interrelated factors contribute to a person's decision to bicycle or walk. These have to do with physical conditions, personal motivation, and institutional considerations. The overriding issues—lack of choice, lack of motivation, lack of institutional support—have resulted in a wide range of factors that need attention. Consequently, the programs that work best are basic and diversified. They are an integral part of the overall transportation and environmental strategy. Most importantly, they are directed at all levels of society, from the national agencies down to the individual commuter.

Many Potential Users

Transportation touches all people like few other activities. It cuts across age, race, neighborhoods, income, and professional interests. Many Americans already bicycle or walk regularly, usually as part of their fitness regimen. There is so much untapped potential for bicycling and walking in this country that virtually no segment of the population should be left out.

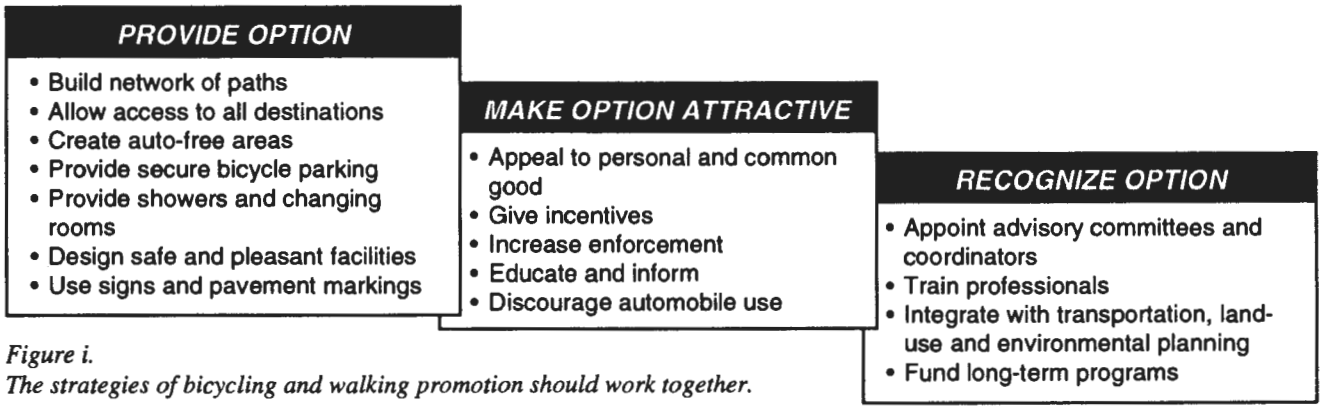

Figure i.
The strategies of bicycling and walking promotion should work together.

Strategies

Successful programs have realistic options, an enlightened public, and strong Government support. Any single strategy, by itself, realizes only modest gains. The best approach is a combination of strategies (see figure i) that creates a comprehensive system, similar to what motorized traffic enjoys.

Provide Option

For bicycling and walking options to exist, usable facilities must be in place, along with the land-use designations to support them. The critical factors of convenience, distance, access, safety, and theft all benefit from good facilities. Also, bicycling and walking must be a partner with the other modes if widespread use is to be achieved. They must be elevated to the same level of planning, design, and funding that goes into the other modes. They logically fit into the short-range travel options, up to about 5 miles by bicycle and 1 mile by foot. They are ideal as collectors and distributors at transit nodes. On the cityscape, bikeways and footpaths should form a grid, finer than the road system, that connects all likely origins and destinations in the most direct manner.

In new development, this means "clustering" residences, employers, institutions, and commercial businesses together to reduce travel distances. An integrated network also means "traffic calming" in built-up areas, whereby various techniques are employed to reduce automobile speed and encourage alternative transportation. Together, the combination of an uninterrupted and unimpeded grid of paths, priority to bicyclists and pedestrians, and short travel distances almost guarantees the success of these systems.

Make Option Attractive

Unfortunately, just having the option to bicycle or walk is often not enough. People need encouragement. A number of things can be done to make it easier to bicycle and walk and to reward those who do.

Safety is people's number one concern. Good facilities help, but some people continue to endanger themselves and others without some special safety measures. Potential bicyclists and walkers must be made aware of their options and shown how to use those options safely

and effectively. Motorists, too, should be taught how to interact with bicyclists and pedestrians.

Maps, events that stress safety, commuter races, and motorist's exams are a few methods used to raise consciousness and to inform. Various employer-provided incentives are effective inducements for some people; stipends, discounted bicycles, and "Leave Your Car at Home" days have been successful.

Only when driving an automobile is made inconvenient will many people begin to consider other options. A proven method of discouraging auto use is to make owners pay the hidden costs of driving through various taxes and user fees. Restrictions are also effective.

Recognize Option

Without strong professional and Government support, well-conceived programs stand an excellent chance of drying up from lack of funding and implementation. Without citizen participation, voter understanding will be lacking. Proven ways for these groups to interact is through advisory committees, program coordinators and professional organizations.

Land-Use and Transportation Planning

Transportation and land use are so intimately related that any attempt to market a particular mode of travel should work closely with planning activities. When planning is properly done, the various transportation modes work together to move people and products efficiently. Marketing goals should be tied into transportation planning so that more bikeways, sidewalks, and other facilities can be built to accommodate the increased need, while competing modes are scaled down.

Portland's Example

Portland, Oregon, is a positive example of how a large city has faced the challenge of shifting from excessive automobile use. Decades of automobile dependence and low-density expansion created the problems most American cities can relate to. Portland's solutions demonstrate the importance of system-wide planning and public support as well as how nonmotorized modes enter into the thinking. By turning to transit and pedestrians, Portland's central business district was rebuilt and revitalized. Various efforts to encourage bicycling have resulted in Portland being touted as one of the best U.S. cities for both bicycling and walking. The important support and leadership of the State in pursuing a balanced, multimodal transportation system is evident in Oregon.

Potential

The recurring theme that emerges in the literature is the complexity of the transportation equation. An individual's need to travel to and from home, work, and other places is basic, but the enabling methods are not so simple. With the proper combination of publicity, incentives, disincentives, and planning, a major shift (0.5 percent to 1 percent per year) to bicycling and walking is possible.

Three things must happen to promote bicycling and walking: the option must exist, it must be attractive, and it must be recognized. The degree to which these objectives are pursued will depend on the community and its agenda as well as the direction given by Federal and State agencies. Local, grassroots efforts that tie into regional, state, and national programs can increase bicycling and walking substantially.

ABSTRACT

Bicycling and walking in the United States contribute a small fraction of their potential as transportation. The automobile dominates all trip types and has become an integral part of our culture. People do not choose bicycling and walking for many reasons, many of which can be overcome with improved facilities, incentives, and automotive disincentives. Effective bicycling and walking promotions are a part of overall transportation and land-use planning; a balanced, multimodal transportation system serving clustered developments provides the greatest potential for bicycling and walking. Major changes away from automobile-dominated transportation require strong Government support and citizen involvement. Portland, Oregon, is an example of one successful approach to promote bicycling and walking.

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1. INTRODUCTION

Bicycling and walking, the two primary nonmotorized transportation choices in the United States, contribute a small fraction of their potential. This study explores ways to promote them as partners in a balanced, diversified transportation system. This section discusses the study's organization, focus, and how it fits into the National Bicycling and Walking Study.

Organization

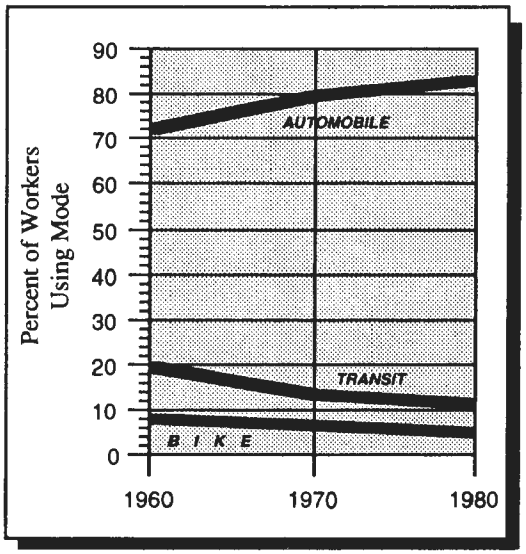
The main elements of this study are the summary, the five sections of text, and the appendices:

- The **Executive Summary** is a condensed version of the text.
- **Section 1: Introduction** sets the scene.
- **Section 2: Overview** delves into the many factors that influence bicycling and walking.
- **Section 3: Strategies** examines the transportation market and explores various promotional methods.
- **Section 4: Portland's Example** reviews the efforts of that city to promote bicycling and walking.
- **Section 5: Conclusion** wraps up the study and presents recommendations.
- The **Appendices** list the references and relevant literature.

Selling Bicycling and Walking

Promote bicycling and walking? It is an odd concept, considering that most of the world uses these modes for primary transportation. Yet, in the United States, we have done such an outstanding job of selling automobiles that human-powered movement has become secondary. The proportion of workers who travel by automobile has been steadily increasing over the years to where it is now over 80 percent, while both public transit and nonmotorized transport have been declining (see Figure 1).[1]

Figure 1.
Commuter transportation trends in the U.S.



Numerous studies have restated the value and desirability of bicycling and walking. Countless plans and policy statements have reaffirmed a commitment to alternative transportation. Still, we continue to use automobiles. How does one go about selling an activity such as bicycling or walking when a more popular and convenient alternative such as the automobile exists? Market research provides a way of analyzing the many factors involved so

that actions can be taken that will change travelers' behavior.

The National Study

This is one of a series of small case studies sponsored by the Federal Highway Administration as part of the National Bicycling and Walking Study. The case studies cover many complicated and interrelated topics such as data collection, barriers, funding, safety, benefits, and planning, to name a few. Promotion—the subject of this case study—touches on many of these other topics:

- The topics "Reasons Why Bicycling and Walking Are and Are Not Being Used as Travel Modes" and "Measures to Overcome Impediments to Bicycling and Walking" must be addressed before a marketing strategy can be formulated. *Factors to be Considered* in *Section 2: Overview* identifies and briefly discusses the relevant factors.
- "Linking Bicycle/Pedestrian Facilities with Transit," "Incorporating Consideration of Bicyclists and Pedestrians into Educational Programs," "Traffic Calming, Auto Restricted Zones, and Other Traffic Management Techniques," "Integrating Bicycle and Pedestrian Considerations into State and Local Transportation Planning, Design and Operations," and "Benefits of Bicycling and Walking on Health" are among the marketing approaches mentioned under *Section 3: Strategies*.
- Existing and past programs provide much of the data and insight into what works. These will be cited as part of *Section 3: Strategies*, although an in-depth analysis is left to "Analyses of Successful Provincial, State and Local Programs in Canada and the U.S." The City of Portland, Oregon will, however, be closely examined in *Section 4: Portland's Example* because its 20-year old program offers much guidance.
- Judging the success of incentive programs and setting goals depend to a great extent on accurate data, which is the topic of "Usage Data on Bicycles and Walking—How Should It Be Obtained?" and "Trip Generation Rates for Different Bicycle and Pedestrian Facilities." This report uses a variety of existing data to support the recommendations while recognizing that the basic precepts stand on their own.

Answering the question: "What needs to be done to promote bicycling and walking?" draws on the other topics in the National Study and represents, in a sense, a summation of where we are now, where we want to go, and how to get there. The temptation to get bogged down in generalities is great. Just as dangerous is the tendency, in reviewing existing literature, to become too focused on specifics that have only a small bearing on answering the question. This study attempts to draw a clear picture of the important issues in promoting bicycling and walking while leaving the details to the other case studies. Those issues are summarized and recommendations made in *Section 5: Conclusions.*

Note that although bicycling and walking are often uttered in the same breath, they are not always equals when it comes to participants, their needs and the

facilities. As evidenced by the recent controversy surrounding use of mountain bikes on trails, the two modes can even be at odds with one another. Where the distinctions are important they will be handled separately in the discussions.

Sources

There is no shortage of material available on the benefits of nonmotorized transport and how America and other countries have attempted to make it part of their modern development. The first bike boom occurred over a hundred years ago. More recently, a serious effort has been going on for at least two decades to offer alternatives to the automobile. A host of national and world events has brought about a reawakening to the need for more sustainable and livable cities. The result is a rash of recent articles, conferences and reports.

This study draws on that extensive history. A potpourri of documentation was accumulated from international, Federal, State, municipal, and academic sources. Some of these are highlighted in the Appendices.

> "Sustainability is the recognition of environmental and resource constraints and their application to all parts of human endeavor... there are now a whole host of environmental, social, resource, and economic arguments which are combining to critical threshold levels and seriously challenging the fundamentals of car-based planning..."
>
> — Peter Newman and Jeff Kenworthy, authors of *Cities and Automobile Dependence: An International Sourcebook*

2. OVERVIEW

A host of factors,both physical and motivational, influence our transportation choices. These factors are identified within an underlying theme of automobile dominance and restricted choice. This section begins with a visit to the previous century, pauses to examine today's factors, and ends with a look at the roles played by the private and public sectors. It becomes clear that the problems facing the bicyclist and pedestrian are systemic in nature—the basic health of our entire transportation system is in question.

> "...just as an ecological system is healthiest when it displays great diversity and differentiation, so too is a transportation system most healthy and robust when diverse modal options are available to those moving people and goods. A transportation system dependent on only one or two modes of transport is far more susceptible to disruption and system failure."
> — Transportation coordinator and author Michael Replogle

Looking Back

Velocipedes and the Art of Walking

Not too long ago walking was the primary mode of transportation in the United States. It still is in many countries. Aided by boats and horses, people explored much of the world on foot. The 19th century saw a series of inventions—the railroad, bicycle, automobile, and airplane—that changed the way we move. Of those inventions, the bicycle is the only one that is human powered, a trait it shares with walking although it is several times more efficient. In the modern transportation system, both bicycling and walking are attractive short-range modes that allow convenient, efficient, door-to-door travel. Either can be used in conjunction with other modes to travel longer distances, as is commonly done with transit (buses and trains).

> "The art of walking is obsolete. It is true that a few still cling to that mode of locomotion, are still admired as fossil specimens of an extinct race of pedestrians, but for the majority of civilized humanity, walking is on its last legs."
> — *Scientific American*, January 9, 1869

Marketing Parallels

Early bicycles pioneered much of the same technology—ball bearings, gears, differentials, steel tubing, pneumatic tires, and wire-spoked wheels—that was later used in automobiles. The freedom of movement and status of bicycles provided an irresistible appeal similar to that of automobiles. Like automobiles, bicycles had a dramatic and immediate effect on society: paved roads, new fashions, buildings (such as Madison Square Garden) dedicated to their use, political lobbies, and

a booming industry. By 1886, there were over 400 bicycle manufacturers in the United States including Henry Ford and the Wright Brothers; they sold about 2 million bicycles in 1897 (about 28 per 1,000 people annually compared to 40 per 1,000 people in 1989).

> "At last man was free from the horse and wagon. A bicycle never needed daily cleaning, currying and stabling; it didn't eat, and it did not use an expensive harness that took time to put on and take off. One could jump on his bicycle and quickly be away from his house."
>
> — Eugene A. Sloane, *The New Complete Book of Bicycling*, Simon and Schuster, New York, 1974

As rapidly as the bicycle gained popularity over walking and horse-drawn carriages, it faded with the introduction of mass-produced automobiles. What the bicycle did, the automobile did much better (at a cost). What can be learned about events a hundred years ago to reintroduce bicycling and walking into the mainstream today? Mainly, that they retain the same virtues—economy, simplicity, and efficiency—that attracted us to them in the first place. In an urban setting, there are still no better ways of getting around. The task is to determine in what conditions they flourish and to promote those conditions.

Automobile Society

> "...the automobile is so much a part of our existence that it seems hard to believe that it is a child of our century."
>
> — Arthur C. Clarke, *Profiles of the Future*, Harper & Row, New York, 1958

It is impossible to discuss transportation alternatives in the United States without focusing on the overwhelming first choice —automobiles. Past efforts to reduce car use have proven to be painful for all concerned. There may be some truth in what automotive historian John B. Rae wrote: "The individuality of automobile transportation is something that Americans, and others, are simply not going to give up except under a degree of compulsion completely unacceptable in a free society. Most of the plans for revised transportation policies recognize this fact and incorporate it realistically into their programs. . . ."[2] In any case, three aspects of automobiles must enter into our thinking: it is the popular choice by a great margin, it has a profound effect on our economy, and it has shaped our cities and landscape. Consequently, any changes will come slowly and will be opposed by some powerful interests.

Popular Choice

There are not many Americans who can remember a world without automobiles. Few would have it any other way. "The car as an expression of personal democracy is a thread that runs prominently through the course of automotive history. . . it has acted as a leveling social force, granting the average man a range of personal choices—where to travel, where to work, where to live, where to seek pleasure and recreation—once available only to the wealthy," writes Stephen W. Sears.[3] As one example, Yellowstone National Park never received more than 35,000 visitors a year before cars were allowed; it now has over 2 million visitors annually.

Yet, the "self-propelled, trackless vehicle" was practically unknown a hundred years ago. Using some of the same technology pioneered on bicycles, the automobile evolved rapidly, so that by 1900 there were over 10,000 cars in the world. In 1913 Henry Ford's Model-T moving assembly line revolutionized industry, and in the following year U.S.

production of motor vehicles exceeded that of wagons and carriages for the first time. By 1930 more than half of all American families owned a car. By 1985 there were an astounding 139 million cars in the United States.

The automobile has been so thoroughly embraced by Americans that it has become part of our mind-set. For those too young to drive, there are radio-controlled toy cars and children's bicycles with steering wheels and stick shifts. Getting our driver's license and borrowing the family car for the first time is a milestone in growing up. Indeed, the driver's license is our primary identification throughout life. As adults, "we are what we drive" is an adopted self-image, and we spend roughly a tenth of our time and a fifth of our income on our "home away from home." We go to home and *car* electronics stores, stay in *motor* hotels, and conduct business at *drive-thru* windows. By 1988, there were 1.7 Americans per car; in many neighborhoods, there are now more registered cars than voters.

Residents of our major cities drive over twice as many miles per capita as Europeans while consuming over four times the gasoline; compared to Asians, we drive four times as much and consume nearly seven times the gasoline per capita. Compared to our European counterparts, we have three times the road space and twice the parking (Phoenix sets the record with more downtown parking spaces than workers).[4]

An FHWA study[5] showed that 72 percent of the people (over 15 years of age) preferred the automobile for commuting to work, although 75 percent actually used that mode. By comparison, 14 percent preferred walking (11 percent walked) and 7 percent preferred bicycling (3 percent bicycled). The bicycle was the only mode, including transit, for which *preference* was higher than *use* for *all* types of trips (commuting, shopping, and personal business).

> "...the automobile is the paradoxical example of a luxury object that has been devalued by its own spread. But this practical devaluation has not yet been followed by an ideological devaluation."
>
> — French philosopher Andre Gorz

A series of blows to the automobile industry in recent decades—clean air regulations, fuel economy standards, safety standards, the oil embargo backlash, recession, oil spills, and war—has placed it in a vulnerable position. More and more, the reality seems to be that the price of unlimited mobility is too great. The automobile has become part of society, but its original rationale is no longer valid.

Economic Importance

The very large and visible automobile and oil industries are just the tip of the economic iceberg. As John B. Rae noted, "The American automobile has become a way of life, and whatever happens to it must profoundly affect the economy and the whole culture of the United States." Supplying an automotive society has become so important to our economy that one out of every four jobs in the United States is dependent on the automobile—jobs in making, selling, or servicing cars and jobs in secondary companies that supply them.[6] Transportation systems are dominated by the automobile: 87 percent of Americans travel

> "The cycle trade is now one of the chief industries of the world. Its ramifications are beyond ordinary comprehension. Its prosperity contributes in no small degree to that of the steel, wire, rubber, and leather markets."
>
> — *Outing Magazine*, February 1896

to work by car and 75 percent of the nation's freight travels by truck (90 percent of the perishable food).

Auto-Oriented Land-Use Patterns

A popular text on planning[7] turns to the effects of automobiles on page 1: "With the development of the automobile, people have gained vastly increased freedom of movement. Their desire to escape from crowded and deteriorating cities has become manifest in the horizontal metropolises of the automobile age. Starting from the central cores of established cities, Americans have expanded outward, first in concentric rings and then along the corridors of major roadways in the pattern often called urban sprawl." The migration to the suburbs is still occurring, with the proportion of both people and jobs in the inner cities steadily declining in recent decades.[8]

Because it came at a time when the American frontier was being consolidated, the automobile had a major impact here, more so than in Europe where cities and roads were well established. The American growth pattern, especially in the West, took on the configuration best suited to the automobile. In 1900, for every 1,000 people added to a city's population, 10 acres were consumed as the city expanded. By 1930, the figure was 30 acres. By 1980, 300 acres.[9]

> "Americans retain the highest degree of individual mobility in the world. But their heavy reliance on the automobile is a peculiar blend of preference and necessity, a cross between an abiding love affair with the passenger car and a profound lack of alternatives to it."
>
> — Michael Renner, *Rethinking the Role of the Automobile*, June 1988

Where automobiles are popular, roads and parking lots are needed. There are over 7 feet of road for every person in the United States. About 2 percent of the total surface area of the United States is pavement. Our cities devote 40 percent to 60 percent of their space to the automobile for roads, parking and services.[10]

Modern sprawling subdivisions that feature limited access, exclusive use and nearby freeways preclude travel by almost any means except the private automobile. Older areas, originally designed for pedestrians, have been extensively modified to accommodate the automobile. Zoning and development ordinances feature wide roads, ample parking, and other features to make automobile use as easy as possible. Reversing this land-use pattern is a fundamental problem that must be addressed if bicycling and walking are to become widespread options.

Factors to Consider

An impressive variety of factors has been mentioned in the literature as contributing to a person's decision to bicycle or walk. One large report[11] identified 107 critical factors to consider in a program to increase bicycle use, and rated 19 as being particularly important. Another multivolume report[12] had at least 50 separate recommendations for encouraging bicycling and walking. The FHWA study[13] presented five complicated scenarios (involving better bicycle and pedestrian facilities, compact land use, congestion fees and fuel price increases) to residents in five cities to

predict what factors would influence their transportation choices. A German study[14] of medium-sized cities used situational analysis to determine that people do not use bicycles due to simultaneous constraints including availability, physical barriers, routes, perception of bicycling and unwillingness to ride (see figure 2).

Many other papers, reports, and plans dealing with bicycle or pedestrian programs have dealt with the same issues in different ways. The sum of these exhaustive analyses is a medley of interrelated factors that have to do with physical conditions, personal motivation, and institutional considerations. Efforts to quantify these factors and isolate the important ones, while useful research, may be obscuring the point. For it is not so much the strength of individual factors that matters, for each is important, as it is their prevalence. The problems pervade nearly every aspect of our daily lives and our supporting institutions. With that caveat, the most prominent factors are discussed below.

Physical Factors

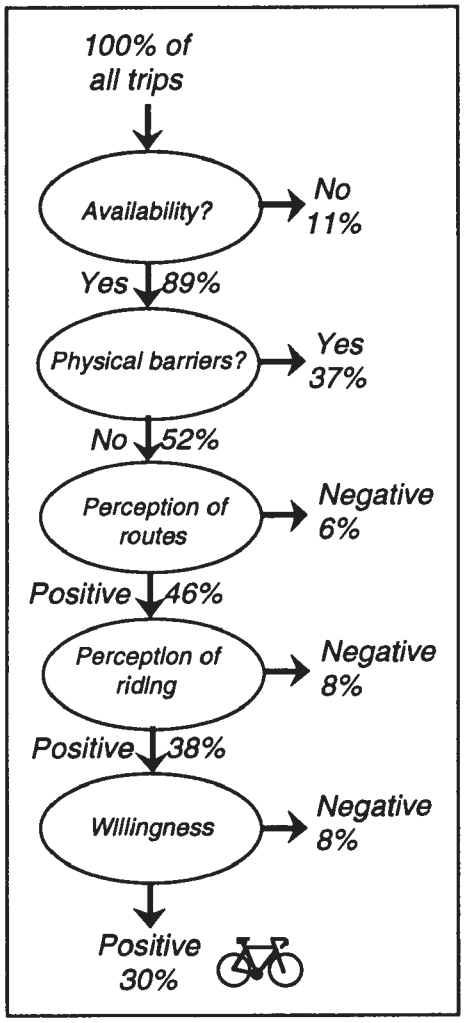
A few of the physical factors, such as terrain and weather, are "givens" that we have little or no control over. However, most of the remaining factors can be manipulated to the advantage of bicyclists and pedestrians.

Availability

Walking equipment consists primarily of shoes, which most Americans possess in abundance. Bicycling, however, depends on having a bicycle. In the late 1800's, bicycles were expensive machines that limited their availability to the wealthy, and ownership was considered a status symbol. Today, that is not the case. A quality utilitarian bicycle can be had for just a few hundred dollars, a fraction of what most people pay yearly for just insurance or gasoline for their car. In fact, one in two Americans already owns a bicycle.

Nearly any bicycle, with a few accessories, can be used for commuting—not to say that the vehicle is perfect. There is a growing market for bicycles with covered drive lines, integral fenders and baggage carriers, lights, upright posture, and other commuter amenities.

Figure 2.
German analysis of factors that determine choice of bicycle (as a percent of all mode trips).



The FHWA study confirmed that bicycle ownership is not a significant variable in choice of mode. Their sample showed 1.5 bicycles per household. Another survey of rail users who drove to the station showed that only 32 percent did not own a bicycle.[15] In the long run, bicycle potential depends less on availability than it does on changing attitudes and priorities.

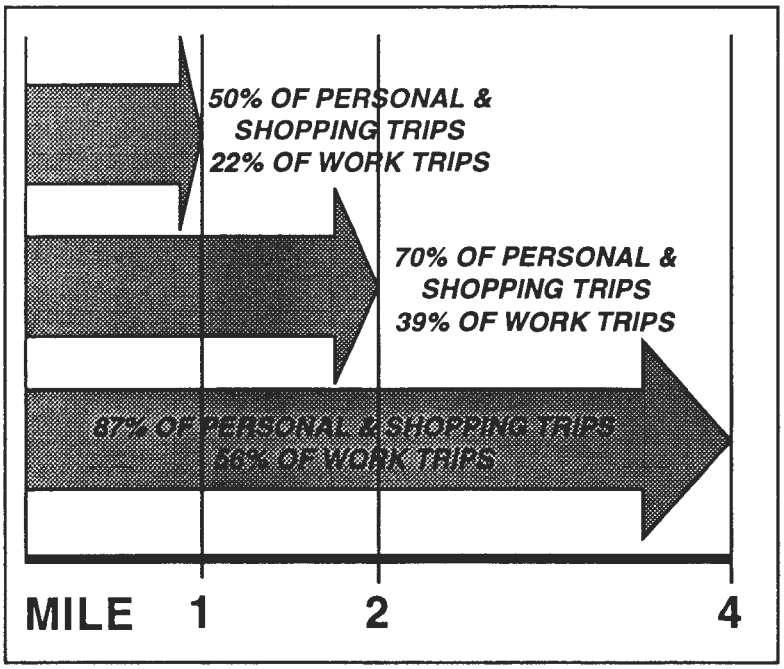
Where bicycle availability is an issue is the institutional "motor pool" that usually offers workers only cars for running company errands. This has been changing of late. Some companies and government agencies have added bicycles

to their pools for in-plant or in-town use. Bicycle policemen are becoming more popular for practical reasons. Even public bicycle pools are being used in Copenhagen.

Convenience

Although we have gone to great lengths to make automobile use convenient in most places, most other forms of transport have suffered, especially bicycling and walking. The inconvenience takes many forms: walking to the store is inconvenient when it is in the back of a huge parking lot, carrying things takes

Figure 3.
Many trips are within bicycling and walking distance.



planning, a change of clothing and even a shower may be called for although there is nowhere convenient at the destination to do these things, finding a pleasant or safe route through traffic requires research, and so on. Some of these problems disappear with experience, whereas others are inbred into our automobile-dominated system. Few, in and of themselves, prohibit bicycling or walking but the sum create a formidable disincentive.

Distance

Studies in the mid-1970s reported that the average length for bicycle trips was no more than 2.5 miles, less for commuters.[16] Various other studies place reasonable walking distance as no more than 0.3 to 1 mile, and typical bicycling distance as 0.5 to 4 miles (although some people routinely travel twice these distances or more). Certainly, bicycling and especially walking are short-range transportation choices, although when used in conjunction with transit or rideshare lots, the range can be expanded.

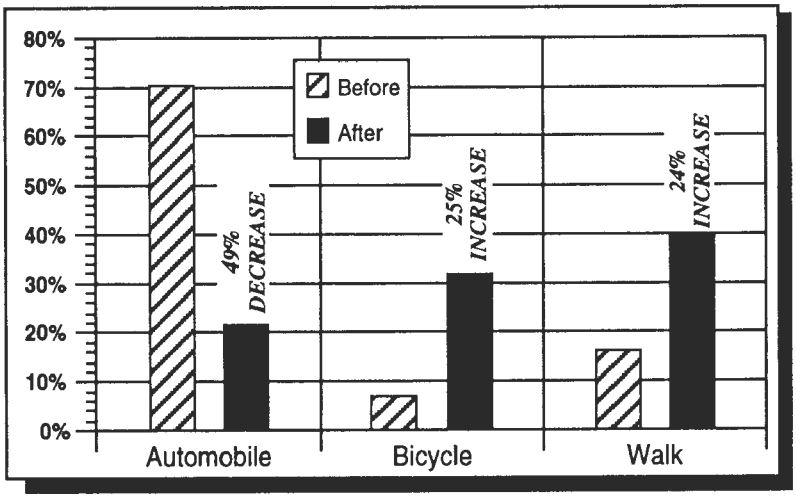
In the FHWA study, more than 90 percent of nonmotorized trips were less than 2 miles versus 63 percent of automobile trips. Shopping and personal business trips were typically shorter than work trips: 70 percent versus 39 percent for distances less than 2 miles. About 80 percent of automobile trips for shopping and personal business were less than 4 miles. These short trips are prime bicycle and even walking distance, which suggests significant potential for getting people out of their cars (see figure 3).

This type of data is highly dependent on the locale and is closely tied into land-use issues. Its main value is in giving a rough indication of current potential. For example, in Portland, only about a quarter of the residents live within 5 miles of their job.[17] Nationwide, average trip length has increased from 7.9 miles in 1983 to 9.0 miles in 1990.[18] Even these numbers are not so much an indication of real potential as they are an indicator of how trip distances have increased due to high automobile use—

a situation that can change with proper planning.

If the importance of distance needed verification, the FHWA study also found that compact land-use, wherein work, shopping and other trips are close to home, produced a large preference shift from automobiles to bicycles and walking (see figure 4).

Figure 4.
Modal choice after compact land use.



Safety

Fear of automobiles is the most frequently mentioned deterrent to bicycling and walking, followed in some areas by fear of crime. To use bicycles as an example, people say in survey after survey that they are turned off from bike commuting by traffic or lack of safe bikeways: 58 percent of bike owners and 38 percent of nonbike owners in Philadelphia,[19] 20 percent of adults nationwide,[20] 55 percent of adults in Portland, Oregon,[21] 56 percent of adults in the FHWA study, and so on. The numbers quoted vary with the exact question asked, but the theme is clear—people are uncomfortable riding on our present roads.

In general, the average rider is uncomfortable in traffic and desires as much separation from automobiles as possible. Wide shoulders, bike lanes, and especially, bike paths are desired. Experienced riders tend to be more comfortable in traffic and recognize some of the benefits of being a partner on the road, but this is far from being the majority view.[22]

Is bicycling dangerous? It depends on who you ask. Safety authorities frequently quote accident statistics that are flawed in various ways: children are overrepresented, unlike for the automobile; accidents per miles traveled are sometimes used, which is not a fair comparison because bicycles accumulate far fewer miles than do automobiles; the type of facility, which may be the culprit, is not taken into consideration; assignment of blame is difficult and traditionally weighted in favor of motorists; and so on.[23] Experienced bicyclists recognize the real dangers and have learned to avoid them, whereas novices or noncyclists have a distorted idea of what is and is not dangerous (for example, the many wrong-way bicyclists who believe rear-end collisions are likely). The real traffic safety issue is not accident numbers; most of the accidents that do occur can be reduced through education, intelligent facility design, and enforcement of fair laws.

As for pedestrian accidents, they are the second largest category of motor vehicle deaths after occupants.[24] Age, visibility and alcohol are the leading factors. The elderly, in particular, are victims (mostly at intersections), possibly due to poor hearing, vision and mobility; starting at age 75, the rate is twice as high as it is for younger people. Males make up 70 percent of the victims. The nighttime hours

between 6 p.m. and 3 a.m. account for 57 percent of the accidents; alcohol (0.10 percent+ in either the driver or pedestrian) is present in 59 percent of the nighttime fatalities involving pedestrians at least 16 years old. As with bicycling, pedestrian accidents are also aggravated by poor facilities, poor judgement, and violations by either the victim or the motorist.

If it is not the automobile that poses a threat, it can be other people. Women, particularly, express fears about being vulnerable to crime while on a bicycle or on foot; driving a locked automobile provides a much greater sense of security. Dogs, too, can be a problem for bicyclists and pedestrians.

Facilities, ironically, can pose safety problems. Poorly designed and maintained bike paths have been demonstrated to be more hazardous than shared roadways, which can cause a problem in areas that require use of these facilities. Poor design can take many forms, including inadequate width, limited sight distance, excessive turns and stops, and too many intersections, to name a few.[25]

Finally, *feeling* safe has to do with the perception of danger. If automobile traffic is too fast (greater than about 20 mph), bicyclists and pedestrians will feel uncomfortable.[26]

Theft

Bicycles are easily stolen without secure parking, which is a significant disincentive for commuters. One study reported a survey where nearly half of the respondents indicated they were afraid that their bikes would be stolen, and another survey where 25 percent had suffered theft, 20 percent of those adding that they gave up bicycling as a result.[27]

Secure and convenient parking is often the missing link in otherwise excellent facilities. Numerous cities have recognized that fact and incorporated bicycle parking into their development ordinances. Transit agencies have installed bicycle lockers, the most secure type of unattended facility, in many locations. As one author concluded: "Bicycle theft appears to be the biggest impediment to the development of bicycle access to transit in the United States."[28]

Access

Where bicyclists and pedestrians are not prohibited from areas, they are often made to travel a circuitous route that magnifies the journey. Bridges, railroad tracks, and tunnels are often off-limits. Freeways often have no crossings for many blocks. Transit stations, airports, shopping centers, and factories are often designed with little regard to approaching them by any way except automobile. Buses and trains infrequently allow bicycles to be brought on board, even when all matter of other items are permitted. Without road space (shoulders or bike lanes) to ride or sidewalks to walk, the bicyclist or pedestrian is without a reasonable route. All of these problems, many of which are designed into the facilities, limit access to bicyclists and pedestrians.

Trip Time

The time it takes to reach a destination is often cited as the reason for choosing a particular mode, particularly when traveling to work. Fifteen minutes has been cited as the maximum trip time for which a commuter will consider bicycling or

walking, which roughly equates to about 2.5 miles bicycling, or 0.75 mile walking, at a leisurely pace.

Time is a function of other factors such as distance, speed, skill, conditioning, route, and weather. Novice bicyclists, by nature of their inexperience, tend to go more slowly than an experienced commuter. Walkers, too, increase their pace over time. Once a person gives bicycling or walking a try, they often discover that the perceived disadvantages are not as great as they imagined.

Local Environment

Automobiles provide a great degree of insulation from the surroundings and the ability to speed through or avoid undesirable areas. Bicyclists and pedestrians have little choice but to endure noise, fumes, pollution, traffic, and other unpleasantries. Pedestrians, in particular, strongly favor a clean, stimulating, and attractive environment. Wide sidewalks, trees, art, insulation from traffic (buffer strips or parking), street-level businesses, multiple destinations, shelters at transit stops, and other design elements create a comfortable space where people want to walk.

Climate and Terrain

Harsh climate, nasty weather and hilly terrain are often mentioned by detractors as reasons why bicycling and walking cannot compete with automobiles. Certainly, they affect bicycle ridership and pedestrian activities somewhat, but no evidence suggests that they are limiting factors and it would be wrong to attach too much importance to them. Steep terrain is a consideration in a few neighborhoods, but cities tend to be built in level valleys and plains, not entirely on hills. No correlation has been shown between climate and whether a city or country has high bicycle and pedestrian use.

A list of the top ten cities where workers over 15 years of age commute by bicycle includes Eugene and Gainesville (rainy); Madison, Fort Collins, and Missoula (severe winters); and Davis, Chico, and Tempe (very hot summers). Only Palo Alto and Santa Barbara have what could be characterized as mild climates. Even in Scandinavia the seasonal ridership varies by only about 50 percent from peak summer use. In rainy Eugene, Oregon, bicycle use is still 7 percent in winter (12 percent in summer). Replogle notes: "Cultural attitudes and misconceptions about the feasibility and comfort of winter bicycle travel appear to account for more of the seasonal variation in bicycle use throughout the year in temperate climates than do actual weather conditions."

Purpose

The type of trip has a bearing on the choice of transportation. Major shopping trips that require carrying a large cargo limit the usefulness of bicycling and walking, although cargo-hauling bicycles, tricycles, and bicycle trailers that can easily transport up to 300 pounds have long been available.[29] Transportation of children is also cited as a need for automobile use, although there are various other means for carrying infants: backpacks, chest carriers, pushcarts, top-tube seats, and trailers. Few trips really require a car; time, security, convenience, and attitude seem to be the determining factors.

Motivational Factors

Personal motivation is often a more powerful influence than physical or rationale factors. Groups of people can suddenly change their behavior if they are given the proper motivation. As author Samuel C. Florman points out: "Society has a disconcerting way of unexpectedly changing its standards of taste. . ."[30] Carefully crafted marketing campaigns directed at the factors discussed below can help overcome resistance to bicycling and walking.

Acceptance

The predominant view of bicycling and walking in this country is that of sport or the activity of children. Few individuals and Government agencies, until recently, have considered them as legitimate forms of transportation. Even today, some public officials question their practicality. Universities rarely teach the subjects to planners and designers. Despite legislation to the contrary, many people still believe that bicycles do not belong on the street. Letters to the editor in newspapers around the country—even in Oregon—complain about bicycles and pedestrians getting in the way of motorists who are on "legitimate" trips.

Awareness

Although they may not reject bicycling's and walking's potential as transportation, many people are simply not aware of it. It does not occur to them to do anything other than climb in their car as they have done nearly every day of their adult lives. Even those who bicycle or walk recreationally may have never seriously considered using those modes to get to work or shops. Exposing these people to bike-to-work campaigns and other events is a good place to start.

Cost

The "economy of muscle power" is a strong attraction to some. In the Portland attitude study, 37 percent of respondents cited a savings in transportation costs as influencing their decision to ride. When economic depression hits the country, as it did in the early 70s, 80s, and again last year, bicycling and walking can become even more attractive. In areas particularly hard hit by the current recession, such as the New England states, the market for cheaper options is wide open. Even in areas not as affected, people are trying to stretch limited resources. For best reception, programs should be introduced when people most need them.

Financially-strapped local and state governments can also turn to more cost-effective ways of providing transportation. The savings can take many forms. All alternative modes are more energy and space efficient than automobiles, some of them dramatically so. Road maintenance and construction, pollution and associated medical costs, traffic control, police—all these costly services become less expensive when nonmotorized travel is emphasized.[31]

Lifestyle

We make many choices in the way we live—our clothing, our attitude towards exercise and the outdoors, the time we allow to ourselves, how we shop, what image we project—that go a long way towards determining our mode of transportation. The modern lifestyle that most of us have chosen depends on the auto-

mobile. To be sure, few consciously choose that approach from a menu. Rather, we tend to do what is easy, what is expected of us, what others are doing, what fits in with the role we are playing. Relentless automobile advertising certainly contributes to our decisions. Counter-campaigns are needed that emphasize a healthy, vital lifestyle that incorporates exercise and concern for the environment.

Status and Power

In the previous century, owning a relatively expensive bicycle was a sign of status over the lowly pedestrian (noun: walker; adjective: unimaginative, commonplace). By the turn of the century, neither bicycling nor walking projected the status of a powerful car. The automobile became the symbol of our prosperous culture. As we aggressively marketed our automotive technology to developing countries, they too eagerly sought the dream of automobile ownership.

> "To take control of this materialized energy, to draw the reins over this monster with its steel muscles and fiery heart—there is something in the idea which appeals to an almost universal sense, the love of power."
>
> — *Motor World*, 1901

Although the allure of the automobile still dominates advertising, sales rates have dropped in industrial countries due to saturation of the market.[32] Manufacturers have even turned to reverse advertising ("...when you have to spend 45 minutes driving to work, why not enjoy it in a..."), trying to make the best of a bad situation. Many opportunities exist to accelerate this status decline through clever campaigns.

Skill

Bicycling takes a certain amount of balance, riding skill, and conditioning. It is not a difficult thing to learn, as evident by the many children who do it, but it can be daunting to an adult. Even walking any distance comfortably can necessitate good choices in shoes, clothing, pacing, and route. Although there is no lack of information on these subjects, it is not often presented in the transportation context. Bike-to-work campaigns, fun-oriented workshops in the business place, and similar efforts can be very valuable.

> "On only one poster that I can recollect have I seen the rider represented as doing any work. But then this man was being pursued by a bull. In ordinary cases the object of the artist is to convince the hesitating neophyte that the sport of bicycling consists in sitting on a luxurious saddle, and being moved rapidly in the direction you wish to go by unseen heavenly powers."
>
> — Jerome K. Jerome, *Three Men on the Bummel*, 1900

Institutional Factors

The rules we make—good and bad—are a reflection of our priorities. The many laws, policies and codes developed by local and national agencies that discourage or prohibit bicycling and walking, as well as many unfavorable court decisions, give the strong message that these are secondary activities. The result for bicycle and pedestrian programs is poor funding, ignorance, and spotty implementation. Effective citizen lobbying is necessary to address these problems.

Legal Status

Efforts in some communities and even states to elevate the bicycle to a legal level equal to the automobile have, at best, met with limited success. Part of the problem is that half the bicyclists are children who have not developed the skills and judgment needed to ride in traffic and do not have good adult role models to copy.

PEDESTRIANS AND BICYCLES PROHIBITED

Prohibitions

There are many examples of local prohibitions against bicycling and walking. Road bike and pedestrian-bans have been common in communities that strongly emphasize automobile use. Restrictions on bridges, in tunnels, on transit, and at major intersections make bicycling and walking difficult or impossible. At the State level, bicycles and pedestrians have often been relegated to inconvenient or dangerous off-road facilities; even Oregon has an outmoded bicycle path law that prohibits on-road riding when an adjacent path exists.

Low Priority

Given the dim awareness that bicycling and walking have among the general public in the United States, it is not surprising that they have been given so little attention in Government programs. The prevailing attitude among officials, planners, and engineers is that the bicycle could never have a real impact on reducing traffic in this country. Examples to the contrary are shrugged off as being aberrations not capable of being duplicated in their city. Consequently, no one takes responsibility for bicycling and pedestrian programs that languish in the bureaucracy. Funding becomes limited and undependable, which makes competition with other modes difficult.

Many of the past failures in bicycle and walking facilities were due to the halfhearted, haphazard, piecemeal fashion in which they were developed. Little thought was given to how they connected and worked with the other transportation modes, particularly the automobile. Cities are full of nonfunctional facilities: bike paths that go nowhere in particular, sidewalks that end abruptly, reconstructed roads that added a travel lane at the expense of the shoulder, no bicycle parking at destinations, lack of curb ramps for wheelchairs, and numerous other examples of poor designs.

Summary of Factors

The factors influencing a person's decision to bicycle or walk are manyfold:

- **Physical Factors**

  Availability—bicycle may not be available

  Convenience—multitude of barriers in facility design

  Distance—many short trips still available

  Safety—most frequently mentioned factor

  Theft—major deterrent to bicycling

  Access—restrictions and lack of facilities

  Trip Time—significant but improves with experience

  Local Environment—especially important to pedestrians

  Climate and Terrain—localized problem; overrated

  Purpose—a few limitations

- **Motivational Factors**

  Acceptance—not considered transportation

Awareness—poor understanding of potential

Cost—attractive

Lifestyle—highly automobile oriented

Status and Power—low

Skill—generally lacking but can be taught

- **Institutional Factors**

Legal Status—bicycles not considered equal to automobiles

Prohibitions—denied use

Low Priority—little commitment; inadequate programs

All are important and most are interrelated. Of all the factors, only cost greatly favors bicycling and walking under present circumstances. Most of the other factors favor automobiles to varying degrees but could be turned around with a change in policies and investment strategies.

Roles

Everyone seems to have a finger in the transportation pie. Accomplishing any meaningful change in our transportation habits will require strong cooperation from varied public, private, and Government entities.

Public

The public contributes to the makeup of the transportation system in many ways. The individual's choice, be it automobile or walking, is the most obvious way. But they also vote on projects, bonds, and officials. They speak up at hearings and in letters and they appeal land-use decisions. Their input is critical to a democratic process and they are a strong voice in promoting special interests. Oregon recognized this by making citizen involvement the first statewide planning goal.

Bicycle and Walking Groups

Citizen activism is an important way of forming consensus and influencing officials. The effort of an individual can be effective but groups generally have more clout. Government agencies and even businesses to some extent are constrained in their ability to support viewpoints unpopular with the powers-that-be. Citizen groups, on the other hand, have few such constraints and can freely publicize issues such as oil drilling, global warming, noise pollution, and the like to persuade people to give up automobile trips and to garner Government support for nonmotorized programs.

On the national level, several groups have an interest in promoting bicycling and walking; one of the most effective has been the Bicycle and Pedestrian Federations of America, the League of American Wheelmen, Bikecentennial, and the Prevention Magazine Walking Club. At the State and local levels, many groups have come and gone in response to specific issues, and some activity clubs maintain "issues" coordinators that represent the membership before public agencies.

There have certainly been successes in the lobbying arena for bicycle and pedestrian interests (in New York, Ottawa, and Dallas, for example) but, on the whole, progress has been slow and spotty. Whatever the reasons—low personal

priority, cultural apathy, the occasional nature of the activities—only a few people have been at lobbying long enough to convey their experiences. What they have found is that citizens create demand and are on the leading edge of change. They are most effective when part of large, visible coalitions, and they must be willing to make a long-term commitment.

Academia

The academic sector has generally not had a positive effect on alternative transportation, despite the fact that universities and colleges are among the most popular bicycling and walking environments. Traditional curricula have not taught the planners, engineers, architects and other transportation professionals much about bicycle and pedestrian needs. Part of this is due to the lack of direction from professional groups and the local community.

Business and Industry

Business and industry make investment decisions that shape our cities and transportation systems. Their influence in the community can cause facilities to be built and programs to happen. Their willingness to encourage employees can go a long way towards making bicycling and walking popular. Their advertising methods and community outreach efforts can educate the public and help build consensus. Their professional contacts (associations and conferences) can be used to increase the awareness and benefits of alternative transportation.

Local Government

In most areas, local government has the responsibility for planning under the broad policies set by the State and Federal Governments and those determined by their constituency. Local municipal and county officials are the ones shaping our urban form. They have powerful regulatory powers: parking controls, zoning, some control of housing patterns, public right-of-way dedicated to parks and streets, and enforcement. By stressing mixed-use zones, affordable housing (so that people can live close to work) and limited parking, local governments can take a huge step in fostering a balanced transportation system.

So far, city and county efforts have been spotty. Despite an impressive number of bicycle, trail, and alternative transportation plans, little real implementation has occurred in the United States. Comprehensive plans often speak to the importance of bicycling and walking, but the councils and the planning and public works departments infrequently incorporate these policies into the codes, ordinances and specifications that shape development.

Failures occur when local governments do not develop community support from businesses and neighborhoods. Government has the tools and expertise to put together good plans to guide development, but the business interests control investment and the citizens determine demand.

State and Federal Government

The role of the State and Federal Governments is primarily that of policy setting, leadership, enabling legislation, and cooperation. They set the legal status of bicyclists and pedestrians, determine safety requirements for vehicles and facilities, support research, and fund programs. Several states—Oregon, California, Florida, and Minnesota—have taken the lead in recognizing bicycle and pedestrian transportation. Oregon was the first: "The policies which have guided the Oregon bicycle program are among the best in the nation, and it is no surprise or accident that both Eugene and Portland are among the best cities for bicycling in the United States."[33]

> "In the most under-reported story of the year, (Congress) redirected 120 billion in federal dollars, and billions more in state funds, toward support of rail, transit, van, pedestrian, bicycle and congestion-management options, seating dozens of new decision makers at tables once reserved for highway engineers. The new law is a promise that will have to be redeemed in tough political combat, city by city and state by state. Air quality, oil needs, congestion and rational land use will all be determined by the outcome."
>
> — Jessica Mathews, Vice President of World Resources Institute, *State of the Planet*, December 1991

The Federal Government can be enormously influential. It has taken a prominent role in turning the public away from smoking and drinking, and it could do the same for excessive automobile use. The existence of the National Bicycling and Walking Study shows that alternative transportation has the Government's attention. The new Surface Transportation Bill and the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 establish bicycling and walking as legitimate forms of transportation and support their widespread development. The ISTEA requires States to staff an alternative transportation coordinator and, along with metropolitan areas, to develop long-range plans for bicyclists and pedestrians.

The ISTEA also provides flexibility in how funds may be used rather than restricting funds to narrow program categories focused on highway construction. This is an important change in direction that has great potential for bicycling and walking projects. However, without Government's definitive support, such projects will have a difficult time competing against the well-established automotive programs and the very expensive transit systems.

3. STRATEGIES

The target market is identified and analyzed, with an emphasis on the general population rather than existing bicyclists and walkers. Various marketing techniques to increase the motivation to bicycle and walk are examined. Both personal incentives and disincentives are considered, as are ways of influencing the organizations that control transportation planning and implementation.

As already noted, the overriding issues—lack of choice, lack of motivation, lack of institutional support—have resulted in a large range of factors that need attention. Consequently, the programs that work best are basic and diversified. They deal in the long term and involve many disciplines: the four E's (engineering, education, enforcement, and encouragement) as well as planning, architecture, administration, and others. They are an integral part of the overall transportation and environmental strategy. Most importantly, they are directed at all levels of society, from the national agencies down to the individual commuter.

Who Drives and Who Doesn't

Transportation touches all people like few other activities. It cuts across age, race, neighborhoods, income, and professional interests. Even those who are bedridden depend on others who can move about. While bicycling and walking are not options for some—the very young, very old, severely disabled, and those needing to travel long distances or carry large loads—the vast majority of people could use these modes for at least some of their trips (refer to *Factors to Consider* in *Section 2: Overview*).

In reality, 87 percent of trips to work are by automobile. Who are these people, and who are the 5 percent who ride bicycles or walk instead? The answers, as explored below, are intuitive: people who drive most are more likely to be suburban or country dwellers, old enough to have a driver's license, employed regularly, and committed to an automotive lifestyle.

Those who favor nonmotorized modes tend to live in the city where destinations are nearby, are all ages, and include children who are too young to drive. Should these people who already bicycle or walk be ignored? Certainly not, for two reasons. If they live in an area where many people already bicycle or walk, they will be comparatively easy to attract because some of the favorable conditions already exist; they may also be encouraged to bicycle or walk more. If, on the other hand, they live in an area of heavy automobile dependence, more basic programs can be started that will lay the groundwork for larger changes in the future.

Many Americans already bicycle or walk regularly, usually as part of their fitness regimen. There are an estimated 90 million cyclists, including 23 million adults who ride at least once a week, and 3.2 million commuters. Walkers make up one of the largest groups in the country, inasmuch as only the severely disabled do not walk. Both bicycling and walking fitness activities attracted participation from nearly 30 million Americans. Both activities are predicted to grow, albeit at a slower pace than they have in recent years.[34]

The potential market is huge. There is so much untapped potential for bicycling and walking in this country that virtually no segment of the population should be left out.

Figure 5.
Population density results in more bicycling and walking.

City	Density (people/ hectare)	Workers using bicycle or foot
Phoenix	9	3.2%
Denver	12	5.3%
San Francisco	16	5.5%
Chicago	18	6.2%
New York	20	8.1%
Stockholm	51	20%
Zurich	54	21%
Vienna	72	15%
Tokyo	105	25%

Geographic Profile

Density

Among cities of roughly the same size, the ones with higher density tend to have more bicyclists and pedestrians (see figure 5). Sprawling American cities put most destinations far from home, which makes bicycling and walking less feasible. The FHWA study showed 88 percent of their sample automobile trips originating from low-density housing, while only 56 percent of the walking trips did.

City Size

An examination of commuter statistics shows a steady decline in bicycling as city size increases. The cities with the top bicycle ridership among commuters are consistently small to moderate size. However, small size does not guarantee favorable conditions since there are many such cities that have poor or average ridership.

Demographic Profile

Age

Bicyclists tend to be younger than walkers. Of the 90 million U.S. cyclists, 47 percent are children (under 16) and 53 percent are adults.[35] In terms of age groups (see figure 6), ridership is at its peak in the 7 to 11 bracket (54 percent participation), takes a nosedive at driving age, and continues with small but steady decreases thereafter, eventually bottoming out in the 65+ bracket (10 percent).[36] The median age of new bike buyers is about 36. Census data for 1975 show that the median age for commuting bicyclists over the age of

13 was 22.5, while that of walkers was 35.4.[37]

Walkers, on the other hand, tend to be older. The most popular age brackets are 55–64 (40 percent), 45–54 (38 percent), and 35–44 (34 percent). Apparently, people tend to take up bicycling as a child, generally abandon it when they start driving, and take up walking in later years.

The FHWA study, which confined itself to people over 15 years of age, found that bicyclists were younger than users of all other modes. Compared to automobiles, bicyclists averaged 32 and 29 years for work and shopping trips, respectively, versus 37 and 40 years for automobiles (and about the same for pedestrians).

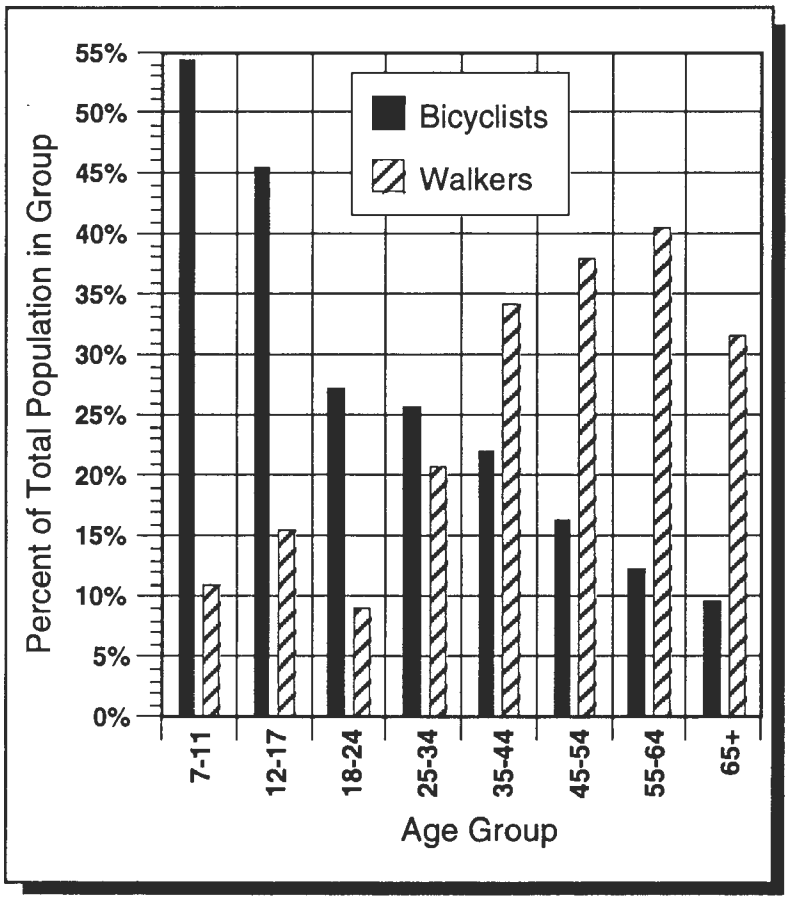
Income

The 1975 Census data show that bicyclists and walkers over the age of 13 have among the lowest incomes of all commuters—up to one-half less than solo drivers.[38] This figure is probably low due to the many students in the 14–21 age group. A survey of Portland residents showed that bicyclists in the higher income categories (above $20K) tended to ride more, with the maximum participation being in the $40K–50K group; median income for Oregon was in the $20K–30K range.[39]

Sex

Among adult bicyclists, about 45 percent are men and 55 percent women.[40] Commuting surveys, however, show that over 75 percent of bicyclists are male.[41] The FHWA study found that for all trip types, 67 percent of bicyclists were male compared to 49 percent for pedestrians.

Figure 6.
Age distribution of fitness bicyclists and walkers (1988).



Disabilities

Although the disabled are not frequent bicyclists, they do use pedestrian facilities frequently, either walking or in wheelchairs. They have an entire set of special needs that, while addressed to some extent by Federal and State regulations, would greatly benefit from more and better general pedestrian facilities.

Occupation

Certain occupations, such as sales representatives, that require much travel or operate from a vehicle do not lend themselves to bicycling and walking. In general, however, there is nothing to keep a person in most occupations from bicycling or walking. Those who drive the least tend to lack consistent employ-

ment, college students being the obvious example. Nearly all of the cities with a high proportion of commuting bicyclists have large colleges, although there are many cities that combine large colleges with very low ridership (Louisville, Akron, South Bend, Memphis, Dallas, etc.); certainly, many of the other factors mentioned here strongly influence ridership.

Activity Choices

Walking and bicycling are the number two and three ranked sports activities among Americans, losing to only swimming. Data for 1988 show 29 percent of the population (at least 7 years old) walks for exercise, compared to 25 percent for bicycling.[42] Of new bike buyers, 90 percent are casual or infrequent riders (less than 15 miles per month).[43]

Encourage Alternative Transportation

Alternatives to the automobile have been a serious topic for at least several decades. Many experiments have been tried and the successes and failures have been duly noted in the literature. There is general agreement that a successful program will have three elements: realistic options, an enlightened and involved public, and strong Government support.[44] Creating those options, informing the public, and garnering support are the objectives of the strategies discussed below.

> "We've been trying to sell cyclists of all ages and abilities on very detailed and demanding education and training programs designed to make them more like motorists. Bicyclists have shown they don't want this. What cyclists repeatedly tell us they do want is more safe places to ride, and it is time we listened to that message."
>
> —Bill Wilkinson, Bicycle Federation of America Executive Director, 1991

Any single strategy, by itself, realizes only modest gains in bicycling and walking. The best approach is a combination of strategies that creates a sustainable system, similar to what motorized traffic enjoys. As the FHWA study notes: "The infrastructure for automobile travel includes not only the street and highway system, but also safe levels of lighting, ubiquitous parking facilities, and a proliferation of signs, signals, and controls aimed at ensuring a safer driving environment... it is perhaps this type of commitment to a mode that is needed to insure its acceptability and success."

Provide Facilities

For bicycling and walking options to exist, usable facilities must be in place, along with the land-use designations to support them. The critical physical factors of convenience, distance, access, and safety all benefit from good facilities. As the FHWA study concluded: "...facilities can play a prominent role in increasing nonmotorized travel, particularly if they are provided in the context of compact land use configurations such as college campuses, residential areas near central business districts, and in areas where shopping opportunities are within walking or bicycling distance...." Without going into the design aspects, which are well documented, the key facility issues that need promotion are discussed below.

Integrated Network

Bicycling and walking must be a partner with the other modes if they are to achieve widespread use. They must be elevated to the same level of planning, design, and funding that goes into the other modes. They logically fit into the short-range travel options, up to about 5 miles by bicycle and 1 mile by foot. They are ideal as collectors and distributors at transit nodes. On the cityscape, bikeways and pedestrian routes should form a grid, finer than the road system, that connects all likely origins and destinations in the most direct manner.

In a new development, this means "clustering" residences, employers, institutions, and commercial businesses together to reduce travel distances. In built-up areas, the first step is to identify where the desirable clustering has occurred (typically college campuses, shopping centers, central business districts, and nearby residences), followed by a plan to provide facilities where they will do the most good; in conjunction with this, future development must be directed to create a more compact land use.

An integrated network also means "traffic calming" in built-up areas, whereby various techniques are employed to reduce automobile speed and encourage alternative transportation. Together, the combination of an uninterrupted and unimpeded grid of paths, priority to bicyclists and pedestrians, and short travel distances almost guarantees the success of these systems. Groningen in the Netherlands has used this integrated approach to achieve an impressive 50 percent of all trips in the city by bike or foot.[45]

Finally, routes must be a part of the regular maintenance schedule, so that they do not deteriorate or become unusable because of debris or snow.

Access

Areas difficult to reach by bicycle or on foot, or services such as drive-up windows, should accommodate these modes. Commercial businesses should be next to sidewalks and easily seen by pedestrians. Sidewalks should lead directly to building entrances and be visible from windows (providing visual interest and safety for pedestrians).

Dedicated Areas

Blocked-off streets where automobiles are excluded or limited to local travel work well where there is a city center plagued with traffic congestion. And people like areas free of automobile traffic. Longer "Bicycle Boulevards" that provide a dedicated, alternate route parallel to congested streets have also been successful (in Palo Alto, California, for example). Narrowing the streets and widening the sidewalks to create a more balanced land use while still allowing through automobile traffic, as was done in downtown Portland (see Section 4), is another possibility. Also, many opportunities exist for plazas and no-vehicle passages between buildings.

Trails and Paths

Separated foot trails and bike paths can be main travel corridors if they are located centrally, have ample access, and are designed for the intended use. Bike paths are valuable training areas for would-be commuters and as recreational facilities on weekends. They are more expensive than on-roadway facilities

(bike lanes and shoulders) and have special design considerations, but they are very popular. One need look no further than the river paths in Eugene, Oregon, to appreciate their value. Eugene is also an excellent example of the importance of bridges. Three bicycle and pedestrian bridges span a large river, providing direct access on paths to downtown streets.

Bikeways and Sidewalks

On-road bikeways and adjacent sidewalks form the bulk of the circulation grid. Built according to the anticipated use, they connect up with the separated trails and paths and with the various origins and destinations, including transit and park-and-ride lots. There are many appropriate designs, each suited to a particular environment. Highest priority should be given to connections between high-density residential areas and local employers, businesses, and transit stations.

Parking

It would seem obvious that any bicycle trip requires some sort of parking at its destination; the longer the stay and the rougher the neighborhood, the more secure the parking needs to be. Yet, of all the ways in which bicycles have been neglected, parking may be the worst example. Lack of adequate parking is almost always cited as a reason people do not bicycle, right after personal safety. An increasing number of cities are requiring bicycle parking in new developments. Covered parking or bike lockers are provided by companies such as Xerox and Hewlett-Packard in Palo Alto. The Federal and State Governments could mandate that any projects built with their funds include adequate bicycle parking.

Showers and Changing Rooms

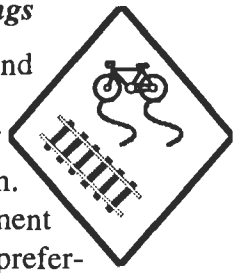
Arriving at work sweaty from exertion with nowhere to shower and change discourages all but the most die-hard cyclists. The Bicycling Magazine poll[46] found this to be a deterrent to many potential bicyclists, especially women. Some communities (Palo Alto, California started the trend) require showers and changing areas at new major commercial and public buildings above a certain size. The mass of potential riders teetering on the brink can be turned into regular commuters when these basic facilities are provided.

Many companies have found that showers and changing rooms are a good investment not only because they encourage bicycle commuting but because they allow employees to exercise during the day, perhaps as part of a company-sponsored program. Fit employees are absent less, make fewer insurance claims, and perform better on the job.[47]

Intersections and Crossings

Most bicycle and pedestrian accidents occur at intersections and other road crossings. Ample road crossings that minimize conflicts with traffic are needed in high-use areas. Redesigning the facility to give nonmotorized traffic priority has proven successful in European cities.[48] Various techniques include "bulbs," grade-separated crossings, recessed stop lines for cars, narrower streets, and many others. Bicycle-sensitive signal detectors are also important, whether in the roadway or a bike lane, as are pedestrian-actuated traffic signals.

Signing and Markings



Carefully signed and marked pathways provide a variety of valuable information. For example, pavement markings delineate preferential lanes and crosswalks, channel traffic safely, and denote buried loop detectors. Signs tell of special regulations, provide directions to parking and entrances, give destinations and distances, and warn of potential dangers.

Appeal to Personal and Common Good

Unfortunately, just having the option to bicycle or walk is often not enough. People need encouragement. One easy way is simply to tell them why it is so important to leave their car at home: personal health, a sustainable future for their children, and many other reasons should be repeated at every opportunity. Public goals and Government expenditures might also address them.

Health

Personal fitness is an increasingly popular concern. Corporate health programs were found to return $3.44 for every dollar invested by reducing sick days, improving productivity and decreasing insurance claims. In its Wellness Program, the U.S. Forest Service allows employees to spend part of their working day in aerobic fitness activities. It stands to reason that bicycle and pedestrian commuting would have an even higher return because it improves health without company-owned health equipment or programs during the workday, while it simultaneously reduces parking costs.

Aesthetics

Moving under our own power with minimal impact is an increasingly appealing notion in a world beset with automotive-related problems. Given an attractive environment and the chance to experience it, people naturally choose to move under their own power. Facility designs should appeal to human senses and provide plenty of opportunities to rest and enjoy the surroundings.

Social Clubs

Both bicycling and walking lend themselves to group activities where socializing can occur. The support and company of other like-minded people are strong incentives. Groups, large and small, such as the American Volkssport Association, the Cascade Bicycle Club in Seattle, the Meridian Park Hospital walking group in Portland, and local clubs in many cities are a good example of this.

Societal Concerns

Asking people to think about the consequences of their driving can be an effective tool. Both bicycling and walking have superior performance in energy efficiency, air pollution, and other factors of importance to society.[49] For example, 45 percent of the energy consumed in Oregon is imported gasoline for transportation. Even a small decrease in this figure would have a large impact. If each American adult rode or walked just 5 miles per week that they would normally drive, our annual gasoline consumption would drop by 1.2 billion gallons, while carbon diox-

ide emissions would be reduced by 6.7 tons.[50]

Sustainability

When people are made aware of the resource depletion, social inequality, and economic instability of our automobile-based transportation system, they may be willing to try alternatives. Sustainability and its importance to this and future generations should be a frequent message to the public for all transportation planning. For example, 80 percent of the world's oil will be used up by 2020, and yet we continue to use it as if it is unlimited.[51]

Economic Efficiency

We spend so much on automotive transportation that the figures alone may persuade people to decrease their driving. Total Government subsides and personal auto-related expenditures are *each* estimated at $300 billion annually. American Government spent $57.5 billion on just highway construction and maintenance in 1985.[52] Our automobiles travelled over 1.3 billion miles in 1987 at a cost of $0.25–$0.50 per mile to the owner. By comparison, bicycle operating costs, including special clothing, work out to $0.03–$0.05 per mile. A person commuting 5 miles to work each way could save about $20 per week by cycling.

Livability and Quality of Life

Livability is a popular topic in communities, that can easily be tied into transportation. Many if not most of our cities suffer from the lack of transportation options. Mobility is hampered for those who do not own a car, traffic jams generate negative moods and aggression, noise and fumes cause tension and health problems, and automobiles intimidate those on bicycle or foot.

Give Incentives

A number of things can be done to make it easier to bicycle and walk and to reward those who do. Some tried and true carrot-and-stick techniques are described below.

Stipends and Subsidies from Employer

The direct approach to encourage bicycling and walking is to pay employees to do it. Stipends of about $25–$30 per month can be effective and have been used in California. The Alza Corporation in Palo Alto pays its employees $1 for each day they ride to work. Reimbursing employees for business travel on bicycles (the City of Palo Alto pays its employees $0.07 per mile for business and travel), as is done for cars, is becoming increasingly popular.[53] Employees who commute by bicycle or on foot should also be included in any incentive programs offered to those who rideshare.

Another approach was taken by Emanuel Hospital in Portland that offered employees $4,000 to buy homes in the local neighborhood—within walking distance of work. An even more direct subsidy would be to forego parking costs and give the money directly to employees.

Flex Time

Allowing bicyclists and walkers to schedule their work day so as to avoid rush hour or darkness would encourage some commuters to try those modes.

However, if everyone including drivers is also allowed flex time, people will tend to return to their cars. Thus, flex time needs to be preferential or combined with other incentives.

Bicycles and Maintenance Provided

Rather than give stipends, some employers have offered to pay for an employee's bicycle after a certain period of riding in regularly or to set up a credit program for its purchase (such as the City of Glendale, Arizona, and Food 4 Less Supermarkets, Inc. in La Habra, California). Arranging for service at a local shop is another perk. Another incentive that can be arranged by the employer is a special discount at a local bike shop for commuter accessories and clothing; if a bike shop can expect some business to develop, they are often willing to give a discount.

Ride-Home Service

For companies with a vehicle at their disposal, an offer to take the employee home if the weather turns bad or if they need to work late unexpectedly can ease the fears of both the employee and the employer about bicycling or walking (such as done by Fleetwood Enterprises Inc. in Riverside, California).

Awards and Commendations

Approval is a powerful incentive. By singling out employees who commute by bicycle or walking, others can be encouraged to try. Competitions can even be arranged between departments. The Jet Propulsion Laboratory Bicycle Club in Pasadena, California, has one such program.

Special Events

"Bike to Work" or "Leave Your Car at Home" days are popular around the country in the spring and summer (for example: Boulder, Colorado; Portland, Oregon; Santa Cruz, California). Employer sponsorship and support can be an inducement to potential bicycling and walking commuters. Various publications listed in Appendix B explain these events.

Relaxed Dress Code

Some offices have formal or informal dress codes that are not entirely compatible with a commuting bicyclist or walker. For example, wrinkle-free fabrics, comfortable shoes and minimum makeup should be approved.

Increase Safety

As already mentioned, safety is people's number one concern. Good facilities will help, but some people will continue to endanger themselves and others without some special safety measures. Another aspect is that safe, predictable riding and walking will command respect from motorists and improve the image of nonmotorized travel.

Improved Facilities

Traffic calming measures, adequate signal lengths, obvious crosswalks, buffer strips, attention to sight distances, adequate lighting, and other design factors can improve bicyclist or pedestrian safety. Codes requiring street-level windows and pedestrian-accessible building entrances improve safety as well. In general, safety goes up in areas of heavy use where there are many people around. Even vehicle design can be improved to reduce pedestrian fatalities.[54]

Traffic Enforcement

Ticketing drivers who do not stop when required and who park illegally, pedestrians who cross on red and in midblock, and bicyclists who disregard traffic laws is an accepted safety tool. Unfortunately, violators often go unpunished and drunkenness is too often weakly penalized. This contributes to a chaotic and dangerous situation. Local enforcement programs need to be established and funded. To be effective, these programs must educate the police in proper bicyclist and pedestrian behavior and must have community support. Cities such as Seattle have enforcement programs that stress these aspects.

Safety Patrols

Neighborhood volunteers can be recruited to patrol near their homes for unsafe behavior (motorists and nonmotorists) and conditions. Although these volunteers have no enforcement powers, their presence and participation are thought to improve safety and community awareness. The Speedwatch program used in Portland and elsewhere is one example.

Classroom Instruction

Many concepts of safe bicycle and pedestrian commuting can be conveyed in the classroom, often in conjunction with on-street tours. This approach is most useful when the audience is captive or highly motivated. For example, Palo Alto has a traffic school for juveniles who violate bicycle laws. Traffic education should be a part of school curriculum. We spend about $200 on driver's education for each 16-year-old but only $1 worth of traffic-safety education from birth to age 15.[55]

Riding Clinics

Bicycle skills and proper behavior in traffic can be taught in various places such as schools, recreation departments, churches, and community service clubs.

Educate and Inform

Potential bicyclists and walkers must first be made aware of their options and, second, shown how to use those options safely and effectively. Motorists, too, should be taught how to interact with bicyclists and pedestrians. Employers, clubs, public-service groups, special-interest groups and Government agencies all play a part in various programs around the country (see *Section 4: Protland's Example* and *Appendix B: Literature Review* for examples). Some of the activities and products include:

- Activist and club literature
- Nonmotorized commuter programs
- Media campaigns (ads, public service announcements, etc.)
- Motorist's training and licensing
- Neighborhood workshops
- Skill and safety courses
- Participation events
- Maps and route information
- Role models
- Commuter "races"

Trends in Controlling Automobile Use

Because the automobile is in such a powerful position, Government actions need to be taken to lessen its attractiveness. Only when driving is made inconvenient will many people begin to consider other options. The following strategies have either been tried or considered in this country.

Most of the strategies are economic. It is thought that if automobile owners pay more of the hidden costs of driving through various taxes and user fees, then they will drive less. This approach has, in fact, proved successful in many countries.[56] The strategy is superior to incentives among people who are, in general, supportive of bicycling and walking but choose to drive instead. It is also the most controversial strategy because people have become used to automotive subsides, estimated to be over $400 per vehicle annually. Many people, even transportation professionals, mistakenly believe that highway users pay all direct costs.[57]

Road System Fees

Charging people to drive on certain roads or at peak hours would cause people to look for cheaper modes. The FHWA study found that a $2 per day fee in 1980 resulted in a 30 percent drop (from 72 percent) in automobile preference for work trips, although transit took up half of the shift with bicycling and walking taking up the other half.

The type of fees charged would depend on the exact objective and on what is most practical in the community. For example, controlled-access roads lend themselves to electronic sensing, bridges to tolls, and downtown areas to purchased stickers.

Parking Fees

Free parking is a strong inducement to drive. The tax laws reward employers who provide free parking. Developers often feel obliged to provide, at considerable cost in land, free parking to attract clients. Furthermore, these parking subsides have the effect of increasing the demand for parking, causing more spaces to be created. It is estimated that every car has eight parking spaces, worth about $1,000 a year.[58] Reducing the demand by means of fees is an obvious step already being taken in some communities (most large downtown areas have resorted to parking fees), although it must be done in conjunction with on-street parking ordinances to avoid clogging the streets with parked cars (unless congestion is an objective; see below).

Registration Fees and Taxes

An added fee, perhaps earmarked for alternative transportation programs, charged on top of automobile registration is another way to discourage automobile use. For example, the Netherlands and Denmark impose, respectively, whopping 47 percent and 186 percent sales taxes on the purchase price of a new car and enjoy among the lowest per capita miles of automobile use in the world. Japan hits car owners with a $2,000 registration fee every 2 years for the life of the vehicle, and stringent smog measures make it necessary for owners to install an expensive new engine every few years as well. Vehicle emissions fees are another potential disincentive.

A study of Wisconsin transportation expenditures estimated that a local "wheel tax" of about $150–$250 per vehicle per year would cover the direct subsides (highway infrastructure and traffic police costs) normally paid for out of general funds. This would allow other revenue sources, notable property taxes, to be reduced. At present, only two local governments in Wisconsin impose such fees.[59]

Gas Taxes

Gas taxes are an accepted way to gather revenue while discouraging driving. Unfortunately, the tendency in the United States is for small, phased-in increases that give people time to adjust to paying more. Furthermore, the revenue is dedicated to highway uses that just encourages more driving. Most European countries, which have gas taxes up to eight times ours, put a large part of their revenues into a general fund.

The FHWA study demonstrated that automobile use could be expected to drop rapidly with an increase in gas prices up to a point ($2 per gallon in the survey) after which the drop is much less dramatic.

Legislation

The Federal Government has a powerful tool to control automobile use in its legislative responsibilities. Eliminating parking subsides to employers, raising the gas tax, funding alternative programs, enforcing clean-air laws, reducing the oil depletion allowances and other tax breaks, and many other actions would all be effective ways to decrease driving and promote other modes. Legislation such as the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 and the Clean Air Act Amendments of 1990 have great potential if they are enforced. (Perhaps the most notable example of missed legislative opportunity is demonstrated by the 1949 Federal trial which found anti-trust violations in the dismantling of transit lines and fined the offenders $5,000.[60]) States and local governments have similar powers that can be applied effectively.

Increased Congestion

Congestion can be used as a traffic and behavior-control method. By purposely designing streets for limited use or by refusing to try and keep up with the unlimited demand for more roads, communities can redirect their resources into alternative programs. The result is that people look for alternatives to the automobile, alternatives that are coincidentally made available to them.

Restrictions

Various restrictions to automobile use are applicable to specific areas. These do not cost the public anything but aim to limit access. Permits, preferential lanes, auto-free zones, parking freezes, time limitations and trip reductions are some of the techniques that dissuade automobile use.

Public, Professional, and Government Interaction

Without strong professional and Government support, well-conceived programs stand an excellent chance of drying up from lack of funding and implementation. Without citizen participation, voter understanding will be lacking. Proven ways for these groups

to interact is through advisory committees, program coordinators, and professional organizations.

Advisory Committees

Many communities and states have appointed an advisory committee to help in bicycle matters (and sometimes pedestrian issues, too). These have taken many forms from all staff to all citizens; most are some combination of Government and citizen participation. Their success, which has varied from place to place, appears to depend greatly on the dedication and effectiveness of the members and the level of the involved staff.

Bicycle and pedestrian facilities and programs can involve many government areas—city and county boards, planning, public works, police, parks, schools—that necessitate constant communications with the other areas and with the public. The advisory committee can play a crucial role in establishing consensus and cooperation between these groups. They can also help "train" the diverse professionals, enlighten the decision-makers and educate the public in bicycle and pedestrian issues.

Citizen input at all levels is essential to a program's lasting success. Bicycle and pedestrian programs are, more than most, dependent on the desires of their users. Citizen involvement empowers the citizens and the staff; the citizens feel that they are part of the process, and the staff has the advantage of public support.[61]

Citizen advisory committees also play a crucial role as public watchdog to see to it that bicycle and pedestrian issues are addressed properly. Few planners, engineers, administrators, policemen, maintenance workers, and other public servants have received any formal training in such issues. The advisory committee can provide an important function by reviewing all proposed developments and programs for their effect on bicycling and walking.

Coordinators

A coordinator can be critical to a strong and active bicycle and pedestrian program. The position not only provides a focal point within the Government for the program but it also administers the Master Plan, supports the Advisory Committee and other Government departments, and acts as a spokesperson for bicycling and pedestrian matters. Strong public relations skills are a must. As bicycle and pedestrian thinking becomes commonplace within the Government, the coordinator can play a more prominent role in promotion.

Several States including Colorado, Florida, New Jersey, North Carolina, Oregon, and Texas have coordinators, and all States must have them under the ISTEA. There are well over a hundred regional, county, and city coordinators as well.

Professionals

Professionals in the fields of planning, engineering, traffic management, and the like have a profound influence on bicycle and pedestrian programs. Unfortunately, far too many professionals are ignorant of bicycle and pedestrian needs and potential. They can keep informed of current practices, public needs, and Government program opportunities through publications, conferences, seminars, and workshops. The Government should develop and implement educa-

tional programs to assure that professionals who work on transportation projects are adequately trained in nonmotorized modes. The Federal Highway Administration and National Highway Traffic Safety Administration are developing such a course.

Marketing Must be a Partner With Planning

Transportation, land use, energy, and pollution are so intimately related that any attempt to market a particular mode of travel should work closely with the various planning activities. These should all be part of a comprehensive plan that refers to State and Federal plans.

Transportation

Transportation planning is prominent at all levels of Government and deals in such diverse facilities as roads, parking lots, transit, bikeways, sidewalks, airports, seaports, and pipelines. When planning is properly done, the various transportation modes work together to move people and products efficiently. "The question has long been debated about whether land-use planning or transportation-facilities planning has the greater effect on shaping the physical environment and which should come first. We only need to look at the influence of the Federal interstate highway system and what it did to contribute to urban sprawl to see the importance of traffic and circulation to zoning."[62]

Marketing goals should be tied into transportation planning so that more bikeways, sidewalks and other facilities can be built to accommodate the increased need, while competing modes are scaled down. A redirection of funding is paramount. Eliminating automobile subsides, as was discussed under Trends in Controlling Automobile Use, would have the added benefit of raising the visibility of public decisions on transportation.[63]

Land Use

Land-use planning is in various stages of development around the country. Most governmental bodies at least recognize its importance in providing efficient, livable cities, even if their actions do not always follow through. Although many of our auto-dominated land-use patterns are only a few decades old, they have long-term effects and offer little flexibility in addressing problems. Planners must deal with a variety of factors to reduce auto-dependence: population density, housing, city centers, automobile infrastructure, and provision for options.

Oregon has a very extensive program of statewide land-use planning. It was adopted in 1973 and has played a large part in Oregon's reputation as a progressive State. The program contains 19 goals that set forth mandatory standards; for example, the cities and counties are required to plan and zone land and to consider a balanced transportation system.[64] Because there are stringent requirements at the state level, it is more likely that sound and consistent transportation plans are developed at the local level.

Energy and Pollution

The reduction of energy and its polluting byproducts for transportation is a stated national goal. Bicycling and walking should be a prominent part of any such programs.

4. PORTLAND'S EXAMPLE

Portland is a positive example of how a large city has faced the challenge of shifting from excessive automobile use. Portland's recent explosive growth has resulted in about 440,000 city residents and over 1.2 million in the metropolitan area. Decades of automobile dependence and low-density expansion have created the problems most American cities can relate to. Portland's solutions demonstrate the importance of systemwide planning and public support as well as how nonmotorized modes enter into the thinking.

> "Our challenge today is to stay ahead of the curve: the increasing vehicle miles traveled per person and the regional growth. We cannot afford to deal with fragments. We have to find ways to bring everybody to the table to deal with it in its totality."
>
> — Earl Blumenauer, Commissioner of Public Works, City of Portland

By turning to transit and pedestrians, Portland's central business district was rebuilt and revitalized. Various programs to encourage bicycling have resulted in Portland being touted as one of the best U.S. cities for both bicycling[65] and walking.[66] Although each city has its unique characteristics and needs, Portland provides many useful examples of how a large U.S. city can deal with its transportation problems and how solutions can only be successful when taken as part of comprehensive urban and regional plans.

Obstacles: Rain, Bridges, Hills, and Suburbs

There was a T-shirt years ago that proclaimed: "Last year 300 Oregonians fell off their bicycles...and drowned." The infamous Portland rain (actually, only 37 inches per year—less than Chicago) is not the only obstacle to bicycling and walking. There is the Willamette River dividing the city, significant hills in the western half, and a city spread out over 125 square miles with many adjoining suburbs forming a large metropolitan sprawl typical of modern, car-based cities.

Portland is home to 437,319 people (3,507 persons/mi^2). The metropolitan Portland-Vancouver area was credited with 1,239,842 people in the 1990 Census, placing it 27th in rank among U.S. metro areas. Its density is somewhat below average for a large city (rank of 36th in 1986).

Portland was settled in the 1850s at a prime location on the west bank of the Willamette River near its confluence with the Columbia River. Although bicycles were to make their appearance a

few decades later, water provided the main locomotion at first. By the 1860s much of the current road framework was in place, with major streets following historical routes and claim boundaries. The Willamette River and the West Hills were the primary barriers to travelers.

The first railroad, built in 1868, spurred development of East Portland. The transcontinental railroad arrived in 1883, and by 1900 Portland was rapidly approaching its first 100,000 residents, 90 percent of whom lived within a half mile of a rail line; there were 1,600 street cars in the metropolitan area at the turn of the century. In 1940, there were 305,394 residents and 843 miles of paved roads; by 1990, the population rose 43 percent while the paved roads increased 98 percent (to 1,666 mi.).

Central Business District

As with cities across the country, the vitality of Portland hinges on its downtown area, or Central Business District. Building a strong city center has been crucial in Portland's transportation strategy. Downtown is by far the largest employment center in the region, with 100,000 employees and 40 million square feet of building floor area. Its 1.2 square miles also contain about 9,000 residents. The street grid features an unusually small 200x200-foot block pattern where 40 percent of the land area is public right-of-way. It is a space originally designed for pedestrians and ease of movement.[67]

From Pedestrians to Trolleys to Automobiles

In the 1870s, as the city expanded across the river, horse-drawn trolleys were introduced and expanded very rapidly, becoming electric in 1889. Bridges and street cars were private ventures. Transit led development and supported itself by selling land. Consequently, subdivisions concentrated along rail lines that radiated from the city center. The downtown streets had an even distribution of modes (center trolley, narrow car lanes, wide sidewalks).

With the automobile came many decades of farflung, low-density growth. The older, close-in neighborhoods also became less densely populated, and people turned away from the city's heart. Cars filled streets originally designed for trolleys and pedestrians. The first traffic count was in 1918 and resulted in widened roads (even truncated buildings along one major boulevard) to make more room for

Figure 7.
Downtown Portland features a tight grid system and the Willamette River.

cars. It is a pattern repeated many times in cities across the country. The first freeway came in the 1950s, followed by the start of the Interstate Highway program.

In the two decades following World War II, the private transportation lines went bankrupt as commuters turned to automobiles. Downtown became dominated by offices, clogged with cars during workdays, and dead at other times. The result was that, by the late 1960s, Portland's air quality had deteriorated substantially. Between 1971 and 1973, Federal air quality standards were violated one out of every three days.

The Downtown Plan and a Return to Pedestrians and Rail

By the early 1970s, the community—the city, businesses, and the public—were seeking solutions to the decay of the Central Business District. Meanwhile, the State was developing new land-use planning legislation (refer to *Marketing Must be a Partner with Planning* in Section 2) that included compact urban growth and multimodal transportation goals. The time was ripe for creative solutions.

The downtown business interests proposed a jointly-funded improvement plan to the city. In 1972, Portland adopted the Downtown Plan that gives priority to pedestrians and emphasizes transit for access. The land-use plans include a unique "transit mall," the first of its size in the country (completed in 1978), where through traffic is prohibited, and high-density development along the transit route. Other plans call for various measures to promote walking:

- reduced parking spaces, especially for commuters
- wide sidewalks and well-designed curb cuts
- enhanced walking environment with amenities and art
- free bus rides within downtown
- development requirements for ground-floor activities or windows to activities

In addition, two-thirds mile of a four-lane highway next to the river downtown was plowed under for a park that includes a popular bicycle and pedestrian path. The Downtown Plan has continued to guide development, not only in the Central Business District but in adjacent districts through the Central City Plan, which was adopted in 1988 after extensive citizen input and review. Each district focuses on a transit spine, usually light rail, and pedestrian facilities.

> "As for the transit-land use connection, the relationship has been institutionalized. It's no longer just a planning theory, it's a practical policy, paying dividends every day. In Portland, transit is not just for moving people, it's a central part of our strategy to guide growth and protect our quality of life."
>
> — G.B. Arrington, Jr., *Light Rail and Land Use: A Portland Success Story*, presented at 68th Annual TRB Meeting, Washington, D.C., January 1989

The catalyst for changes such as the Downtown Plan was a citizen revolt over a proposed new freeway. Citing the negative impacts on surrounding neighborhoods, loss of housing, increased air pollution,

and dependency on automobiles, Portland rejected the freeway in 1973 and used the money instead for, among other things, a highly successful light-rail line that was completed in 1986.

The Metropolitan Area Express (MAX) connects downtown with the suburbs to the East, making Portland one of only 17 cities in North America with similar systems. The 15-mile route with 26 trains has been a magnet for riders (over 23,000 trips each weekday) and adjacent business development. About 43 percent of commuters to downtown ride MAX or buses, a higher ridership rate than most large U.S. cities. Since the early 70s, the volume of cars entering downtown has remained the same even though the number of downtown jobs has doubled. Much of the success is due to creating a pedestrian-friendly environment by improving pathways to the stations, widening sidewalks, and designing new circulation patterns to reduce traffic in the vicinity of the stations. The result has shown to be much more cost-effective than highway construction for both the community and the commuters who can leave their cars at home.[68]

Voters recently approved (with a 3-to-1 margin) increased taxes to fund an expansion of the rail system on the same day they imposed a property-tax limitation, which demonstrates a high commitment towards alternative transportation. A new light-rail line to West Portland, which is experiencing the fastest growth, should be completed by 1997. The Regional Transportation Plan ultimately calls for 50 miles of lines radiating from the Central Business District to suburban satellite centers. The City's Regional Rail Program is exploring the best ways to make this happen (see below under *State, Regional, and City Planning*).

The bus system, which was made a public agency in 1969, is also being expanded and improved. Tri-Met recently contracted for 108 new buses to create a fleet of about 550 vehicles serving 74 routes (770 miles) by the Spring of 1992. The City Council passed a resolution encouraging Tri-Met to develop and implement a system for transporting bicycles on trains and buses. In response, front bicycle racks for buses have been designed and tested for a pilot program in 1992, and methods have been developed for carrying bicycles onto MAX trains.

This type of long-term commitment to transit is an essential element in promoting options to the automobile. The success of transit depends on reaching riders. The traditional means of park-and-ride lots and feeder buses are expensive and bring many of the same problems that transit is trying to correct (traffic congestion, pollution, and energy consumption). On the other hand, enhanced bicycle and pedestrian access to stations and destinations can greatly increase the cost-effectiveness of the transit system by bringing in users from a wider area. Likewise, the success of bicycle and pedestrian programs depends on a healthy, integrated transit system. Both depend on supportive land use.

Bicycle and Pedestrian Program

The landmark for nonmotorized programs in Portland and other Oregon cities was the passage of the State "Bi-

cycle Bill" in 1971 that dedicated 1 percent of the gas tax revenue to bicycle and pedestrian facilities (but not education). Because half of the funds are distributed by population, Portland—Oregon's largest city—was able to start a Bicycle Program with paid staff. Within 2 years a Bicycle Master Plan was adopted, and the Program, now called the Alternative Transportation Program, was expanded to provide facilities for pedestrians and the disabled. A permanent Citizen's Bicycle and Pedestrian Advisory Committee was formed in 1978.

Bikeway Plans

As one might expect of a formative program, the early efforts had their ups and downs. Bicycle planning was in its infancy and there was much to learn. The focus for several years was on local improvements that would make bicycling easier and safer: bridge crossings, short street segments, and other hazards or bottlenecks. As knowledge was gained and attention turned to implementing a real bicycle system with routes and lanes, the realities of an automobile-dominated culture hit home. The strong public resistance to removing on-street parking and the city's reluctance to reduce traffic lanes were particularly damaging.

Although the Bicycle Master Plan had received thorough public review before adoption, attitudes shifted in the years following the gas crisis of the early 70s. The moment had passed and bicycling was no longer a high public priority. In an attempt to revitalize the bicycle program, an elaborate planning process, called the Corridor Program, was developed that allowed area residents to assist in selecting local bicycle routes and in determining desirable treatments.

With Portland divided into 22 corridors, the staff and Advisory Committee had their hands full trying to implement the time-consuming new program. Again, there was strong opposition to removing parking, even on collectors and arterials that carried considerable traffic. By 1989 only about 30 miles of bikeways—mostly shared roadway—were established, including several capital improvement projects completed with State grant funds (the other half of the 1 percent gas tax revenue). In the meantime, progress took another form.

The years of working with the city engineering and planning staffs and the Park Bureau established valuable relationships and helped make bicycle considerations a part of all new projects. Virtually all city departments are now exposed to bicycle issues. The various plans, codes, ordinances, and specifications that guide development were modified to include bicycles. Chief among them are the Comprehensive Plan and the Arterial Streets Classification Policy (ASCP) that directs development of Portland's transportation system. The ASCP is being revised to include additional language about bicycle facilities. The net result is that new development projects routinely include bicycle facilities such as parking, bikeways and signing.

The Advisory Committee decided in 1990 to streamline the Corridor Program and concentrate on what was pos-

sible. The revised process, called the Bikeway Signing and Improvement program, divided the city into five areas and focused on doing the many little things that improve bicycling:

- connecting existing bikeways
- widening shoulders
- fine tuning traffic signals to detect bicycles
- making utility covers flush with the pavement
- modifying tire-eating inlet grates
- addressing intersection problems
- signing desirable streets while minimizing removal of on-street parking

This program has proven effective, with 30 miles of bikeway identified for improvements in the first area plan completed. Combined with the strides made in institutionalizing bicycle planning, continued progress is expected. The goal of the Advisory Committee is to increase bicycle ridership to 10 percent of work trips by the year 2000.

Bicycle parking has continued to be a priority over the years. From the late 1970s to mid-1980s, 225 hitching-post racks were installed at no cost to those who requested them. Parking requirements for new and renovated developments were written into City code in 1981 and revised in 1991. Forty bicycle lockers are rented in the Central Business District and at Portland State University; at $7.50 per month these are very popular, and 10 additional lockers will be installed in 1992 as part of an ongoing effort.

Educational Programs

Numerous programs have contributed to bicycle awareness, education, encouragement, and involvement. The city has produced special maps and sponsored rides, races, and clinics. Safety pamphlets were printed and distributed, and the police were assisted in their safety presentations to elementary school children. Bicycle and pedestrian promotion and education has also become an integral part of traffic management strategy (see the *Community Traffic Safety Initiative* below). Although education efforts by the Alternative Transportation Program lapsed after 1985 because of recession budget cuts, information is still distributed when requested.

Maps

Maps have proven to be a valuable educational tool. Traffic hazards and safe routes have been the main concerns of Portland bicyclists since the first local bicycle map was produced in 1896. It showed three classes of roads: good, fair and poor...along with railroads and taverns.[56]

Resolving traffic problems in a large city is a costly, long-term process. A bicycle map is a cost-effective way of encouraging bicyclists to make the best use of the existing system. The next bicycle map was produced in 1975 and used the basic street system as the bicycle network. It was a useful map but lacked detail.

In 1979, a new map was published that used creative color-coding to rate the appropriateness and difficulty of routes connecting all areas. It was designed to be compact, durable, and useful to all classes of bicyclists. The original 5,000 copies were designed and printed at a cost of $10,500 (slightly over $2 per map). An informal market analysis,

based on contacts with map retail outlets and bike stores, suggested that a map priced at $2 would achieve a market penetration rate of 75 percent—that is, about 75 percent of all potential purchasers would buy it. As sales increased, outlets were offered the map at $1, at which price penetration was expected to be near 100 percent. It eventually sold out and thereby helped many users at a negligible cost.[69] An updated version was produced as part of the Bike There Program (see below), and a new map was published by the Metropolitan Service District in 1991.

Bike There Program

In the early 1980s the Federal Highway Administration helped fund demonstration projects aimed at improving the nation's transportation systems. Innovative strategies were sought that would improve system cost, safety, capacity, efficiency, and air quality. Portland's program was centered around increasing the number of bicycle commuters and providing a safe riding environment. It was an interagency effort between Portland and the Metropolitan Service District, the regional agency that plans for, among other things, regional transportation. Corporate sponsors were also a key ingredient, donating funds, materials, and services. The program had four elements:

- A **bicycle map** showing the safest and most desirable routes in the metropolitan area. This was an updated edition of the 1975 map. A measure of its success is that 10,000 copies sold out by 1987 and it has been frequently copied by other cities.
- An **employer program** to reach potential bicycle commuters. In a 6-month period in 1983, bicycling information was distributed to all 2,600 businesses in Portland with 25 or more employees. Over 100 companies participated in the program (a greater ratio than similar rideshare programs). Participation ranged from using materials, such as posters and paycheck stuffers, to sponsoring weeklong promotions. Promotional techniques included commuting workshops, bicycle tuneups, fitness workshops, paycheck stuffers (how to commute, safety, motorist's guide and fitness), custom route posters, and the regional map.
- **Public events** to generate interest and share information. Two events were held: Bike-to-Work Day in May to kick off the summer programs and Summer Cycle, a family-oriented ride and fair in August, as a climax. Employers reported from three to ten times the usual number of bicycle commuters on Bike-to-Work Day; the event has been a regular fixture since and is used by many communities around the nation. Summer Cycle was an expanded version of an annual city-sponsored event called Bike Days; about 850 riders registered for rides from 10 to 25 miles.
- A **promotional campaign** to support the activities. Some of the materials developed for the employer program and the two events were incorporated into an educational effort aimed at the general public. A tabloid-style calendar of summer bicycling events was distributed. A local TV station donated 25 public service spots. Five sets of radio spots were aired on 12 stations throughout the summer. Two

bus cards stressing bicycle safety were placed on 300 buses.

The success of the program is indicated by the number of people reached, by the increase in bicycle commuters, and by the public support. An estimated 1,320 employees participated in company promotional events, while over 20,000 employees came in contact with program literature.

A post-program survey indicated that 28 percent of Metro area residents had heard about the Bike There Program and 44 percent had heard about Bike-to-Work Day, implying that over 300,000 people were reached. A comparison of bicycle commuters before (3.6 percent) and after (4.4 percent) the program showed modest gains, although there were across-the-board increases in frequency, first-time riders, school trips (0.9 percent to 2.0 percent), and shopping trips (7.9percent to 13.2 percent).

When the survey asked whether programs to encourage bicycle riding and improve safety should be developed or continued, 86 percent of the respondents were supportive. About 95 percent of participating employers thought the program materials or services were useful and expressed interest in continuing to encourage their employees to bike to work. The corporate sponsors also were pleased with the results.

As the program's final report stated: "The Bike There Program has raised public awareness that the bicycle can be a real transportation option. It has galvanized efforts of Portland-area communities to improve the environment for bicycling—physically, through route development efforts, and socially, through public education efforts like Bike There. In the long run, it is such a combined approach that will have the greatest effect in increasing the extent of transportation by bicycle."[70] This same multifaceted approach has been adopted by several communities, most recently in Boulder, Colorado.

Traffic Management and Safety

Several programs benefit bicyclists and pedestrians by improving traffic conditions and safety.

Community Traffic Safety Initiative

Portland's Bureau of Traffic Management has recognized the value of nonmotorized modes in its aggressive Community Traffic Safety Initiative (CTSI) begun in 1991. This wide-ranging effort aims to reduce the impact of vehicular traffic on neighborhood streets by building long-term, community based, self-sustaining programs. One of its four goals is to "increase bicycle and pedestrian safety and encourage their use as a mode of transportation."

It is recognized that no single approach will solve all of the traffic problems, so a variety of public information and education campaigns are coupled with engineering and enforcement solutions:

- college-credit classes for the public in traffic and transportation
- a newsletter and brochures
- speakers for neighborhood, business and civic organizations
- a citizen's program begun in 1989, Speedwatch, to identify and educate speeding drivers

- the Neighborhood Traffic Management Program to identify appropriate engineering solutions on local streets
- the Collector Recovery Program to find solutions for large neighborhood streets
- the Pedestrian Program to coordinate planning for pedestrian mobility
- a series of NeighborRides to introduce people to bicycling
- a State program called *Smart Cycling* to promote safe bicycling
- a miniature version of Portland to emphasize traffic safety and transportation issues for children
- the Neighborhood Congress (see below) to introduce the CTSI to the public

Neighborhood Congress

Portland's Bureau of Traffic Management sponsored a unique event, coined the "Neighborhood Congress: *Reclaiming Our Streets*," in November 1991 that aimed to get citizens involved in the city's transportation planning. A full day of free talks, workshops, information tables, tours, and panel discussions for all ages attracted an estimated 500 people. Citizens were recruited for four working groups, one of which is devoted to bicycle and pedestrian issues, that will advise the city planners.

> "This, to the best of our knowledge, is the first conference of its kind in urban traffic management. *Reclaiming Our Streets* is a different attitude, a different approach, a different way of doing business. We want a specific process with the single, community-wide goal of reducing the impact of vehicular traffic on Portland's neighborhoods."
>
> — Earl Blumenauer, Commissioner of Public Works, City of Portland

The Congress participants enjoyed talking with a formidable group of experts that included not only the City's planning staff but also an international authority on transportation planning, a nationally known bicycle activist, the Chief of Police, the Commissioner of Public Works, and representatives from many interested groups such as the trucking industry and the American Automobile Association. Representation from all sides of the issue was considered critical to the event's success.

Because the Congress was a first of its kind, the city had no model to go on. They chose to create a very structured, upbeat and positive atmosphere in which to discuss what can be an overwhelming and controversial subject. The difficulties of talking about transportation were handled by starting from recognized objectives and then exploring ways to reach them. The emphasis was on involving everyone and finding solutions. The conference may well be the model for how a large city can bring together its diverse interests to begin solving problems. A second Congress is planned for the fall of 1992.

Design and Enforcement Innovations

The city has tried various innovations over the past several years that improve conditions for bicyclists and pedestrians:

- A 1989 city ordinance permits seizure and civil forfeiture of the vehicles of persons convicted of drunken driving while driving with a suspended li-

cense. This has markedly reduced the occurrence of repeat offenders and had led police departments from other States to inquire about setting up similar programs.

- Portland began in 1991 to change many parking and other signs to conform to international standards. These new signs are easier to read and will ultimately improve traffic control. The Oregon Bikeway Program Office has also adopted signing standards for bicycle facilities that are being followed by Portland.

- The Bureau of Traffic Management took on the responsibility of enforcing City parking ordinances, freeing up police for other enforcement activities and significantly reducing the time from citizen complaint to action.

- Residential parking permits reduce the amount of congestion and commuter parking in neighborhoods adjacent to commercial and retail centers.

- "Performance" or "skinny" streets are a design change to reduce the required width of new residential streets from 32 to 28 feet. This slows down traffic on local streets and creates shorter pedestrian crossings.

Bicycle Surveys and Counts

Several surveys and on-street counts have been performed over the years that shed light on commuting patterns and needs:

- *Attitude Study for the Portland Metropolitan Bicycling Encouragement Program*, Columbia Research Center, Vancouver, WA, October 1982.

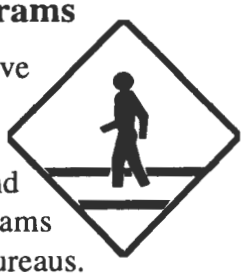
- *Transportation Services Survey for Portland*, SLR Research Services, Longview, WA, May 1986.

- Periodic counts of traffic entering and leaving downtown, bicycles and pedestrians on bridges, and bicycle use before and after facility improvements.

These data indicate that bicycle travel into and out of the Central Business District has doubled during the 1980s. Currently, there are up to 1,500 bicycle trips daily into the CBD, which suggest a citywide usage of 10,000 commuters daily (about 4 percent of all work trips).

Data on the origins and destinations of bicyclists have helped determine priorities and provided rationale for certain projects. For example, more riders originate from the Southeast district, so that area received first attention.

Pedestrian Programs



Pedestrian needs have traditionally been met through standard construction and maintenance programs within several city bureaus. The lack of organized pedestrian interest groups has contributed to this status. Portland's Alternative Transportation Program and the Citizen's Bicycle and Pedestrian Advisory Committee monitor pedestrian needs and make recommendations where necessary. Existing programs aimed at pedestrians are:

- The Neighborhood Curb Ramp Program established in 1973 to build corner ramps for the elderly and the disabled. With about 90,000 corners in the City, the program has been busy. Initial efforts were concentrated in the Central Business District with

nearly a thousand locations. Later the program was expanded to other areas that serve transit stops, enhance access to services, are located near housing for disabled people, improve safety, and complete a gap in pathways. In FY 90/91 the City entered into an interagency agreement with Tri-Met, the area transit service, to build ramps at bus stops.

- The Neighborhood Traffic Management Program, initiated in 1984, employs engineering solutions to mitigate the impact of vehicular traffic on residential neighborhoods and to improve the environment for all residents including pedestrians. Over 100 traffic circles, diverters, and curb extensions have been constructed.
- The Sidewalk Maintenance Program assures the proper maintenance of Portland's 2,456 miles of sidewalks and sees to it that new developments provide for pedestrians.
- The Street Cleaning Program includes regular sweeping and flushing of stairways, walkways, and bikeways.
- The Structures Program maintains the 169 stairways as well as many bridges, underpasses, and overpasses. New bridges are designed to provide for bicycle and pedestrian access.
- The Crosswalk Marking Program places one of three types of crosswalks at intersections according to policies revised in 1990 and in conformance with the Manual on Uniform Traffic Control Devices.
- The Collector Recovery Program deals with nonlocal traffic and excessive speeding on residential collectors, two concerns of pedestrians.

The elements of a comprehensive pedestrian program were identified in 1978 by a Federal Highway Administration training course: neighborhood and citywide pedestrian network plans, central business district improvements, removal of obstacles to the elderly and handicapped, and a pedestrian safety program.[71] Some of these elements were already being addressed in 1978 and all have received attention by 1991.

Yet, there are still many obstacles to pedestrian mobility and the need for a network of pedestrian-oriented corridors to provide transit access and to link major activity centers. The city is developing a separately funded and staffed Pedestrian Program for FY 93/94 that will expand and coordinate previous efforts. This program will develop policies to guide transportation planning and activities, plan for improved pedestrian mobility, and be a resource for citizens concerned about pedestrian issues as well as educating motorists and pedestrians about their rights and responsibilities.

Citizen Involvement

Much of the progressive transportation planning in Portland is the result of citizen actions. Some of these—the neighborhood committees, the rejection of the freeway, the vote for more transit—have already been mentioned. Also, the Citizens Bicycle and Pedestrian Advisory Committee, a city-appointed body staffed by citizen volunteers, has been instrumental in the direction city planning has taken.

Two recently-formed groups, the Bicycle Transportation Alliance (BTA) and the Willamette Pedestrian Coalition, bode well for Portland's future. These

are grassroots organizations made up of local citizens who aim to improve bicycle and pedestrian conditions.

The BTA persuaded Tri-Met, the area's transit service, to improve bicycle access on buses and light rail and to install parking at park-and-ride and transit centers; this was initiated by gathering 5,200 signatures on petitions. From a one-man operation, the BTA has grown quickly, now publishes a monthly newsletter, and is expanding its influence. Another bicycling group, the Portland Urban Mountain Pedalers (PUMP) has worked with the City's Park Bureau and other groups on trail use. The Willamette Pedestrian Coalition has already conducted a workshop at the Neighborhood Congress and supplies input to the Alternative Transportation Program and the Advisory Committee.

State, Regional, and City Planning

Portland and other communities are following the lead of the State in pursuing a balanced, "multimodal" transportation system. Oregon has long been considered to have a progressive approach towards transportation. Various State, regional, and local efforts contribute to this reputation.

The crucial role of the State in requiring and supporting alternative transportation is very evident in Oregon. Without the State's guidance and funding, communities such as Portland would have a much more difficult time in establishing bicycle and pedestrian programs.

State Bicycle Programs

The State's Bicycle Bill, in which 1 percent of the gas-tax revenues are dedicated to bicycle and pedestrian facilities, celebrated its 20th anniversary in 1991. In 1990, $2.8 million went to various State and local projects. In 20 years, 530 miles of bikeways have been implemented using the funds, with 180 miles in the Portland area alone.

The Bikeway Program Office, a part of the Oregon Department of Transportation, distributes the 1 percent funds. They also do planning, design, and publications (such as the State's Bicycle Master Plan, Guidelines for Bicycle Racing, Bicycling Guide, and Coast Bike Route Map) as well as provide guidance to county and city bicycle programs. The State Bicycle Advisory Committee meets quarterly to assist the Program Office. In 1991, a successful meeting was sponsored for about 80 local bicycle coordinators and advisory committee members to learn more about what the State is doing and to discuss common concerns. The meeting will be expanded in 1992 to cover more topics and to accommodate more participants.

The Oregon Traffic Safety Division has also helped fund activities such as the Community Traffic Safety Initiative and Smart Cycling. These programs have helped to partially fill the void caused by the 1 percent funds not being available for educational purposes.

State Transportation Planning

Recently, the State took a fresh look at its transportation needs. It refined its transportation planning rule to require reduced reliance on automobiles by incorporating alternative modes into State,

regional and local plans. It also stipulated that land uses be consistent with the planned transportation system. Enhancing bicycle and pedestrian travel is an important part of the strategy. It is mandated that per capita vehicle miles traveled will be reduced by 20 percent over the next 30 years (as a comparison, during the 6 years between 1982 and 1988, travel in the Portland metro area increased 40 percent despite only a 5 percent population gain).[72]

Also, the Oregon Department of Transportation launched a long-range planning effort to achieve a balanced system that "promotes economic prosperity and livability for all Oregonians." It clearly addresses the need for compact urban areas and land-use patterns that allow more people to bicycle and walk. Public hearings around the State in late 1991 gathered reactions to the draft policy statements. At the same time, the State is updating its acclaimed Bicycle Master Plan and its Highway Design Manual.

Oregon Bicycle Events

Yet another way in which the State has contributed to bicycling awareness is in sponsoring the popular Cycle Oregon rides. These annual weeklong tours in different parts of the State not only promote tourism, the main objective, but expose thousands of people to the possibilities of bicycling. A 5-mile commute to work does not seem so daunting when you have just completed 500 miles. Cycle Oregon continued in 1991 under private leadership, the State feeling that it had successfully established the event.

Another popular cross-state event is the privately-run Oregon Bicycle Ride. Although a tenth the size of Cycle Oregon and aimed at more experienced bicyclists, it too has a positive effect on changing people's perspective of transportation. Its smaller size is also an advantage in interacting positively with noncyclists along the route.

One of the largest bicycle rides in the country is the annual Seattle-to-Portland (STP) Bicycle Classic. It is a 2-day, 200-mile event that has exposed people to bicycling in a festive atmosphere. Events like this that stress fun and accomplishment also introduce many people to bicycling's potential as well as change the perception of their own capabilities.[73]

Regional Rail Program

The Regional Rail Program is a long-term effort that looks for ways to accommodate the half-million people expected in the Portland metropolitan area over the next 20 years. Not just about rail, the program stresses an integrated system where bicycle and pedestrian modes are encouraged. Key to its success is community support that is being nurtured through neighborhood meetings, surveys and "Regional Rail Summits" where concerns are brought out into the open.

The first Summit was held in January 1991 and attracted 400 people to discuss issues such as the role of transit, impact on neighborhoods, relationship with land use, access (bicycles, pedestrians and the disabled), and financing. The second Summit will be held in February 1992 to address two topics: what the rail system will look like and how it will be funded.

The public is also being asked to participate in the planning process beyond what is required to receive Federal funding. Citizen advocates are being recruited to facilitate neighborhood meetings and broaden the grassroots support for transit. Architecture students from local universities are helping to develop light-rail station designs that support pedestrian use, incorporate existing buildings, and maintain the architectural qualities of the affected neighborhood. These drawings are shown to residents to highlight the potential of light rail in their neighborhood.

Because many of rail's benefits address nontransportation goals, a successful program must draw support from a wide cross-section of the community. The Regional Rail Program is forming a broad-based community coalition of supporters—neighborhood activists, businesses, environmentalists, and others—whose agendas are served by light-rail development. The strength of the coalition will assure that voters and decision-makers understand the many ways in which an integrated transportation system will benefit them.

Other City Programs

Besides the transportation programs discussed in previous sections, Portland has embarked on The Livable City Project: Preparing for Portland's Future. This ambitious project incorporates considerable public involvement to develop recommendations on how to meet the State's land-use and transportation requirements. Among the many factors that will be analyzed are current growth trends, neighborhood characteristics, and the impacts of low and high densities. Various "tools for livability" including alternative transportation modes, parking standards, and land use will be considered.

The Livable City Project, the Community Traffic Safety Initiative, the Alternative Transportation Program, and other efforts address bicycling and walking in various ways appropriate to the sponsoring agency. The point is that they are all headed in the same direction—increased bicycling and walking—due to the strong and unambiguous direction given by the State.

5. Conclusion

Opportunity

The literature on bicycling and walking is rich and varied but has barely entered into the thinking of the average citizen or public official. America embraced the automobile with devotion during the critical growth decades after World War II, with the result that other forms of ground transportation were largely ignored. Everything about America—its economy, resource base, layout of cities, social psyche and health—is so wrapped up in the automobile that promoting alternative transportation becomes an issue of fundamental change.

The recurring theme that emerges in the literature is the complexity of the transportation equation. An individual's need to travel to and from home, work, and other places is basic, but the enabling methods are not so simple. Promoting bicycling and walking requires some hard choices in the way we develop our cities, how we allocate resources, and even who is to have political power. It remains to be seen if enough consensus can be raised or sufficient leadership provided to facilitate meaningful change.

There has been isolated progress around the country in promoting bicycle and pedestrian programs; Portland is one good example among several. The recent appointment of bicycle and pedestrian coordinators at the Federal level and the new Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 are positive signs. The seed is there for the public to take nonmotorized transportation seriously. How likely is this to happen?

Given past history, a dramatic shift in public consciousness away from automobiles seems unlikely. And yet, it may not be as unlikely as it appears. Public attitude towards automobiles has risen and fallen dramatically during the past two decades. With the proper combination of publicity, incentives, disincentives, and planning, a major shift (0.5 percent to 1 percent per year) to bicycling and walking is possible.

The potential is certainly there, for both bicycling and walking are considerably underutilized in the United States—so underutilized, in fact, that questions of market demographics and key factors become somewhat academic. Virtually the entire population is eligible and large leaps need to be made in overcoming obstacles. Where do we start?

Recommended Actions

It would be interesting to ask that 19th century committee about our current predicament. What has changed is not so much the nature of the problem as its scope. Although explosions are rare (except in movies), the automobile has proven to be a dangerously consumptive

"We therefore earnestly recommend that Congress set up the Horseless Carriage Commission which will have complete control over all sources of gasoline and similar explosive elements in all activities connected with their development and use in the United States. These measures may seem drastic and far-reaching, but the discovery in which we are dealing involves forces of nature too dangerous to fit into any of our usual concepts."

—*Report of a Joint Congressional Committee on the Horseless Carriage*, 1875

and addicting machine. Far-reaching actions are needed to tame it to the point that other forms of transportation become effective. To begin, three things must happen to promote bicycling and walking (see figure 8):

- **The option must exist.** Both bicycling and walking need a proper setting in which to be effective. This depends on appropriate land-use planning and facility development.
- **It must be attractive.** Demand for bicycling and walking can be increased through a combination of incentives, automotive disincentives and education. Without such actions, there is little reason for people to abandon their cars.
- **It must be recognized.** The public and their leaders must understand the importance and desirability of bicycling and walking. These modes are an integral part of the transportation equation (along with autos, transit, air, etc.) and must be presented in that light for acceptance. In the beginning, a strong program with dependable funding is needed. Eventually, the program will become part of routine transportation planning.

The degree to which these objectives are pursued will depend on each community and its agenda. Strong direction from Federal and State agencies will make the decisions much easier. Locally, grassroots efforts supported by State and national programs can increase bicycling and walking substantially.

National

The Federal Government wields tremendous influence over transportation choices. The DOT report[74] recommended a comprehensive program that retains its merit today. Although aimed at bicycles, it is just as applicable to pedestrians. It included a 14-point action plan for the Department of Transportation that puts the content of *Section 3: Strategies* in a Federal perspective:

1. Adult education and training
2. Public information and awareness
3. Motorist information program
4. Enforcement and registration
5. Incentives

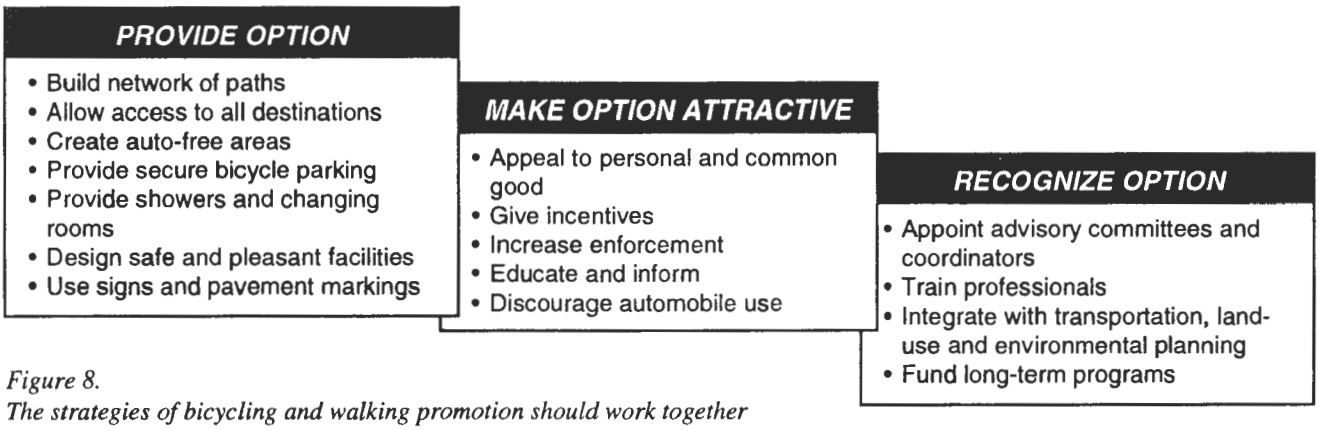


Figure 8.
The strategies of bicycling and walking promotion should work together

6. Funding programs and policies
7. Standards and guidelines
8. Integration into Government planning efforts
9. Coordination of Government programs
10. Increase in professionals' acceptance
11. Increase knowledge of program and funding opportunities
12. Elimination of surface and design hazards
13. Improvement of access
14. Provision of bicycle parking

Additions to this list should include:

15. Automotive disincentives
16. Land-use guidelines
17. Child education and training

The plan also called for promotion and implementation efforts from various other agencies:

- **Environmental Protection Agency**—air quality
- **Department of Energy**—energy conservation
- **Department of the Interior**—encouragement programs
- **Consumer Product Safety Commission**—bicycle safety
- **Department of Agriculture**—promotion
- **General Services Administration**—facilities at Federal installations

All areas of the Federal Government were given the responsibility to encourage their own employees to bicycle and walk. A few of the elements of this plan were adopted, although the time is ripe to update and reapply it. Piecemeal efforts of the last decade have proven ineffective, as nonmotorized transportation has continued to decline.

State and Local

State and local governments have the responsibility to follow the Federal lead in the promotion of bicycling and walking. Their most important tool is the ability to guide growth and land-use decisions to favor nonmotorized travel. They must also provide for the systematic investment in an integrated transportation scheme where bicycles and pedestrians play a prominent role.

Most of the same action items listed for the Federal Government also apply for the State and local governments. In addition, they should respond quickly to the new direction given by the ISTEA:

- appoint an alternative transportation coordinator and citizen's advisory committee
- develop their own multimodal transportation plans
- establish and publicize bikeway and footpath networks
- enact development ordinances and codes
- develop funding sources for bicycle and pedestrian programs

With occasional Federal and State support, communities with strong leadership have shown the ability to build a

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[53]Marcia D. Lowe, *The Bicycle: Vehicle for a Small Planet.*

[54]Frederick P. Rivara, "Child Pedestrian Injuries in the United States," *American Journal of Diseases of Children*, Vol. 144, June 1990.

[55]Source: League of American Wheelmen, Bicyclists' Education and Legal Foundation, 1991.

[56]John Pucher, "Urban Travel Behavior as the Outcome of Public Policy: The Example of Modal-Split in Western Europe," *APA Journal*, Autumn 1988.

[57]Mark E. Hanson, "Automobile Subsidies and Land Use—Estimates and Policy Responses," *APA Journal*, Winter 1992.

[58]David Morris.

[59]Mark E. Hanson.

[60]Michael Replogle, *Alternatives to the Automobile*, workshop at Probike Northwest '91, Olympia, WA, July 1991.

[61]Daniel Layden, *Citizen/Staff Cooperation in Program Development: the Eugene Bicycle Advisory Committee*, thesis paper at the University of Oregon Department of Planning, Eugene, OR, December 1991.

[62]Herbert H. Smith, *The Citizen's Guide to Zoning*, Planners Press, American Planning Association, Chicago, Illinois, 1983.

[63]Mark E. Hanson.

[64]Mitch Rohse, *Land-Use Planning in Oregon*, Oregon State University Press, Corvallis, OR, 1987.

[65]Bicycle Federation of America, Inc., *Non-Motorized Travel Facilities Integration Project.*

[66]Dan Zevin, "America's Most Walkable Cities," *The Walking Magazine*, August 1991.

[67]Steve Dotterrer (City of Portland Senior Planner), *Light Rail Transit and Pedestrian Supportive Land Use*, paper presented at the 12th International Pedestrian Conference, Bethesda, MD (co-city), October 1991; also from speech at Neighborhood Congress in Portland.

[68]Wendy Novick (City of Portland Regional Rail Program Outreach Coordinator), *Building Citizen Support for Light Rail: The Portland Experience*, paper presented at the 12th International Pedestrian Conference, Boulder, CO (co-city), October 1991.

[69]Janet Schaeffer, *Suitability Mapping: Portland's Experience*, Bicycle Facility Planning & Engineering, 1980.

[70]*Bike There Program Final Report*, Metropolitan Service District and the City of Portland Bicycle and Pedestrian Program, April 1984.

[71]*Pedestrian and Bicycle Considerations in Urban Areas—An Overview*, training course developed for the Federal Highway Administration by the Traffic Institute, Northwest University in cooperation with Barton-Ashman Associates, 1978.

[72]*A Proposal for The Livable City Project: Preparing for Portland's Future*, City of Portland Bureau of Planning, Long Range Planning and Urban Design Section, November 1991.

[73]Jim Hoff, "Bicycling's career man: Seattle's Josh Lehman," *Northwest Cyclist*, Vol. IV, Issue 8, Sept./Oct. 1991.

[74]Katie Moran.

B. LITERATURE REVIEW

The following reports, papers and other materials represent a small sample of literature related to bicycle and pedestrian promotion. Some sources already referenced inthe text are discribed in more detail.

Reports

Feasibility of Demand Incentives for Non-Motorized Travel, Barton-Aschman Associates, Inc., Minneapolis, MN, April 1981

This attitude survey and transportation behavior model was prepared for the Federal Highway Administration, Offices of Research and Development. It consisted of a survey of selected neighborhoods in five cities. Responders were asked to rate their preferred transport mode (auto, bus, walk, or bicycle) at present and under "improved" conditions, thus indicating the potential for mode shift.

Improvements included: (1) compact land use with good transit, free access to bicycles, strong separation of walking and bike lanes from autos, and most business and shopping trips within 0.5 mile; (2) bicycle-related facility improvements including bikepaths, bikelanes, roadway conditions, lighting, and secure bicycle parking facilities; (3) improvement of pedestrian facilities including pedestrian paths, sidewalks, pedestrian-timed walk signals, high-intensity lighting, and the addition of amenities such as street trees, fountains and vendor kiosks; and (4) auto use penalty measures including an automated fee for use during peak hours, dramatic fuel price increases, odd-even license plate access restrictions and parking restrictions.

Researchers observed that followup mode-shift behavior is overestimated in contrast to intended mode shift, bicycling mode was clearly favored as a conversion from auto over the other options, and mode shifts would most likely be effectuated by more compact land utilization practices. The study poses various mathematical models for analyzing strategies for causing mode shifts.

A summary of the first, and most useful, part of this study is contained in:

Ferrol O. Robinson, et al., Strategies for Increasing Levels of Walking and Bicycling for Utilitarian Purposes, in Pedestrian Behavior and Bicycle Traffic, Transportation Research Record 743, National Academy of Sciences, Washington, D.C., 1980.

Katie Moran, *Bicycle Transportation for Energy Conservation*, Mountain Bicyclists' Association, Inc., Denver, CO, Technical Report DOT P-80-092, May 1980.

This study is a systematic analysis of the future of bicycle transportation in the U.S. It records that 470,000 commuted in the USA in 1975, establishes a goal to add 1.5 to 2.5 million bike commuters by 1985 (saving 16.4 to 23.5 million barrels of oil by 1985), identifies obstacles to increased bicycle use, outlines a comprehensive bicycle transportation program, discusses lack of public awareness of cycling and lack of integration with public transit, dangers of poorly designed bikelanes, and nonutility of bikepaths that provide a lower level of service than is available on the road. The recommended program includes operators' awareness and training, transportation system characteristics, institutional and professional involvement, policy and action.

Bicycle Federation of America, *Non-Motorized Travel Facilities Integration Project*, for Pierce Transit, Tacoma, WA, June 1991.

This four-volume study identifies policies, standards and designs for facilitating bicycle and pedestrian access to transit. In doing so, it covers the spectrum of transportation issues including implementation strategies, ridesharing programs, land-use planning, many details of bicycle and pedestrian facilities, promotional techniques, and demonstration projects. There is also a literature review. The study is a good example of current thinking on the integration of nonmotorized modes into a transportation system.

Papers

Worldwatch Papers, The Worldwatch Institute, Washington, D.C.

The Worldwatch Institute is an independent, nonprofit research organization created to analyze and to focus attention on global problems. Directed by Lester R. Brown, Worldwatch is funded by private foundations and United Nations Organizations. Worldwatch papers are written for a worldwide audience of decision makers, scholars, and the general public. The following monographs deal with urban transportation including bicycles and pedestrians; all are global in scope, meticulously referenced and insightful.

Michael Renner, *Rethinking the Role of the Automobile*, Worldwatch Paper 84, June 1988.

Marcia D. Lowe, *The Bicycle: Vehicle for a Small Planet*, Worldwatch Paper 90, September 1989. The title was used as the theme for Probike Northwest '91.

Marcia D. Lowe, *Alternatives to the Automobile: Transport for Livable Cities*, Worldwatch Paper 98, October 1990.

Marcia D. Lowe, *Shaping Cities: The Environmental and Human Dimensions*, Worldwatch Paper 105, October 1991.

"Bicycle 2000", Bicycle Federation of America, Washington, D.C., September 1991 (draft).

The status of bicycling in the United States is reviewed and an agenda is set for the next decade. Strong bicycle areas are identified as Eugene, Seattle, San Diego, Madison, Oregon, and Florida. Twenty States and 100 cities have recognized bicycle programs and coordinators with very few State coordinator positions created within the last ten years. Study notes that there are more new bikes each than cars. Bike commuting is less than 1 percent of all commutes nationally. Nine hundred cyclists are killed each year in accidents.

Bicycle interest groups include: the League of American Wheelmen with 450 clubs and 20,000 members; Bike Centenial with 23,000 members; Bicycle Federation of America, which provides consulting work to State and Federal agencies; the Institute for Transportation and Development Policy, which includes 30 active chapters whose goal is to coordinate multilateral agency policies; the International Mountain Biking Association; the Bicycle Institute of America, an international industry association; and the Rails to Trails Conservancy, a 50,000 member started in 1986.

Organizational agenda include one percent funding for bicycle and pedestrian improvements in the 1991 transportation bill and 2 percent funding in 1996, all DOT agencies to have a bicycle coordinator, Federal funding to States contingent upon State compliance with comprehensive transportation plans with the inclusion of cycling, and an AASHTO "Green Book" containing a guide to the development of new bicycle facilities. Additional objectives include making every corridor accessible, wider highways, intermodal facilities and parking, and special recreation facilities for on- and off-road cyclists.

International Pedestrian Conferences, 1979–91.

These annual gatherings of professionals and activists have been held in various cities. The most recent event was held simultaneously in Bethesda, Maryland (theme: "The Pedestrian Agenda") and Boulder, Colorado (theme: "From Grass Roots to Green Modes") in October 1991. Workshops featured a variety of topics (safety, planning, etc.) and some papers. Two of the papers were presented by Portland speakers, Steve Dotterrer and Wendy Novick (refer to Appendix A).

The 1983 conference had as its theme "Marketing Pedestrianism: A Step Forward." Some of the papers were:

Micheal Pittas discussed the devestating effects on our cities from segregation of uses and economic groups, the over facilitation of auto access, the abandonment of public transit, and the lack of coherent land-use policy at regional and State levels.

Werner Brog refuted the idea that "almost no one walks" in a study of trips of a sample of 335,000 people over ten years of age who were nontourists. He found that four out of ten trips are made by foot when public transit ridership is included, the number of pedestrian trips in-

creases as city size increases (in cities over 500,000 walking trips are dominant), and walking trips are more frequent in winter than summer.

Gerhard Meighorner described the appeal of older cities that were built very compactly and offered a rapid succession of things worth seeing.

Jan Korjmit theorized that people became dependant on cars when urban values deteriorated, particularly with the spatial segregation of residential, industrial, and other land use.

Terence Bendixsan observes that in Britain 37 percent of trips of a length up to 3/5 of a mile are by foot not including walks to and from transit. The most walks are by children, followed by women generally lacking access to a second car with men walking the least. He suggests that the greatest obstacle to promoting walking are 25–55 year old men who drive to work and make decisions. He cites the Mitchel and Stokes findings that the greatest irritants to pedestrians are noise, air pollution, and sense of danger.

The city of Munich is described as an example of a city transformed into a downtown shopping mall which is well served by public transportation and auto-free areas. Jan Gehl of the School of Architecture Copehagen, Denmark, attributes his city's renaissance not to design but to a change of attitudes characterized by a general demand for a quality environment: a downtown closed to cars, parking lots removed, and public transportation improved. Toronto is described as a city which shifted from isolation zoning to a mixed-use policy as a result of the 1974 Central Area Plan that included three key policies: the rehabilitation of historic buildings, extensive public transportation improvements, and emphasis on public pedestrian streets.

Howard Simkowitz of the Department of Transportation, District of Columbia, reviewed cities in Latin America and concluded that "the key to creating pedestrian environments in South American cities is in providing good public transportation."

National and Regional Probike Conferences, 1985–91.

These annual gatherings around the country focus on many bicycle issues such as planning, facility design, safety, off-road issues, foreign activities and many other topics. The national events are sponsored by the Bicycle Federation of America.

An example of these events was Probike Northwest '91. Its theme was "The Bicycle:Vehicle for a Small Planet" (see earlier review of Worldwatch papers) and featured three days of workshops surrounded by a week of associated events. The nearly 50 presentations covered many aspects of bicycle use, planning, promotion, and safety from around the country.

Other Literature

The following publications are guides on bicycle (and sometimes pedestrian) commuting and promotional programs:

Bike Week Guide for Colorado Communities, Colorado Bicycle Program, Colorado Department of Highways, Denver, CO, May 1991.

> Boulder started a bike week in 1982. It progressed form a single-day event to one of the largest in the U.S. By 1991, the project had evolved into a Statewide Bike Week. It is a 7-day series of fun and educational events tailored to each community, with a Wednesday Bike-to-Work Day being conducted at all locations. The Guide is a tool to help communities produce a Bike Week most beneficial to their citizens. It describes what is needed in the way of organization, skills, volunteers, budget, sponsors, and media coverage. Suggested events include celebrity media events (commuting races, relays), rides of various types (century, family, seniors, church), parades, displays, and bike-checkup stations.

Another Way to Work: The Employer's Handbook on Bicycle Commuting in the Delaware Valley, Bicycle Coalition of the Delaware Valley, Philadelphia, PA, 1983.

Developing Pedestrian Plans: Pedestrian Coordinators Manual, Florida Department of Transportation, Tallahassee, FL.

Bicycles Make Good Business Sense!, Bicycle Program Office, D.C. Department of Public Works, Washington, D.C., 1981.

Bicycling to Work Seminar Information, Bicycle Coordinator, U.S. EPA, Office of Air and Radiation, Washington, D.C., 1983.

How to Organize a Bike Day, Bicycle Coordinator, U.S. EPA, Office of Air and Radiation, Washington, D.C., 1985.

Dayton Commuting By-Cycle, Miami Valley Regional Bicycle Committee, Dayton, OH, 1982.

Try something really different: Don't drive to work, City of Boulder Bicycle/Pedestrian Program, Boulder, CO, 1984.

Tuscon Area Bicycle Commuter Handbook, Alternate Modes Planner, Tucson Department of Transportation, Tucson, AZ, 1989.

Pedestrian Safety Program Resource Kit, NHTSA and FHWA, Washington, D.C., 1990.

National Safe Kids Campaign, a program of the Children's National Medical Center, Washington, D.C.

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