

Final Report

NCTR Report Number: NCTR-473-132

FDOT BC 137-38

TDM in Europe: A Synthesis of
Research Findings

**TDM IN EUROPE: A
SYNTHESIS OF
RESEARCH FINDINGS**

by

Francis Cleland, Research Associate
Tom Cooper, Graduate Research Assistant,
Center for Urban Transportation Research
National Center for Transportation Research
University of South Florida
College of Engineering
Tampa, FL 33620



Project Manager: Joel Volinski, Director
National Center for Transportation Research

Prepared for:
**National Center for Transportation
Research**
Center for Urban Transportation Research
4202 E. Fowler Avenue, CUT 100
Tampa, FL 33620

May 2003

1. Report No. NCTR-473-13.2 FDOT BC137-38	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle TDM in Europe: A Synthesis of Research Findings		5. Report Date May 2003	
		6. Performing Organization Code	
7. Author(s) Cleland, Francis & Cooper, Tom		8. Performing Organization Report No.	
9. Performing Organization Name and Address Center for Urban Transportation Research 4202 E. Fowler Avenue, CUT 100 Tampa, FL 33620-5735		10. Work Unit No.	
		11. Contract or Grant No. DTRS98-G-00329	
12. Sponsoring Agency Name and Address Office of Research and Special Programs Florida DOT U.S. Department of Transportation 605 Suwannee Washington, DC 20590 Tallahassee, FL 32399		13. Type of Report and Period Covered	
		14. Sponsoring Agency Code	
15. Supplementary Notes Supported by a Grant from the USDOT Research and Special Programs Administration, and the Florida Department of Transportation.			
16. Abstract This synthesis is an examination of TDM strategies in Europe. This synthesis details successful TDM strategies and examines, in detail, the literature on this subject in an extensive, annotated bibliography. The synthesis covers such TDM strategies as using parking measures, road pricing, alteration of infrastructure, mobility centers, green commuter plans, carsharing, carpooling, and vanpooling.			
17. Key Words TDM strategies, TDM in Europe, The future of TDM in Europe, roadway pricing, parking measures.		18. Distribution Statement An electronic version of this document is also available to the public in .pdf format through the NCTR web site, http://www.nctr.usf.edu/.	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of pages 65	22. Price

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**Florida Department of Transportation
Summary of Final Report
submitted by the
National Center for Transit Research (NCTR)**

FDOT Master Agreement Number FDOT BC137-38

RPWO Number:

NCTR Project Number: NCTR-473-132

Final Report Date: May 2003

Project Title: “TDM in Europe: A Synthesis of Research Findings”

This report contains information on TDM strategies in the EU, specifically, but not limited to, the United Kingdom, the Netherlands, and Belgium. In addition, Europe’s attitude toward TDM, as a journey rather than a destination significantly differs from the attitude about TDM in the United States. This synthesis reports on the major TDM approaches to terminating and curtailing traffic in Europe, such as parking measures (i.e., high prices for premium parking spaces and the elimination of parking spaces and auto access in certain areas to make car travel less attractive); road pricing (i.e., charging varying tolls according to time of day and also charging high enough tolls to influence driving behavior); and alteration of infrastructure (i.e., changing existing infrastructure to benefit nonmotorized travel). Further, many TDM organizations in Europe are offering positive incentives as well as the aforementioned negative incentives in order to curtail automobile traffic and congestion in major European cities. These incentives include public transportation improvements such as fare reductions, multi-user cards, expansion of current transit systems, easier transfers, shuttle service, feeder routes, increased speed and reliability, more access to fare cards at venues other than stations, and special routes to serve certain travel requirements. In addition to these improvements, European TDM strategies also include personalized travel via mobility centers. These prototype centers, located in major cities in the UK, Germany, and the Netherlands, offer more than 50 transportation services to clients, covering all modes available, including carsharing and vanpooling services. Finally, both companies and commuters can benefit from Green Commuter Plans. These plans provide incentives for both employers and employees to reduce auto travel to a worksite by providing an array of incentives, such as financial rewards for cycling, vanpooling, carpooling, or taking transit to work as well as provisions for telework and variable work schedules which benefit both employers and employees.

MOST (Mobility Management Strategies For the Next Decade) is an organization overseeing the implementation of pilot TDM projects in 32 European cities. The scope of the MOST project is to improve access to transportation for all sectors and to foster positive attitudes about alternative options toward sustainable mobility. MOST programs focus a large amount of resources on educational programs to enhance public awareness and to attract school children to transportation

alternatives, before commuting habits are formed. MOST also is involved in shaping policy decisions such as changing tax laws to favor alternative mode use, changing land use rules to favor car-free spaces, and alteration of existing infrastructure to improve car-free options.

The purpose of this paper was to glean what the Transportation Planners in the U.S. could learn from TDM in Europe. In the U.S., policies could be made which would favor alternative mode use over private vehicle use in terms of taxation, land-use policies, and improvement of public transportation options. The Europeans have adopted and improved on U.S. TDM measures, such as carpool matching, vanpooling, and TMAs at employment sites. TDM is integrated into national transport policy in Europe, whereas in the U.S., TDM is only locally focused and operated for congestion relief and air quality management. Finally, TDM in Europe is marketed as a responsible lifestyle choice rather than as an alternative. However, TDM is also marketed in the U.S. as a responsible choice, but Americans have many more open spaces and less centralized living spaces than Europeans, as most American cities were developed after the advent of the automobile. And, it should be noted that there has been an increase in car use and ownership by Europeans in the past decade, even given their greater propensity to use transportation alternatives in comparison to Americans. Given the political differences, land-use differences, and space-availability differences between American and European cities it is to wonder if European-style TDM policies would be applicable and practical in the U.S. However, this report is interesting and informative as to the options available to Transportation Planners in the U.S., based on European advances in TDM. Additionally, this report contains an annotated Bibliography, listing many of the successful European TDM programs and what policies were used to implement them. Although the reader is cautioned that this synthesis does not contain an extremely broad approach to TDM in Europe, given that it is a short report, it does give the reader the overall texture and flavor of TDM policies and implementations in Europe and how this information might be useful to TDM professionals in the U.S.

TDM in Europe: A Synthesis of Research Findings

Introduction

In searching for possible solutions to domestic transport concerns, Transportation Demand Management (TDM) professionals in the United States are becoming increasingly interested in mobility management practices in Europe. Attesting to Europe's growing reputation as an innovator in the field of mobility management is the amount of recent research not only about national incentives in countries such as the Netherlands, United Kingdom and Belgium, but larger scale efforts conducted within the European Union.

Though still in its incipient stages throughout most of Europe, Transportation Demand Management can at least be considered an interest for most countries within the European Union, a fact reflected in policies that are less frequently favoring road development and more often opting for management solutions that rely on sustainable modes of transport. In this manner, Europe's approach to TDM might be regarded as more prescient and future-oriented than the United States'. Much research and commentary from experts seem to suggest that the United States' response to mobility problems has been less anticipatory and comparatively reflexive; in other words, dilemmas are dealt with after they develop instead of before [34]. Likewise, the increasingly popular view of TDM in Europe as a continuous process distinguishes Europe's approach to mobility management from the United States'. In those countries recognized as innovative practitioners of mobility management---including the Netherlands, Belgium and United Kingdom---transport policy more frequently exhibits these enlightened attitudes.

In the past, TDM methods in Europe have typically focused on curbing private car use. In response to increasing private car use, Europe has deployed various mobility management methods, some similar to the United States', and others more recent in development and unique in approach. Whether through incentives or disincentives, European TDM has sought to reduce the attractiveness and affordability of car travel while increasing the practicality and desirability of relying on alternative modes. Strategies that increase the cost of car travel, including taxes, traffic tolls and parking fees, have been implemented in various cities to meet this objective. Conversely, other strategies have been deployed to decrease the price of public transport use and to enhance the experience of using these modes. Recent efforts have been devoted to the smooth integration of these modes through the alteration of infrastructure, the strategic placement of mobility information centers and stations and the creation of multipurpose travel cards. Moreover, emphasis has been placed on the encouragement of additional alternative modes, walking and cycling in particular. Other strategies such as the development of green commuter plans and employer-initiated journey plans are becoming more common throughout the European Union. More recently European TDM has relied on the relatively new approach of influencing travel behavior through advertising campaigns and marketing, encouraging citizens to make more conscientious travel choices while

simultaneously targeting a younger, school-aged demographic before their travel habits have become routine.

These major trends are noticeable in research about European TDM, and will be explored in greater detail within this report. Less common but nonetheless successful measures will also be explained, and examples of European cities where these large and small trends have been adopted will be provided.

Some of this information will only be briefly related, but those readers requiring fuller detail may reference the annotated bibliography annexed to this report, covering research in which European TDM phenomena is given more thorough attention. Additional Internet resources are also provided at the end of the report.

TDM Approaches to Terminating and Curtailing Traffic in Europe

In those European areas where private car use is more common, congestion has not only affected the traveling time of the average commuter but has also contributed to air and noise pollution problems. These effects of congestion, combined with impact they have on Europe's economy, have led some European countries to take a more aggressive approach in the deployment of TDM methods. For example, one approach to the Dutch adoption of TDM is to remove cars from the international road network to allow for freer flow of goods from Rotterdam to the rest of Europe via truck. In the past, traditional TDM strategies have involved either halting or curtailing traffic. This section examines how several of these approaches work.

Terminating and Curtailing Traffic through Parking Measures

Aggressive parking strategies have played a vital part in Europe's effort to curb car use. Typically, strategies associated with the control of parking spaces have endeavored to influence travel behavior by limiting the number of parking spaces available and regulating the use of these spaces by imposing restrictions in terms of who can park there when and for what amount of time. In some cases, charges have been applied to parking spaces, decreasing the desirability of private car travel and eliminating many of the traffic problems that occur when drivers vie for limited amounts of space. A combination of the aforementioned strategies are often employed in European companies' "Green Commuter Plans," which will be discussed later in this report.

Amsterdam can be considered one of the most aggressive cities in its enforcement of parking regulations; among its policies is a limitation of parking spaces new businesses are permitted to have in public transport-accessible locations. In the locations closest to public transport stops and stations, for instance, businesses are given no more than one parking space per ten employees, a restriction that has limited traffic in particular areas dramatically. This is actually a national policy called A-B-C policy.

In Italy, Bologna also discourages car use by way of parking restriction; drivers have to pay relatively high parking fees, residents can use certain parking spaces only, and in

some cases residents even have to pay parking fees. Some sections of Bologna have access limited to residents, business owners and taxis only during designated hours, enforced by electronic equipment to verify vehicles have required permits [21].

Increasingly, companies and institutions are also using parking measures to alleviate onsite traffic problems. University of Sheffield in the United Kingdom, for instance, has incorporated into its travel plan the practice of dividing its car parks into categories, distinguished from one another by location, convenience, price and restriction. Car parks are divided into hierarchal categories, and permits for spaces are awarded on a points and criteria basis. Those commuters with the most points are given priority and allocated the most desirable spaces. Points are given to those who meet specified criteria and have commuter needs of higher urgency and priority; for instance, if a commuter has no access to public transport from his or her home, needs to travel by car for another reason, or has to take children to and from school, then he or she is given points. Though concrete statistics testifying to this plan's effectiveness are unavailable, evidence suggests a reduction in the number of staff and students driving alone to the school [1].

Terminating and Curtailing Traffic Through Road Pricing

Statistics indicate that most urban trips in Europe are made by car, and that private car ownership is continuing to rise. In the past, a typical response to these trends has been the construction of new roads and the creation of additional infrastructure; recently, however, TDM policymakers in Europe are regarding this approach as neither viable nor practical, and are instead more frequently opting for increasing the efficiency of existing road space. One method of optimizing infrastructure is through road pricing that influences commuter travel behavior.

Though few actual examples of road-based demand management exist worldwide, and despite the fact that road-pricing is still relatively rare in Europe, charging commuters for use of infrastructure is attracting attention as a means of deterring traffic. Testifying to this increased interest in road pricing, the European Commission has produced a "Green Paper" entitled "Towards Fair and Efficient Pricing in Transport" [24f] that delineates a fair and efficient pricing strategy:

- Charges should be linked as closely as possible to underlying costs.
- Charges should be highly differentiated to encourage behavioral adjustment.
- The price structure should be clear to the transport user.
- Charging should be non-discriminatory across modes and revenues should flow to authorities in countries where costs are incurred.
- Transport prices of journeys should be better aligned with the cost to society of these journeys.
- The full costs of all infrastructure networks should be recovered from the transport user in the long run, unless infrastructure has been constructed for other policy reasons.
- Imposing additional charges for simple revenue raising purposes is likely to lead to distortions.

Due to these concepts, road pricing plans that recover at least a part of the economic tolls resulting from commuter journeys, congestion and pollution are likely to attract more interest among the EU member countries. Some road pricing plans, in fact, are already in varying stages of development within Europe. In Oslo, Norway, for instance, a method of charging cars electronically has been in practice since the late 1970s. The toll, charged to vehicles entering the center of the city and averaging approximately £1.70 per trip, generates about £65 million in revenue each year. While some research acknowledges that the reduction of traffic past the toll areas is modest---averaging about 2 to 5 percent--there has been increased use of public transit since the toll was initiated, indicating that the toll serves the purpose of not only recovering part of transport costs, but also functions as a viable disincentive to driving [21].

Other various forms of road pricing are currently in practice in European countries. In France, Italy, Greece, Portugal and Spain, motorway tolls now exist, and in the Norwegian cities of Bergen and Trondheim, urban-based pricing is underway. Commonly, these tolls generate revenues for the creation of additional infrastructure, or the maintenance of existing roads [25].

A less common practice is congestion tolling, a strategy meant to optimize the efficiency and use of existing infrastructure by distributing transport demand more evenly throughout commuter days. Toll prices fluctuate according to time and travel demand, reducing traffic during peak commuter hours. In Europe, Paris, France currently claims to be one of the few existing examples of a congestion-tolling scheme. To better ensure that weekend return travel traffic is more evenly and manageably spread, tolls are charged at strategic places and times [25].

Until recently, the tax system in the UK had failed to accommodate the development of mobility management strategies with a taxation regime that encourages alternative mode use and discourages private car travel. Besides road pricing and congestion tolling, however, a potential disincentive exists in a tax scheme that influences travel behavior. Despite slow and incremental changes in the taxation system, taxation in the UK has for the most part favored those who choose private car travel and discriminated against those who avoid private travel modes. Until early 1999, any financial incentive given to an employer in support of creating a travel plan for its staff was subject to income tax. In 2002, however, the UK's plan was to create a new taxation scheme based not only on a percentage of the company car's price, but its levels of carbon dioxide emissions. In the UK government's 1998 White Paper, "A New Deal for Transport: Better for Everyone," [32] experts recommended against the building of new infrastructure and instead endorse mobility management approaches that are more progressive and feasible. One of these approaches is the government support of company green commuter plans in ways that reduce private car use and promote sustainable modes. The White Paper emphasizes the need for a revised taxation plan that assists in meeting this objective, and observes that some changes are already taking place that aid companies in the creation of commuter plans [33].

Terminating and Curtailing Traffic by Alteration of Infrastructure

Another control of traffic has involved the alteration of infrastructure to terminate or thin congestion, whether by decreasing road capacity and controlling space in a strategic way, or regulating existing space by implementing strategies that discriminate who and what kind of vehicles have access to this space [47].

A number of studies and resources, including those conducted by ADONIS and the research firms headed by Litman and Zeeger, have studied the potential of improving pedestrian conditions and encouraging walking [15]. Some measures and incentives include:

- Integrating nonmotorized planning into all transport and land use planning activities.
- Educating all transportation professionals in nonmotorized transportation planning principles.
- Funding nonmotorized planning at a comparable rate as other modes.
- Making sure that all roadways are suitable for walking unless it is specifically prohibited and suitable alternatives are available.
- Using current planning practices and design standards.
- Including nonmotorized travel in transportation surveys and models.
- Creating pedestrian-oriented centers and neighborhoods.
- Performing user surveys to identify problems and barriers to pedestrian travel.
- Using traffic calming and other traffic control measures to make street environments safer and more pleasant for walking.

Since 1995, the Danish Folketing, part of the Danish governing body, has allocated money to the Ministry of Transport's Traffic Pool. This money has been spent on initiating and supporting demonstration projects that can make traffic safer and less harmful to the environment, under the theme "Safer Bicycle Traffic." The projects demonstrate that road safety for cyclists can be improved, and that car trips can be changed into cycle trips if travelers are presented with the proper initiatives and cycling conditions [12].

Certain locales in Europe occupy the forefront of promoting pedestrian walking as an alternative to private car use. Pedestrianized, car-free commercial districts are becoming increasingly common throughout Europe, as evidenced in the Netherlands, whose "woonerfs" (literally translated "living yards", it means areas which are off-limits to vehicles, which could be used for a variety of alternative activities) number approximately 6,000. Other locales are more actively pursuing the creation of pedestrian-friendly environments, like Vienna's aesthetically pleasing areas filled with art, sculpture and fountains and Freiburg, Germany's sight-filled historical district, off limits to cars. The reconfiguration of neighborhood streets has also proven to make a substantial difference, such as Odense, Denmark's constraint of auto use to make parks and play-areas for children [15].

Copenhagen, Holland has acquired a reputation as one of the most innovative cities in the realm of improving walking conditions. A testimony to Copenhagen's achievements in this arena is the increased time people spend using the city's car-free spaces for a multitude of different activities, whether necessary for work or errands or optional leisure time. Data on these changes of urban culture have been recorded since the 1960s in a series of surveys and indicate major changes in traffic behavior and public life. Moreover, these surveys indicate that since 1968 car-free activities have quadrupled in the car-free zones of Copenhagen.

Through various measures and policies, Copenhagen has transformed the center of the city from a once car-dominated area to a place hospitable to pedestrian traffic and alternative, nonmotorized modes. Copenhagen's first pedestrianized street, Stroegget, currently has about 80,000 people walking through a relatively narrow street (10 to 12 meters wide) during any summer day or night. Once a main street crowded with buses, lorries and cars, Stroegget was changed in 1962 to a pedestrian-only area. Surprised by the success of their experiment, traffic planners realized the potential of creating pleasant pedestrian space to reduce traffic problems. Since Stroegget opened to pedestrians, the amount of people staying in the pedestrian spaces has been growing proportionately with the number of car-free square meters that had been made available for pedestrians. Every time Copenhagen has added another 14 m² for pedestrian use, a new person has come along and settled in to enjoy the city [39].

The Improvement and Promotion of Alternative Modes in Europe

This section reviews the literature that discusses how Europe seeks to improve and/or promote the use of various alternative modes to driving alone.

Public Transit Improvements

According to the research, a decline in the use of public transportation modes has been observed in recent decades. This phenomenon is not due to lack of availability, generally, but an increased accessibility to use of private transportation. The use of private cars is alluring to the general public because of a perceived sense of comfort, flexibility and security [24a]. In addition, company cars are very common and some countries provide tax breaks for the use of cars for commuting. In order for public transport to be utilized to its fullest potential as a means of combating congestion and curbing private car use, efforts need to be made in terms of changing the public's perception of this alternative mode and facilitating improvements to make public transport more alluring for commuters. The foremost objective of public transport services, according to many studies, should be the smooth and efficient integration of modes; instead of competing with one another, bus, tram and train services should cooperate to ensure that the public transport system operates efficiently, presenting to its users the least amount of obstacles and inconveniences possible.

Ideally, this integration of modes could be made even more user-friendly with the creation of cards that allow commuters to make transfers from one public transport mode to another relatively easily. The Netherlands, for instance, has recently created such a card, though it has been utilized on a relatively small scale, designed primarily for recreational travel. The project of the Gelredome stadium in Arnhem, Netherlands has proven successful in reducing car use, improving public transport accessibility, and promoting a cleaner environment. Contributing to this success was the creation of the "clubcard of Vitesse Arnhem," which allowed football fans free access to all bus services two hours before and two hours after each game. Primarily, the main goals of the Arnhem mobility plan have been to prevent parking problems around the stadium and ensure optimal traffic flow for visitors of the Gelredome [33].

Other studies indicate that a combination of different improvements is required to maximize public transport ridership. Among these improvements are:

- Fare reductions (e.g. off-peak or weekend reductions)
- New fare options, particularly discounted tickets and passes
- Free transit areas
- New and expanded transit systems
- More convenient routing
- Shuttle service, distributor routes, feeder routes
- More frequent service
- Increased speed and reliability

- Longer service hours
- Regularized schedules
- Sale of transit tickets at employment sites, tourist offices, and other venues
- Special route to serve particular travel requirements, such as access to employment centers [17].

Despite high levels of private car ownership in much of Europe, public transport continues to be popular in locales such as Munich, Barcelona and Achterhoek, Netherlands (*Public Transit Improvements*). The UK Commission for Integrated Transport, an independent body set up by the government in the late 90s to rescue Britain's failing transport network, studied the public transport in these places and concluded what many other studies reinforce: that the largest contribution to success is a smooth integration of modes. Other qualities of the public transport systems in these areas, however, are noteworthy. Most importantly, a successful public transport system depends on an integration of policy-making and finance; land use, public finance and transport decisions need to be made in consideration of each other. Moreover, in order to decrease auto dependence, streets in municipal areas must be usurped from car users, and preferential treatment should be accorded to travelers who favor alternative modes instead of commuters who choose private travel [17].

Other areas regarded as having worthy models of public transport systems are Stockholm, 70 percent of whose trips are made on public transport during peak hours, and Utrecht, Netherlands, 80 percent of whose trips are either made on public transport or bicycle within the downtown area [22]. Cities such Utrecht owe part of their success to the locations of their stations, which often adjoin important urban areas and are within cycling distance to other destinations and attractions. Other cities like Stockholm have made efforts to create stations that are aesthetically pleasing to citizens, by renovating them and filling them with beautiful artwork [23].

Zurich, Switzerland's public transportation system combines some of the aforementioned strategies to impressive effect. Zurich's system provides 270 kilometers of line within the city and 262 lines covering 2,300 kilometers overall. The city's system is unique in that design features are given priority over other considerations, a decision made by the voting public. Buses have reserved exclusive lanes [23] and are equipped with electronic transmitters that allow the drivers to signal the vehicles' approach to traffic lights. Additionally, the routes of the public transit system are monitored with computers and commuters are provided accurate information about arrival and departure times. In addition to some of the aforementioned features, Zurich's is a smooth-running system because of the relative proximity of important areas to transit stops and commuters' ability to use a single ticket on any mode of transport throughout the city [23].

Mobility Centers

According to MOST (Mobility Management for the Next Decade), mobility centers are the nerve center of mobility management. On one hand they are the information point for all transport users with questions on sustainable transport, on the other hand they are the organizational core for mobility management and mobility services [46]. Momentum and MOSAIC, two research programs funded by the EU, have paid close attention to mobility management strategies implemented by members of the European Union in recent years. Of particular interest recently is the emerging trend of mobility management centers such as Münster's Mobilstations and Wuppertal's MobiCenter which promote the use of alternative transport and provide commuters with services such as timetable information, carpooling schemes, purchasing tickets and parking.

The MOSAIC (Mobility Strategy Applications in the Community) project [48], a three-year research endeavor conducted through partners and demonstration projects in the UK, Germany and Netherlands. One of MOSAIC's primary demonstration projects focused on a mobility center in Wuppertal, a German city of approximately 400,000 citizens. When the MOSAIC project was initiated, the mobility center in Wuppertal became a focus of MOSAIC's attention. As a result, the center was allowed to broaden the range of services it had to offer. Currently, the Wuppertal center offers more than 50 services, covering all modes. According to the MOSAIC report, approximately one third of the population of Wuppertal is aware of the Mobility Center, largely due to its central location in the heart of the pedestrian zone. The best-known Mobility Center services were those related to public transport. Auto-related services provided for the MOSAIC pilot project, such as car sharing or information on available parking spaces, were less well-known [48]. An estimated 1% of Wuppertal citizens are users of the mobility center services, the typical clients being licensed, employed females who do not own cars. By the MOSAIC project's conclusion, there was a small but identifiable shift from private to public transport [48]. More recent information, however, indicates that the MobiCenter of Wuppertal is swiftly gaining attention and users, since the degree of knowledge about the center grew to 40 percent among Wuppertal citizens in 2000. Over half of the citizens who knew about MobiCenter have used its services [46].

Another mobility management center, Münster's "mobile," was initiated in the late nineties. Located in the center of the city, "mobile" offers a range of information services to its users, and recent research indicates that 8% of these customers have altered their travel habits after consultation. It is Münster's plan in 2002 to combine existing information centers to create a larger and more extensive center across from the central station, an improvement that can reasonably be expected to increase the number of customers who utilize and are affected by the service [46].

Other mobility centers in Europe include Bologna, Italy's center, which has been in existence since 1995 and has been offering information of alternative and multiple modes since 1998. At the Bologna center, a customer satisfaction survey is conducted annually, and the number of people utilizing the service is estimated every month [46]. Within

close distance to the University and Academic Hospital, Utrecht's Mobility Office aimed to reduce commuter car use and increase accessibility to the area. One of the service's primary objectives was to provide transport management information to participating companies. Based on surveys, the MOSAIC report concludes that between 1992 and 1994, the trip distance traveled increased for all modes at the university but decreased slightly at the hospital. The use of cars for business trips had declined at the university, while public transportation use remained stable [48].

Green Commuter Plans (GCPs)

Increasingly, companies throughout Europe are implementing green commuter plans (GCPs), adopting a series of strategies that, when combined, reduce a company's transportation problems and influence the commuting behavior of employees and visitors. In the U.S., these plans are often called Transportation Management Plans or Trip Reduction Plans. Based on Rye's report, the MOSAIC projects, and other related research and demonstrations, company, site-level action is becoming increasingly common, and the success of GCPs depend both on a balanced combination of measures and a blending of incentives and disincentives. Companies more actively seek GCP solutions to transport problems when there are dilemmas to surmount, such as parking shortages, site congestion and planning problems. Commonly, companies require the catalyst of a travel problem to be spurred into the contemplation phase of GCP development. In order to achieve the initiatives delineated by its travel plan, a company may incorporate a range of transportation-related initiatives to address different transportation aspects, including commuter journeys, business travel, and fleet management. A company can incorporate into its plan a broad package of complementary measures, depending upon the goals of the plan [1]. These measures include an array of incentives and disincentives, such as provision for cycling, teleworking and carpooling, as well as limitation of parking and changing of work conditions. The UK government requires GCPs of county councils and for new developments.

The Greater Nottingham area, 190km north of London with a population of roughly 600,000 inhabitants, was the focus of some MOSAIC demonstration projects that encouraged local employers to adopt green plans. Part of this effort involved MOSAIC's recruitment of a mobility consultant, funded by MOSAIC, to introduce the idea of green commuter plans to these employers. Typically, the Nottingham consultant contacted these businesses via letter; the task of developing a travel plan, however, was left largely to the employers. The Nottingham consultant's only contribution to the process was the suggestion of possibilities. When this demonstration project was completed, MOSAIC then began the process of assessing the effectiveness of promoting green commuter plans through the mobility consultant. According to the MOSAIC report, "Only 6 of the 36 'not contacted' organizations had heard the term 'Green Commuter Plan' before and over half of the other organizations first heard the term through contact with City Council. Reactions to the initial meeting with the Mobility Consultant were positive with 9 of the 19 organizations interviewed who had a meeting describing it as very useful and 6 as quite useful. The majority of the 23 Active organizations thought that the level of assistance they received from the City Council on Green Commuter Plan issues was what

they needed” [48]. At the time of the MOSAIC report’s completion, 32 of 108 possible organizations were working on green commuter plans. Ten of these organizations were already involved in the initiation of a green commuter plan before being contacted by MOSAIC’s mobility consultant; the remaining 22, however, were encouraged to create incentives and disincentives to achieve a reduction of car use [48].

In his report *Management of Staff Travel Choices at the Company Level in the UK*, Tom Rye [1] provides several examples of existing travel plans that typify methods of the practice in its various forms:

- University of Sheffield. University of Sheffield has incorporated into its travel plan the practice of dividing its car parks into categories, distinguished from one another by location, convenience, price and restriction. Parking permits are granted on a points and criteria basis. Rye [1] grants that even though concrete statistics testifying to the plan’s effectiveness are unavailable, evidence suggests a reduction in the number of staff and students driving alone to the school.
- Nottingham City Hospital. The measures of Nottingham City Hospital’s travel plan include:
 - Improved pedestrian and cycle access to the hospital
 - Installation of showers and lockers, as well as improved bicycle parking
 - Arrangements with bus service providers to arrange city routes with respect to the location of the hospital
 - Parking charges, with a portion of the revenue invested in improving non-car based access to the hospital
- Fife Council, Scotland. Measures utilized by Fife Council include:
 - Offering secure bicycle parking, lockers, showers and public transport information
 - Use of a carpool matching database
 - Reservation of car spaces for carpoolers
- Hewlett Packard, Edinburgh, Scotland. The primary components of Hewlett Packard’s travel plan are:
 - Bicycle parking and access to lockers and showers
 - Preferential parking for carpoolers, based on number of passengers
 - Carpool matching databases
 - A discount of up to 40% on rail tickets, achieved through the company’s negotiations with Scotrail
 - Information and promotion of non-car based modes
 - Gradually eliminating company cars and/or replacing them with environmentally-friendly vehicles
- Stockley Park Business Park, near Heathrow Airport, West London. The aspects of business park’s plan have included:
 - An internet site with travel information
 - Travel coordinator/s
 - Support of key bus services

- Dissemination of information and publicity
- Staff surveys
- Financial investments in further sustainable transport solutions, including the development of a new railway station
- Gyle/New Edinburgh Park. Rather than a single organization or company, the Gyle/New Edinburgh Park is a large employment area consisting of numerous companies, as well as a major shopping center. The combined actions of the park's travel plan have included:
 - Gathering and sharing data
 - Lobbying public transport providers
 - Lobbying the local council for better parking control

According to Rye [1], Nottingham City Hospital reduced its individual car commuting by 17% between 1997 and January 2001. In Stockley Park, car use decreased from 88% to 84%, and cycling use more than doubled. Moreover, a modal shift from car to rail was evidenced at the Hewlett Packard demonstration, where the number of employees commuting alone dropped from 65% to 59%.

Carsharing and Vanpooling

In Europe, carsharing companies and vanpooling services are propagating at a healthy rate. Carsharing is a form of a vehicle rental or fleet operation where travelers have instant-access to a network of cars throughout a city, 24 hours per day and pay per trip. Carsharing is more common in Europe compared to the United States, though carsharing companies and practices are increasingly being developed throughout North America. In Europe, carsharing organizations typically charge \$1-2 per vehicle hour, plus 25-40 cents per mile. Some carsharing operations also charge a membership deposit of \$300-500, typically refundable. These charges usually cover all vehicle-operating expenses, including fuel and insurance. Often, special rates are designed for extended trips and infrequent users. The creation of all-inclusive packages and specially tailored rates has led to an increase in European carsharing, but other barriers include adequate education and marketing, as well as a need to establish and maintain a regular and substantial clientele [18].

In his *State of the Art* report, Roy Traue [10] provides examples of what he feels to be representatives of carsharing innovators. German CarPool, for instance, “offers open end, instant access and one way rides. Apart from CarPool, no regular carsharing system across Europe includes open end or instant access”. Traue [10] also describes as state of the art a type of access-technology that allows a customer to reserve his or her car by phone or Internet, among other options, and this order in turn is transmitted via computer to the on-board computer within the customer's car of choice. “The customer then has to put his smart card in front a reading device behind the car's windshield or incorporated into the key-locker. The car or locker only opens if there is a valid reservation registered for the corresponding customer and if the customer types in the right PIN. After the trip, the respective data are transferred back to the local branch office where an automatic billing is carried out” [10].

In Switzerland and Germany, car sharing (also called station cars) has been a transportation offering for more than 10 years. Presently, Mobility CarSharing Switzerland serves more than 20,000 people at 600 stations in 300 cities and towns throughout Switzerland and manages a fleet of 900 cars. Already some mobility services exist in Europe, such as Autodate in the Netherlands, which attract more than 85,000 customers. At present, many transit agencies, CSOs, and mobility centers are beginning to provide a variety of car sharing products and other mobility services based on smart cards and communication technology [36].

A less common phenomenon in Europe is vanpooling. In early 1995, the Dutch Ministry asked Organizational Coaching (a Dutch research consultancy) to explore the pros and cons of implementing vanpooling programs in the Netherlands. After discovering that the possibilities for successful vanpooling existed, Organizational Coaching was then asked to establish pilot projects.

The pilot process was carried forth and the outcome revealed obstacles hindering the widespread adoption of vanpooling in general, including high van prices and lack of HOV lanes. Nonetheless, vanpooling pilot programs confirmed user satisfaction and support, and changes are currently taking place in the Netherlands that are making the future implementation of vanpooling programs likely. Political pressure is growing to change the Dutch fiscal and transportation law in favor of vanpooling, and the Ministry of Transport has advised all relevant government agencies to accept vans in bus lanes [35]. More common than vanpooling in Europe are “employee” or company buses that transport employees from pick-up points near their homes to work at large facilities.

Future Directions of TDM in Europe

MOST (Mobility Management Strategies For the Next Decade) [46] is an attempt at implementing pilot projects in 32 European cities spanning over both traditional (companies, schools) and new niche areas such as tourism and new planning sites. The scope of the project is to improve access to transportation for all sectors and to foster positive attitudes toward sustainable mobility. The development of an evaluation framework in the form of a clear guide and impact assessment of the strategies is called MOST MET (MOST Monitoring and Evaluation Toolkit) Project assessment is evaluated by the reduction in vehicle kilometers and the toolkit outlines the entire process for data collection and analysis in this process.

In the education sector, a traditional area in pilot projects, MOST [46] promoted traffic safety both to parents and school officials along with presenting sustainable alternatives to methods being used to transport children. For instance, in Limburg, Belgium, officials implemented four separate projects in a “step-by-step” approach, first promoting a “car-free” school week encouraging other modes like cycling causing an increase 23% in this mode. Subsequent steps led to the development of a comprehensive plan for the province that aimed to integrate infrastructure development while essentially ensuring mobility management. In the tourism sector, MOST sought to encourage visitors to utilize public transit to relieve some strain on the transport system during peak tourist times.

In Malaga, Spain, a detailed long-term development plan for mobility management and transportation infrastructure was developed in which a dedicated “tourist bus service” was implemented, information leaflets distributed and a smart-card service initiated all to improve the level of service provided.

MOST strategies have also been applied in site development, incorporating new strategies for alternative sustainable mobility and congestion reduction. In Bremen, Germany, the planning of Botanika (a local rhododendron park) included planning for a “pedestrian guidance system” and information dissemination at the park café concerning public transport to park visitors.

The MOST MET presents some suggestions for Mobility Management projects that are to be evaluated:

- ❑ Embrace evaluation
- ❑ Set measurable objectives
- ❑ Build monitoring and evaluation into planning
- ❑ Monitor and evaluate continuously
- ❑ Maintain objectivity
- ❑ Monitor users and their activities
- ❑ Evaluate and report results

Given these methods are utilized in evaluating a MOST project there is a clear opportunity to make an accurate assessment of the impact of the project.

Conclusion

Certain European countries are utilizing mobility management strategies to impressive and significant effect. Countries such as Germany have made efforts to enhance public awareness about sustainable travel, and recently more emphasis has been placed on educating children before their commuting habits are formed.

The United Kingdom is investigating the feasibility of green commuter plans, such as exploring new taxation plans that favor public instead of private travelers. In addition, road pricing has been implemented in London, and the city has undertaken a large-scale media campaign entitled “Do your bit” [53].

Widely considered vanguard in its implementation of mobility management strategies, the Netherlands has taken large strides in the improvement of pedestrian conditions, promoting public transportation and bike use, implementing carpooling and park and ride systems, and discouraging private travel. It would be a mistake, however, to assume that all countries in Europe are as advanced in their creation of transport demand strategies as the United Kingdom and the Netherlands.

In fact, there are some countries in which the idea of mobility management is just starting to take root, and some in which few noteworthy sustainable mobility strategies exist. Nonetheless, countries such as England and the Netherlands represent a significant trend within the European Union, recognizing the need to curb private car use and promote sustainable modes of travel.

A final and accurate summation on the feasibility of mobility management strategies is difficult to attain, since many measures and projects are in varying stages of development and implementation. One important lesson gleaned from years of research---and an attitude more commonly adopted among TDM professionals---is the view of mobility management as a continual process. Instead of viewing TDM as a final goal to be realized, mobility management instead should be treated as a never-ending evolution and adaptation, never reaching completion but always striving to improve mobility with feasible and sustainable methods.

Some strategies have already proven successful and will likely play an integral role in the evolution of mobility management in the future:

- Promotion of information-based forms of mobility
- Alternation of infrastructure to favor pedestrians and bicyclists
- Public transport improvements
- Road pricing
- Green commuter plans
- Carsharing and vanpooling
- Mobility information centers

The transferability of these strategies to all locales is open to question. For instance, cities like Freiburg and Berlin, Germany, and Vienna, Austria have developed and continue to

develop extensive and impressive bicycle networks, and in the Netherlands, pedestrian conditions are so favorable that there are 17 million bicycles nationally, more bicycles than people. It would be unreasonable to expect all cities to promote such widespread bicycle use, since some infrastructure, climates and terrain are unaccommodating to certain forms of low-tech mobility. Similarly, the public transport systems of other locales may not facilitate those particular cities being participants of the car-free network, of which Barcelona, Spain; Nottingham, England; and Turin, Italy are a part. On the other hand, mobility information centers, green commuter plans, alternative work schedules, and telework have been deployed in various cities with relative ease and success.

Whatever the mobility management strategy being implemented, a number of reports seem to agree that a combination of factors needs to be present to ensure maximum success. One of the foremost recent trends is educating the public about personal responsibility, and in the process reducing the stigma attached to public transport use. Eventually, the goal should be to make public transport more comfortable, efficient, and cost-effective than private vehicle use. The process of luring travelers to public transportation from private vehicle use should involve both incentives and disincentives.

Furthermore, tax schemes, legislation and the creation or alteration of infrastructure should prioritize pedestrians and sustainable mode users over those who travel by car. A smooth integration of modes and convenient access for commuters is key to ensuring optimum ridership. Aside from these factors, mobility management should be approached as a continuous process, since in a world in which transport demand is exponentially growing, measures to limit the impact of traffic on the economy, environment and infrastructure will always need to be made.

What can the TDM professional in the U.S learn from this growing European Experience? Clearly there are some key differences in the environment in which TDM is implemented. In Europe, the carpool mode is brand new as a recognized alternative to promote. Public transport and bicycle mode shares are significantly higher in most places in Europe as compared to the U.S., with its taxation policy that tends to favor cars more than taxation policies in Europe.

Even with all these differences, the U.S. can certainly learn a lot from European TDM experience. First, the Europeans have adopted and improved upon U.S. TDM measures, such as carpool matching, vanpooling, and the creation of TDM plans at employment sites. Second, TDM is integrated into national transport policy in Europe, whereas in the U.S. it is one local option for congestion relief and air quality. Finally, the Europeans have improved on the marketing of TDM by often promoting sustainable transport as a lifestyle choice rather than as an alternative. European TDM experience also stresses a more personalized, consultative approach through mechanisms like Mobility Centers. Additional information about successful TDM strategies is available in the annotated bibliography accompanying this report.

Annotated Bibliography of TDM in Europe

1. Rye, Tom. (2001). Management of Staff Travel Choices at the Company Level in the UK. *European Conference of Ministers of Transport*, Napier University Transport Research Institute. <http://www1.oecd.org/cem/online/conclus/rt121e.pdf>.

This report devotes broad attention to travel plans implemented by companies in the United Kingdom. Rye defines a travel plan as “a strategy...to reduce [a company’s] transportation impacts and to influence the travel behavior of its employees, suppliers, visitors and customers” (2). In order to reach the initiatives delineated by its travel plan, a company may “incorporate a range of transport-related initiatives to address different transport aspects, including commuter journeys, business travel, and fleet management. It can incorporate [into its plan] a broad package of complementary measures, depending on the objectives and targets set” (2). These measures include an array of incentives and disincentives, such as provision for cycling, teleworking and car sharing, as well as limitation of parking and changing of work conditions.

Rye provides in his report several examples of existing travel plans that typify methods of the practice in its various forms:

- University of Sheffield. University of Sheffield has incorporated into its travel plan the practice of dividing its car parks into categories, distinguished from one another by location, convenience, price and restriction. “Permits for Category A and B car parks are awarded on a points/criteria basis. Applicants gain points if they need a car for work, have to drop children *en route* to the university, live far from the university, and/or have no direct bus or tram route to the university” (15). Rye grants that even though concrete statistics testifying to the plan’s effectiveness are unavailable, evidence suggests a reduction in the number of staff and students driving alone to the school.
- Nottingham City Hospital. The measures of Nottingham City Hospital’s travel plan include:
 - Improved pedestrian and cycle access to the hospital
 - Installation of showers and lockers, as well as improved cycle parking
 - Arrangements with bus service providers to arrange city routes with respect to the location of the hospital
 - Parking charges, with a portion of the revenue invested in improving non-car based access to the hospital
- Fife Council, Scotland. Measures utilized by Fife Council include:
 - Offering secure bicycle parking, lockers, showers and public transport information
 - Use of a car-sharing database
 - Reservation of car spaces for car sharers
- Hewlett Packard, Edinburgh, Scotland. The primary components of Hewlett Packard’s travel plan are:
 - Cycle parking and access to lockers and showers
 - Preferential parking for carsharers, based on number of passengers
 - Car sharing databases

- A discount of up to 40% on rail tickets, achieved through the company's negotiations with Scotrail
 - Information and promotion of non-car based modes
 - Gradually eliminating company cars and/or replacing them with environmentally-friendly vehicles
 - Stockley Park Business Park, near Heathrow Airport, West London. The Aspects of business park's plan have included:
 - An internet site with travel information
 - Travel coordinator/s
 - Support of key bus services
 - Dissemination of information and publicity
 - Staff surveys
 - Financial investments in further sustainable transport solutions, including the development of a new railway station
 - Gyle/New Edinburgh Park. Rather than a single organization or company, the Gyle/New Edinburgh Park is a large employment area consisting of numerous companies, as well as a major shopping center. The combined actions of the park's travel plan have included:
 - Gathering and sharing data
 - Lobbying public transport providers
 - Lobbying the local council for better parking control
- On a microlevel, separate organization's individual actions have included:
- Cycle facilities
 - Car sharing
 - Discounted bus tickets

After providing the details of his examples, Rye shares data on the results of these travel plans. Among the findings discussed are:

- Nottingham City Hospital reduced its individual car commuting by 17% Between 1997 and January 2001
- Car use decreased from 88% to 84% at Stockley Park over a period of Approximately two years. Moreover, cycling rates have more than doubled
- At Hewlett Packard, the number of employees driving alone fell from 65% to 59%. This was achieved due in part to a noticeable modal shift from car to rail

Based on the evidence provided in his report, Rye concludes that travel plans do work, and that modal shifts on a site level are achievable given the proper conditions. Rye comments "the factors that contribute to the success of travel plans are, firstly and most importantly, a site specific problem with congestion, parking and/or transport-related staff recruitment" (25). Aside from these factors, Rye adds, "a supportive organizational culture can be of great benefit, as can staff dedicated to the travel plan. Joint work has also shown to be of some use in raising awareness, building morale amongst transport staff in companies, and lobbying public transport providers" (25).

Finally, Rye remarks that the future success of travel plans depends partly on an organization's "own transport difficulties" (26). "Essentially local and national government, especially in England, have chosen to 'create a problem' for new/expanding organizations through requirements for travel plans in planning agreements, and by reducing the amount of parking that is allowed at a new development. The difficulty of this for wider travel plan implementation is that [it] does not affect existing organizations, and it is critically dependent on the level of economic activity, which drives planning applications. The question remains for government: if it desires the wider adoption of travel plans by existing organizations, then it must find some way 'encouragement' to do this---or otherwise accept that travel plans will be limited mainly to new/expanding organizations" (26).

2. *Integrated Policy Aspects of Sustainable Mobility*, A thematic Synthesis Of Transport Research Results, Paper One Of Ten For The EXTRA Project Within The European Commission- Transport RTD Program- Fourth Framework Program September 13th, 2001.

http://europa.eu.int/comm/transport/extra/sustainable_int.pdf

This report supplies a structured guide to the findings of research carried out in the transport RTD Program that relate to the development of an integrated policy perspective on sustainable mobility. According to the author, "many people see the current trends in European transport activity as unsustainable, with traffic growth leading to greater congestion, increasing emissions of carbon dioxide and depletion of fossil fuels. Yet the pursuit of *sustainable* mobility presents a challenge" (3). Though Europe has aspirations both in growth and social demands for mobility, certain measures to limit environmental and other effects of traffic movements must be made. According to wide opinion, solutions to this dilemma exist in an ability to create an "*integrated* approach, combining pricing instruments, new technologies and other policy actions" (3). Research has discovered three recurring fundamentals in the implementation of policy measures: work on understanding the future that has provided the foundation for policy analysis; consideration of economic, social and environmental aspects that has enabled policy decisions to be made in a balanced way; evaluation of the transport effects of policy measures and research on policy integration that has provided the means of identifying appropriate packages and measures. The first in a series of ten substantial reports concerning the European Community's Transport RTD Program, "*Integrated Policy Aspects of Sustainable Mobility*" is not meant to be read front to back, according to its authors, but referenced for RTD results on topics of particular interest. Section five provides an overview of topics addressed by "clusters" of RTD projects and section six usefully summarizes findings for these topics of interest, while annexes one and two identifies individual projects relating to a topic and reviews the key results from each of these topics, respectively. Furthermore, the report provides a working, practical definition of "sustainable mobility" as formulated by the by the EXTRA project within the European Community's Transport RTD Program: *A transport system and transport patterns that can provide the means and opportunities to meet economic, environmental and social needs efficiently and equitably, while minimizing avoidable and unnecessary adverse impacts and their associated costs, over relevant space and time scales* (7).

3. Cohen, S. (1998). *Effect on Narrow Lanes on the Capacity of Motorways: A Trial in the Paris Region, Delivered at the Third International Symposium on Highway Capacity, June 1st, 1998.*

<http://www.vd.dk/wimpdoc.asp?page=document&objno=8600>

The trial described in Cohen's report focuses on a project realized in Paris in 1996, concerning a 2.5 km section of the A6a motorway in south Paris. Data was collected after lanes were modified and narrowed to assess possible effects. Particular attention was paid to traffic behavior changes---the positioning of vehicles and motorcycle traffic volume--- as well as a macroscopic analysis of traffic flows. A reduction in the lateral spacing of vehicles was noticed, and it was also noted that heavy trucks traveled closer to the edge lines. For the most part, however, motorcycles continued moving between streams of traffic during heavy traffic hours, and the congestion level was almost consistent with that of the motorway before it was changed.

4. Rye, T. and McGuigan, D. (2000). *Green Commuter Plans: Do They Work?* Napier University Transport Research Unit.

<http://www.scotland.gov.uk/cru/commuter-01.pdf>

In this lengthy report of almost one hundred pages, authors Rye and McGuigan devote careful attention to the viability of green commuter plans in the U.K. The aims of their project were to:

- Ascertain the potential of GCPs in achieving a modal shift
- Identify GCP success factors
- Identify the most successful and effective qualities of GCPs
- Identify barriers to GCP implementation and methods to overcome these barriers

In order to reach some conclusions about the possibility of these plans helping the effort of TDM, three case studies were chosen: Hewlett Packard in South Queensferry, the South Gyle/New Edinburgh Park employment area in West Edinburgh, and the Kirkton Campus business park in Livingston. According to the authors, these sites were chosen specifically because they were already practicing GCPs in some form, whether at more advanced or incipient stages.

At the outset, the authors answer the question posed by the title of their report: Do green commuter plans work? Their answer is a "qualified yes" (ii). "Two case study organizations in this project achieved a significant reduction in the proportion of their staff driving alone to work as a result of GCP. At HP, the proportion of staff driving alone fell from 65% in 1997 to 59% in 1999. At the Royal Bank of Scotland in the Gyle/NEP, the proportion of staff carsharing to work rose from about 25% to roughly 35%" (ii-iii).

To address specifics in their study, the authors describe stages of GCP development so readers can better understand their development. The stages are:

- Pre-contemplation

- Contemplation
- Preparation
- Action (Basic, Incentives, Disincentives)
- Maintenance
- Relapse

In Rye and McGuigan's estimation, Hewlett Packard has reached a stage of action that relies on presenting incentives to its employees as a means of promoting GCP. Hewlett Packard's effort has not included the introduction of disincentives thus far, however, and for this reason the authors speculate that the "overall effect on employee modal split is likely to be in the range of 5-8%" (78). Nonetheless, Hewlett Packard's efforts represent an achievement, since they demonstrate the effectiveness of GCPs and their viability in a larger U.K. context. The Royal Bank of Scotland at Gyle also demonstrated that GCPs could work. "The formation of the Commuter Forum at the Gyle/NEP has moved most employers from the pre-contemplation stage of the model" to the action stage (79). Unlike Hewlett Packard and the Gyle/NEP area, the Kirkton Campus remained for the most part in the pre-contemplation stage throughout the length of the study.

Rye and McGuigan also identify main components of the implementation of GCPs in the various case studies given attention. The components of Hewlett Packard's GCP plan, for instance, were "low cost and low intervention" and included:

- Bicycle parking, showers and lockers
- Preferential parking for carsharers with 3 or more in the team; a carshare data base to promote carpool information
- A discount of up to 40% on rail season tickets to Dalmeny Station
- Promotion of and information about alternative modes
- The phasing out of company perk cars and their replacement with clean-fuelled pool vehicles.

Oddly, one of the factors hindering more widespread implementation of GCPs is a lack of problems, according to Rye and McGuigan. That is to say, corporations more actively seek GCP solutions to transport problems when there are dilemmas to surmount, such as parking shortages, site congestion and planning problems. Commonly, corporations require the catalyst of a travel problem to be spurred into the contemplation phase of GCP development. After considering this phenomenon, the authors contemplate the effectiveness of different measures and conclude, "the key measures that appear to have resulted in mode shift are the rail discount at HP and carsharing *combined with parking management* at the Royal Bank" (81, italics the authors'). It is admitted in the report that only limited cost/benefit data was available and collected, but it is noted that "the installation of 2 showers and 20 lockers at the City of Edinburgh Council cost 7,000 pounds, so this gives some indication of the costs of HP's installations, although it must always be borne in mind that these are very building specific" (81). Nonetheless, to judge from the cost of HP's measures and actions by corporations like it, the cost of adopting GCP measures is relatively low when viewed alongside the benefits achieved.

5. Duff, Alastair. (1999). Working in Partnership: Creating Heathrow Airport's Transport Forum, International TDM Column. *TDM Review*, 7(1), 22-23, 34.

Traditionally, how an employee has commuted to and from work in the United Kingdom has been viewed as a concern of employees, not the employers, but increasingly companies view their economic growth and success as dependent on access issues. Such is the case with Heathrow Airport, whose forum and implementation of transport strategies has established Heathrow's reputation as a major intermodal transport hub. Heathrow's forum is the first organization of its kind in the UK, combining the efforts of public and private sectors in the pursuit of common initiatives. Officials attribute the success of their enterprise to this holistic and partnership-oriented approach, integrating ticketing and information issues as well as encouraging mode shifts to car sharing, walking and cycling. While the author admits that the size of the operation and the large number of variables make the results hard to measure, certain conclusions have been reached nonetheless:

- In the past three years, there has been an increase of 100 percent in use of the local bus services.
- The number of local buses entering the airport has risen by 52 percent in recent years.
- The number of buses equipped with new, environmentally friendly engines has risen from 0 to 54 percent within three years.
- The M4 Spur bus lane has saved 10 minutes for every bus and coach by using the freeway in peak traffic hours, alleviating congestion.

Finally, these findings reinforce the author's belief that only through partnership and bringing together interested parties in an area can the best possible return on the effort and investment required to achieve mode change be ensured (34).

6. Newsome, C. & Schreffler, E. (1998). *The Healthy Transport Network: Hospitals Learning TDM from Each Other in the U.K.* International TDM Column. *TDM Review*, 6(2), p.24.

Like the United States, many health sites in the United Kingdom experience severe parking shortages. It is becoming more common, however, for local planning authorities to refuse expanding parking space. In response to this problem, some hospitals, such as Southampton University Hospital Trust (SUHT), have started implementing green commuter plans. Formerly, many of the approximately 5,000 employees were waiting 40 to 50 minutes to get into the parking lots, but the TDM program SUHT instituted in 1995 alleviated some of the problem. SUHT's TDM program included:

- Parking restrictions (employees living nearby are prohibited from parking at the site)
- Parking charges (other employees pay \$80-160 a year to park)
- Bus subsidies

- Park and ride services
- Bicycle facilities
- Guaranteed ride home
- Bicycle purchase subsidies or bus passes for turning in parking permit

Since the institution of these measures, the hospital reports a reduction in staff car trips of 12% in two years.

7. Wagner, Conrad. (1998). *Swiss Roll on With Mobility Management*. International TDM Column. *TDM Review*, 6(2), 24-25.

The car sharing plan implemented by Switzerland aims to provide a viable alternative to car ownership and travel by offering users rental options from nearby neighborhood locations. In Switzerland, some 75,000 people use the service, sharing approximately 800 cars available at 600 stations. Most plans offer a wide variety of vehicles such as small economical cars, luxury cars, vans and convertibles, all of which are available at the strategically-located stations and can be put on reserve 24 hours a day, with minimal notice. The success of this enterprise has resulted in many car sharers forfeiting their private cars and forgoing single-occupancy transportation, opting for mobility packages. These packages include “Fahrpass,” “zurimobil,” and “Zuger Pass Pins,” which combine transit passes with car sharing, rental privileges, taxi and other modes of transport. Because of these options, car owners’ mileage has been reduced from an average of 9,000 km to 2,500 km annually, according to studies of Switzerland’s Department of Energy. The author of this article contends “greater cooperation between local and central government, public transport operators, car retailers and car industry will extend the car sharing system in the future” (25).

8. De Tommasi, Robert. (1998). *Zug Switzerland’s Pilot Project on Mobility*. International TDM Column. *TDM Review*, 6(4), 20-21.

In 1997, a two-year pilot was initiated with the goal of expanding the city of Zug’s selling and information center of the regional public transport company, “Ticketeria.” One of the plan’s primary objectives was to replace the existing center with an expanded and improved mobility center than would provide a greater variety of services. The project was divided into working steps:

- An analysis of the overall framework conditions
- An analysis and evaluation of the existing services at the Ticketeria
- Prepare a definition of a “mobility center-profile” for the Ticketeria
- Define and develop services to be implemented during the pilot project
- Implement the services
- Monitor and evaluate the implemented services
- Make conclusions and recommendations for further activities outside the pilot project

A wide range of evaluation methods was created to gauge the influence and effectiveness of the pilot projects. However, “determining the environmental and traffic effects of the selected measures [is] virtually impossible,” according to the author, since it is impossible to “isolate the effects of a single measure” (21). Nonetheless, some concrete qualitative results were attained:

- Within the public transport company the view that the main business is not to Sell buses, but to sell mobility, is growing.
- The successful collaboration and implementation of the Zuger Pass Plus Stirred interest in further collaborations of this sort.
- The success of the ZPP has had a national impact, which has led other Transport companies to try similar measures.
- With the implementation of mobility lessons on public transport at schools to Go along with the pilot project, future target groups will be exposed to transit Options at an early age.

9. Yeaman, Elizabeth. (2000). *Selected Transport Demand Management Practices in New Zealand*. International TDM Column. *TDM Review*, 8(2), 13-16.

Though the term “transport demand management” is not often used in New Zealand, New Zealand is increasingly being recognized as an innovator in the field due to a wide range of transport management activities undertaken by local and regional authorities. This article describes a few of these initiatives. Among them are “Internet Rideshare Matching” and “Telework” trials: the former, involving the utilization of software developed to put potential rideshare customers in touch via e-mail, is responsible for a decrease of single occupancy vehicle trips from 58 percent in 1997 to 46 percent in 1999; the latter, aimed to encourage four staff members at a legal services company of 115 people to telework at least a few times a week, also proved successful, decreasing peak-hour traveling time by 14 percent. Based on the results of the telework trial, the author concludes that if the program were extended to include as little as 20 percent of the company’s staff, “peak-hour commuting across the company would drop by approximately 13 percent” (16).

10. Traue, Roy. (2001). *Moses: State of the Art Report*. Moses Deliverable D 2.1 Version 2.0 December 20th, 2001.
http://213.170.188.3/moses/m_papers/StateOfTheArtReportFINAL.pdf

This extensive and well-researched report on the state of carsharing companies in Europe is the result of ten years of “professional carsharing experience” by the author, including “on-site visits and data collected by means of a questionnaire that was sent to more than 100 European carsharing companies in Austria, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Sweden, Switzerland and the UK” (3). Overall, the author views the carsharing services throughout Europe as characterized by “the absence of standards of any kind” (29). Traue hopes that his report “contribute[s] to a higher

awareness of the actual market situation, so that future schemes can profit from the inherent experience of existing services” (29). To achieve this objective, Traue illuminates the organizational frameworks of carsharing companies, as well as to describe services offered, technologies deployed and the integration of modal services, often in an urban context.

After an initial analysis of the status quo in European carsharing covered in chapter one, chapter two explores the organizational frameworks, technological levels, and integration of modes and urban development of European carsharing services.

Among the concerns addressed are:

- Financing. There is an increasing trend to make customers shareholders.
- Staff recruiting, service fleet and outsourcing. Most carsharing companies do not have garages of their own and, in compensation, local garages and car dealers are often relied upon. Troubleshooting, cleansing and logistical particulars are often handled by the carsharing company staff. Skill requirements differ greatly between European carsharing companies, as standards seem heterogeneous.
- Reservations. Most companies offer a 24/7-reservation service.
- Product Innovation. Typically, carsharing services have not adapted to technological developments and market demands and thus have not answered customer needs. These include:
 - Open ended car return, or the ability to rent a car without specifying a definite return time.
 - Instant access, or the means of using a carsharing vehicle without the need of prior reservation or arrangement
 - One-way travel, or a customer’s ability to return a vehicle without the restriction of a specific location.
- Marketing. Only few carsharing companies have made a reliable evaluation of marketing measures, and the success of these campaigns are usually “felt” by managers instead of “proven.” Media is “kind” to carsharing, and the effect of reports on TV, radio and newspapers has attracted many customers to carsharing services.

Furthermore, the “state of the art” in carsharing is covered in chapter two, and Traue provides copious examples of what he feels to be representatives of carsharing innovators. German CarPool, for instance, “offers open end, instant access and one way rides. Apart from CarPool, no regular carsharing system across Europe includes open end or instant access” (11). Traue also describes as state of the art a type of access-technology that allows a customer to reserve “his car by phone...or internet and his reservation is transmitted to the on-board computer of the respective car or to an intelligent key-locker system on the basis of telematic technology. The transmission is carried out by SMS or bearer service. The customer then has to put his smart card in front a reading device behind the car’s windshield or incorporated into the key-locker. The car or locker only opens if there is a valid reservation registered for the corresponding customer and if the customer types in the right PIN. After the trip, the respective data are transferred back to the local branch office where an automatic billing is carried out” (15).

Further on, Traue considers intermodality and the integration of carsharing with other modes of transport, which he judges as still in its infancy in Europe. Naturally, there are places that prove to be exceptions to this rule, such as Switzerland. “On the basis of good experiences with the ‘zurimobil’ product, the Swiss carsharing company mobility and the Swiss railway supplier SBB launched the ‘Mobility Rail Card 444’ in 1998. For 444 Swiss Francs the customers receive a card that gives them for a period of two years [a] 50% reduction on railway rides plus the dropping of carsharing entrance fee[s] and deposit[s] plus 30% reduction on car rental rides from Hertz” (17).

Finally, the author considers in chapter two the integration of carsharing services within urban environments. He earmarks as one of the foremost obstacles of developing carsharing services the “lack of appropriate parking space” (19). For this reason, carsharing providers struggle to integrate themselves within urban landscapes and often have to adapt to adverse planning. Despite “more than ten years of intensive lobbying and press work, only weak successes can be registered. Only the example of the Netherlands and the UK can be judged as honest solutions. Here the legal framework has been set up to allow the installation [of] special parking zones within the ordinary curb side parking areas” (19).

In the last chapter of his study, Traue provides a description of existing carsharing services, technologies and productions, useful to transport researchers and professionals who wish to explore the phenomenon of carsharing in greater detail. Noteworthy entries in this chapter include:

- Invers, the foremost provider of carsharing access technology, responsible for the production of more than 65,000 smart cars that give access to 4,000 cars of 60 carsharing services in 8 countries.
- Mobility, the largest carsharing provider worldwide, with more than 44,000 customers in 350 Swiss cities with 1,700 vehicles. Mobility also distinguishes itself because it has created its own software products and systems of access.
- Cambio, the first complete carsharing service provider in Germany, offering several modular services, including software, reservation and system services that caters to carsharing companies’ needs.

11. Cowe, Roger. *Think About Electric Cars*. www.sustainablemobility.com.

Though long considered a viable alternative to use of vehicles that rely on internal combustible engines, electric cars have yet to make a significant impact on the transport market. However, “in London, Ford has put together a consortium including the private sector, local and central government, that has been exploring the potential for using Ford Motor Company’s ‘Th!nk City car’ in a real world market test. The project has completed its first six months, with results that show the sustainability of such vehicles for city use” (1). A collection of 15 companies leased cars as “specially subsidized rates” and reported the usage of the vehicles. Typically, the two-seater electric cars are used in place of a taxi by company staff, for such routine procedures as transferring between office sites, goods delivery and other business purposes (1). “The results over the first six months show that the 15 cars traveled [a] total distance of 18,300 miles, which means they saved an estimates 2,900 liters of petrol and 4.7 tons of carbon dioxide emissions” (1).

12. Collection of Examples, Danish Folketing Report.

<http://www.folketinget.dk/BAGGRUND/00000047/00232628.htm>

Since 1995, the Danish Folketing has allocated money to the Ministry of Transport's Traffic Pool. This money has been spent on initiating and supporting demonstration projects that can make traffic safer and less harmful to the environment. The knowledge and experience deriving from eight demonstration projects under the theme "Safer Bicycle Traffic" are described in this report. The projects demonstrate that road safety for cyclists can be improved, and that car trips can be changed into cycle trips if travelers are presented with the proper initiatives and cycling conditions. Naturally, some of the projects mentioned below varied in success, with cycling rates rising noticeably in only some areas while cyclist safety was improved in all locales. The Most importantly, perhaps, the report demonstrates the connection between cyclist safety and rates of cycling. Among the locations given attention in the report are:

- Naestved, near Copenhagen. The wish to have a foot and cycle bridge across the railway at Naestved Station was won by the architects Anderson and Sigurdsson, an improvement over the preexisting design of the 1920s, long considered badly designed and unsafe. This improvement, in tandem with other goals being pursued by systematizing work on a number of important themes, are part of a cycle action plan designed to increase the number of cycle trips by 30% over 1998-2009. The other goals include:
 - Main cycle routes
 - Bicycle Parking
 - Safety
 - Delivery of goods
 - Driving pupils to school
 - Cooperation with companies
 - Cycle audio in planning, construction and maintenance
 - Communication strategy
- Karlebo. According to an analysis carried out by the municipality, it is a problem for cycle users to find their way around the network of cycle paths around the town. Similarly, safety conditions for cyclists have been in need of improvement, especially around busy roads and junctions between paths and busy roads. A campaign consisting of a variety of events and elements was carried out over a period of 5 weeks. The campaign was directed towards certain target groups among the public. The first phase was to ensure that as many people as possible would become aware of the campaign, followed by efforts to arouse curiosity among the candidates to ensure participation in the events. Despite extensive coverage in the local press, however, the turnout was far smaller than expected, with only 50 participants. Nonetheless, the writer/s of the report consider the project a success, albeit on a small scale, to heighten the public's awareness of and attraction to cycling.
- Aalborg. The dual goal of the ABC project in Aalborg was to attract citizens to cycling while improving road safety for cyclists and pedestrians. A package of measures for more and better cycle routes, company bikes and activity

plans at workplaces together with various campaigns were implemented in 1995-1998. The measures were concentrated within a 12-km corridor between Skalborg and the airport. Parallel with the new and existing cycle tracks along busy roads, cycle routes were established on paths along traffic calmed residential streets. These cycle routes were carefully inspected for holes, problematic gully gratings and other nuisance factors for cyclists. A 50 m long foot and cycle bridge was also established along the north shore of Liim Fiord. During and after these improvements, an increase of 5-20% of bicycle traffic was registered, an estimate established on the basis of bicycle counts.

- Praesto. The goal of the project was to attract more people to shopping by bicycle by initiating a number of activities, making baggage equipment for bikes available, road construction and campaigns. A pilot study showed that 85% of the municipality's inhabitants shopped primarily in the town of Praesto. 25-30% of the customers came on foot, while 15-20% came by bicycle and 55-60% by car. This was so despite the fact that 60% of the catchment area is within 3 km of the shops, and 93% of the customers came directly from their homes and returned home immediately after shopping. Of the vulnerable road users, 37% were not content with traffic conditions, while only 6% of motorists were dissatisfied with parking conditions. It seemed therefore that there was a considerable potential for improving conditions for cyclists, possibly at the expense of motorists.
- Herning. Goals and projects in Herning included the creation of new and better cycle routes and the introduction of "employee bike" programs to 7 firms in Herning. An agreement was concluded with workplaces about how many bicycles they wanted to buy. Employees who wished to use the employee bikes were found on the basis of questionnaires, typically brought to attention to company employees by firms' internal newsletters. 5-20% of the car drivers were interested in an employee bike, with men and women showing equal interest. Since its initiation, the project has proven a noticeable success, with leisure cycling among employees tripling since the introduction of employee bikes. "If employee bikes were introduced in all firms and institutions in Herning, this initiative alone would almost fulfill [Herning's] goal of shifting 4% of passenger kilometers from cars to bicycles" (149).
- Randers. People in Randers use their bicycles for one out of every five trips. The police recorded approximately 120 injured persons in traffic per year in the municipality, cause for concern among Randers' authorities, so measures were undertaken to revise certain forms of marking at bus stops and junctions in order to maximize safety. Almost 500 stop interviews with bus passengers and cyclists showed that the markings gave 42% a greater sense of security. 60% had noticed the campaign about new markings at bus stops. 3 out of 4 knew that cyclists had to give way to boarding and alighting bus passengers. Only 23% of road users believed that the markings had changed their behavior at bus stops, while only 13% had noticed a change in the behavior of other road users. Most pedestrians and cyclists, however, expressed that they preferred stops with the revised bus boarder markings.

- Svendborg. Despite the fact that cyclists had been given low priority for many years in Svendborg, bicycles were extensively used. The goal of Svendborg's project was to improve the safety of cyclists by reducing the number of injuries by 5% per year, to increase bicycle traffic by 10% over 3 years and to give cyclists a greater sense of security in traffic. The project was realized in the form of an improvement in the cycle route between Svendborg and Thuro, which had been perceived as unsafe and exposed to accidents. In addition, a number of campaign activities were arranged. A comparison between the cyclist studies from 1994 and 1999 shows a significant fall in the number of cyclists who felt at risk on the cycle route. Telephone interviews revealed that even though the cycle route has not made people change mode of transport, the route has attracted cyclists from other roads and paths.

13. Ricci, Lonza Laura. (2000). Monitoring Progress Towards Sustainable Urban Mobility: Evaluation of Five Car Free Cities Experiences. Report For Institute for Prospective Technological Studies- EUR 19748 EN
<ftp://ftp.jrc.es/pub/EURdoc/eur19748en.pdf>. 1-81.

The majority of Laura Lonza Ricci's report specifies the findings of a study conducted in five European cities that participate in the Car Free Cities network: Barcelona, Bremen, Nottingham, Strasbourg and Turin. Before each of the case studies is provided, each section is preceded with a brief description of the locations; population, population density, employment rates and urban space are among the primary characteristics considered. After these details are established, the author then analyzes information supplied by these local authorities to "evaluate the impacts of a given mobility policy on the progress towards sustainability of the urban area" (2). By comparing results derived from this analysis, Ricci names congestion, air pollution and acoustic noises, freight transportation and delivery in the city, lack of parking space and safety as the five most important priority problems in the selected locations, respectively. The primary obstacles hindering implementation to sustainable mobility measures are then considered; in order of ranking; they are problems of institutional/inter-departmental cooperation, complexity of the mobility measures considered, legal problems, technical problems including public awareness and acceptance, and insufficient public funding. Finally, Ricci provides the foremost benefits to the implementation of sustainable mobility measures; respectively, they are better access for citizens, more efficient cooperation between different institutions, better technical integration, improved organizational integration, and an improved quality of general public services. "The picture given by the comparison among the five cities is very interesting," Ricci states. "It proves---although for a very limited sample---that cities of different dimensions, located in different countries (and, consequently, different institutional settings), characterized by different habitat patterns, and having different relations to long-distance networks are all faced with very similar problems when trying to implement sustainable mobility measures" (60). Ultimately, Ricci stresses the importance of conducting a comparison between the cities with a consistent methodology over a sufficient span of time so that an accurate and reliable evaluation might be achieved. Moreover, Ricci observes, it is important to disseminate results widely to ensure future success in transport experiments. Successful dissemination

requires clear objectives and the sharing of experiences by local authorities on a EU level. While giving these considerations attention, it is also vital/crucial, according to Ricci, to look for similarities in results between the cities, in order to identify successful instruments and practices.

14. Victoria Transport Policy Institute. *Individual Actions for More Efficient Transport.* <http://www.vtpi.org/tdm/tdm68.htm>.

A study conducted by the TravelSmart has indicated that typical Australian households can reduce their automobile trips by 25-35% by avoiding necessary trips, task grouping and using alternative, sustainable modes when possible. TravelSmart is a community-based program that encourages people to choose alternative modes of transport in place of private car travel, and has proven integral in Perth Metropolitan Transport Strategy's goal to reduce single-occupant vehicle trips by 35% over the next 30 years. By providing information, motivation and means to people willing to use alternative modes of personal travel, both the PMTS and TravelSmart have striven to reduce single-occupancy vehicle use significantly. The program's pilot project, started in South Perth in 1997, resulted in a 14% reduction in car travel, a 16% increase in walking, a 21% increase in public transit use, and a 91% increase in walking. Subsequent studies revealed that these changes in travel behavior continued when measured in later years.

15. Victoria Transport Policy Institute. *Pedestrian Improvements: Strategies to Make Walking Convenient, Safe and Pleasant.* <http://www.vtpi.org/tdm/tdm92.htm>.

A number of studies and resources, including those conducted by ADONIS and the research firms headed by Litman and Zeeger have studied the potential of improving pedestrian conditions and encouraging walking. Some measures and incentives include:

- Integrating nonmotorized planning into all transport and land use planning activities
- Educating all transportation professionals in nonmotorized transportation planning principles.
- Funding nonmotorized planning at a comparable rate as other modes
- Making sure that all roadways are suitable for walking unless it is specifically prohibited and suitable alternatives are available.
- Using current planning practices and design standards
- Including nonmotorized travel in transportation surveys and models
- Creating pedestrian-oriented centers and neighborhoods
- Performing user surveys to identify problems and barriers to pedestrian travel
- Using traffic calming and other traffic control measures to make street environments safer and more pleasant for walking

According to this article, certain locales in Europe occupy the forefront of promoting pedestrian walking as an alternative to private car use. Pedestrianized, car-free commercial districts are becoming increasingly common throughout Europe, as

evidenced in the Netherlands, whose “woonerfs” (residential yards) number approximately 6,000.

Elsewhere, the article observes that pedestrian fatalities are 36 times higher and bicycle fatalities are 11 times higher in the United States than in Europe. As the Netherlands and Germany have demonstrated, pedestrian walking and bicycle riding can be made much more safe when certain measures are taken:

- Better facilities for walking and bicycling
- Urban planning sensitive to the needs of non-motorists
- Traffic calming of residential neighborhoods
- Restrictions of motor vehicle use in cities
- Rigorous traffic education of both motorists and non-motorists
- Strict enforcement of traffic regulations protecting pedestrian and bicyclists

16. Victoria Transport Policy Institute. *Telework: Using Telecommunications to Substitute for Physical Travel.* <http://www.vtpi.org/tdm/tdm43.htm>.

According to information cited in this article, about 50% of all jobs are information-related, making them suitable for telework, but the amount of employees who can telecommute is much lower than this percentage would seem to indicate. Because many jobs require access to special materials and equipment or frequent face-to-face meetings, not all employees are ideal candidates for teleworking. For those employees whose work and home conditions make teleworking a viable possibility, however, commute travel can be significantly reduced. “For example, a twice-a-week teleworker reduces commute trips by 40%” (2). Moreover, teleworking is a particularly attractive alternative for those employees who commute from long distances. “A telework program that reduces 10% of vehicle trips may reduce 15% of vehicle mileage if participants have longer than average commutes. One study (Henderson and Mokhtarian, 1996) found that neighborhood telework centers reduce commuting by about 50%” (2).

17. Victoria Transport Policy Institute. *Public Transit Improvements.* <http://www.vtpi.org/tdm/tdm47.htm>.

Although public transit accounts for a small portion of total travel in some areas, it is nonetheless able to provide part of a solution to transportation problems, especially when improved adequately enough to become an attractive, alternative mode for travelers. Of the case studies given attention in this entry, some provide examples of successful transit improvements that, when implemented, encourages change in commuters’ travel behavior:

- Fare reductions
- New fare options, particularly discounted tickets and passes
- Free transit areas
- New and expanded transit systems
- More convenient routing
- Shuttle service, distributor routes, feeder routes
- More frequent service

- Increased speed and reliability
- Longer service hours
- Regularized schedules
- Special route to serve particular travel requirements, such as access to employment centers.

Another study given attention in this article concerns the success of public transport in places such as Munich, Barcelona, Graz (Austria) and Achterhoek (Netherlands), despite high levels of private car ownership. The UK Commission for Integrated Transport, an independent body set up by the government in the late 90s to rescue Britain's failing transport network, studied the public transport in these places and deduced from its observations that the largest contribution to success is a smooth integration of modes. Other conclusions reached were:

- Public transport strategies must be coordinated across the different modes, Rather than allowing buses, trams and trains to compete with one another.
- Finance and policy-making needs to be integrated, preferably at a regional Level, bringing together land use, transport planning and public finance.
- Streets and urban areas need to be reclaimed from the dominance of the car, Providing space for all uses rather than concentrating on auto mobility.

Moreover, "the research found wide variations in transport indicators across the continent. Congestion was worst in Britain, where almost a quarter of the most popular roads experience delays of at least an hour. There are no such traffic jams in Denmark, Sweden, Luxembourg or Finland, while only 8% of roads in Germany suffer such congestion and only 5% in France. Car ownership is not the most critical factor in congestion. Luxembourg, Italy and Germany have the highest car ownership rates in the European Union. But British people make more use of cars than in any other European country, so that only Spain had more intensively used roads" (10).

18. Victoria Transport Policy Institute. Carsharing: Vehicle Rental Services That Substitute for Private Vehicle Ownership. <http://www.vtpi.org/tm/tm7.htm>.

Carsharing is common in Europe compared to the United States, though carsharing companies and practices are increasingly being developed throughout North America. In Europe, carsharing organizations typically charge \$1-2 per vehicle hour, plus 25-40 cents per mile. Some carsharing operations also charge a membership deposit of \$300-500, typically refundable. These charges usually cover all vehicle-operating expenses, including fuel and insurance. Often, special rates are designed for extended trips and infrequent users. The creation of all-inclusive packages and specially tailored rates has led to an increase in European carsharing, but other barriers include adequate education and marketing, as well as a need to establish and maintain a regular and substantial clientele. Some practices that have been implemented to surmount these obstacles include:

- Structure carshare organizations to meet the needs of the community.
- Try to implement carsharing in conjunction with other TDM programs that improve transportation choices.
- Find ways to minimize administrative and overhead costs.
- Provide a variety of pricing options to serve different types of users.
- Structure rates to include both time and mileage fees, so the organization will not lose money with either a high-mileage trip during a short rental period, or low-mileage trip during a long rental period.
- Develop partnerships with organizations that are interested in reducing vehicle ownership or providing occasional vehicle access to a particular group.
- Use innovative marketing.

This article also devotes attention to the fast-growing phenomenon of the Paris Tulip service, which has not only strengthened its business by recognizing the abovementioned suggestions but also offered an alternative to the gas-fueled car. The Tulip system includes:

- A network of rental electric mobiles specially designed for public use within The city
- A central control station that manages the system and handles reservations, maintenance and billing.
- An infrastructure of stations, located around the city where the mobiles are Parked. These stations are equipped with a computerized parking space management application and an automatic recharging system.

19. Victoria Transport Policy Institute. *Bike/Transit Integration.*
<http://www.vtppi.org/tdm/tdm2.htm>

This article examines several strategies for integrating cycling and transit, a combination that has the potential of providing a high level of mobility comparable to automobile travel:

- Bikes on transit (many transit vehicles have enough space to carry bicycles)
- Bicycle parking at transit stops
- Bicycle Access to Transit Stations
- Bikes on taxis (some taxi services are able to make improvements in order to accommodate bicycles, providing cyclists with an important fallback option when they have medical or mechanical problems)
- Bicycle rentals (particularly common in Germany, Denmark and the Netherlands)

The city of Nottingham has undertaken some of these strategies on their new tram system, and a research project conducted by the University of Nottingham has concluded that the bike-and-ride and bike carriage services offered by the tram has minimized risks for cyclists and increased their use of the public transport system.

20. Victoria Transport Policy Institute. *Alternative Work Schedules: Flextime, Compressed Work Week, Staggered Shift.* <http://www.vtpi.org/tdm/tdm15.htm>.

This article identifies three strategies often undertaken to alleviate commuter traffic congestion:

- Flextime: allowing employees some flexibility in their daily work schedules. For example, rather than all employees working 8:00 to 4:30, some might work 7:30 to 4:00, and others 9:00 to 5:30
- Compressed Work Week: allowing employees to work fewer but longer days, Such as 4 10-hour days a week
- Staggered Shifts: Varying schedules so that employees do not arrive at and Leave the workplace at the same time.

If a company takes these strategies into consideration, other issues should be accounted for:

- Which job categories are suitable
- What is required of employees to qualify
- What criteria are to be used to evaluate the performance of employees on alternative schedules.
- How employees' schedules are determined and what is required to change schedules.
- Periodic review of the arrangement.
- Model contracts and forms for establishing and tracking alternative work schedules.

According to the Canadian Labor Market and Productivity Center, “alternative work arrangements such as compressed workweeks and flexible work schedules are becoming more common. Approximately 10 percent of the workforce follows a compressed workweek schedule and 25 percent have flexible work schedules” (5). According to the CLMPC, there are many examples of these alternative work arrangements in public and private-sector employment. In Edmonton, Alberta, for example, a compressed workweek is one of several options available to city employees to reduce vehicle traffic. Furthermore, the Royal Bank and the Toronto Star are examples of companies that have also implemented flexible work arrangements and modified workweeks.

21. Beatley, Timothy. (2000). Chapter 4: Transit Cities: Public Transport Innovations and Priorities. *Green Urbanism: Learning from European Cities.* 76-136.

Compared with the United States, Europe has invested greater ingenuity and effort in creating sustainable transport systems on local and countrywide levels. Reasons for this success vary from city to city, but common to every effort is the level of priority given to an “integrated combination of rail, tram, metro and bus” (109). Studies indicate high ridership levels in a variety of European locales:

- Stockholm (70 percent of trips during peak hours made on public transit, as well as 40 percent of all trips)

- Utrecht (a modal split of 40 percent by public transport and 40 percent by bicycle for trips to the downtown area)
- Helsinki (55 percent of trips made by environmentally friendly means, with 30 percent by public transit, 16 percent by walking and 9 percent by bicycle)
- Zurich (30 percent of trips to the city and 40 percent within the city are made by public transit)
- Copenhagen (31 percent of trips are made by public transit and 34 percent by bicycle when commuting to the city)

While public transport in America accounts for an average of 5 percent of home-to-work trips and 3 percent of urban travel, European cities in contrast place greater emphasis on the importance of finding modes of sustainable travel. Evidence of this can be found in a city such as Utrecht which, through its combination of “urban form, land use decisions and policy and transit investments, [exemplifies] the high mobility levels that exist in many European cities” (110). Accounting for Utrecht’s success in the maintaining its high rate of public mobility, certainly, is the location of its main train station, the largest in the country, which adjoins a shopping mall that is a short bicycle ride away.

Investment plays a vital role in the success of sustainable public mobility. British planner Peter Hall, cited in Beatley’s book, identifies five main forms of investment:

- Extensions of pre-existing rail systems
- New rail systems in “second-rank” cities such as Vienna and Brussels
- The transformation and modernizations of old tram systems into full-fledged light rail systems, such as those in Hannover and Frankfurt
- New express rail systems like the S-bahn trains in numerous German cities
- High-speed inner-city rails

These transit investments, in turn, are usually coordinated with land use and urban development decisions. Large developments and areas of activity, for example, are placed strategically, within close proximity to public transit. The cities taken into consideration in Beatley’s study “do not wait until after housing is built; rather the lines and investments occur contemporaneously with the projects” (112). Growth in both urban and public transport development, in order words, occurs simultaneously, with respect to one another.

“In these European cities, transit modes are generally integrated to an impressive degree, which means coordination of investments and routes so that transit modes compliment one another. In most of the cities studied, for example, regional and national train systems are fully integrated within local transit routes, and it is easy to shift from one mode to the other” (113). The smooth integration of transport modes is only one of many measures undertaken by authorities to maximize public transport ridership, however. Increasingly, attention is being paid to making public transport comfortable and aesthetically attractive. Freiburg is one of many cities to alter its trams to better accommodate passengers with baby strollers and wheelchairs by lowering the carriage of its vehicles. Aside from efforts to enhance speed, reliability, and comfort, cities such as Stockholm have also endeavored to make its metro stations attractive to passengers, allocating a substantial percentage of funds to renovation and the purchasing of art for metro centers.

Among the cities given consideration in Beatley's study, none seem more dedicated to improving their public transport systems, perhaps, than Zurich, which combines many of the ideas mentioned above to impressive effect. Zurich's system provides 270 kilometers of line within the city and 262 lines covering 2,300 kilometers overall. The city's system is unique in that design features are given priority over other considerations, a decision made by the voting public. "In many places, trams and buses travel on exclusive, reserved lanes. A traffic control system is used to give trams and buses green lights at intersections, through the use of individual signal transmitters that allow each [vehicle] to signal its approach to a traffic light. A central computerized control system monitors the location of transit vehicles and bus and tram drivers are given information about how close to schedules they are running" (116-117). In addition to some of these measures, Zurich's is a smooth-running system also because of the relative proximity of important areas to transit stops and commuters' ability to use a single ticket on any mode of transport throughout the city.

Beatley explains the reason why Zurich has adopted such an aggressive transit policy in comparison to other cities. "Officials at the Zurich transit authority argue that much of the success has to do with the heavy emphasis in Switzerland on referenda and direct voting of the public on many public decisions, and specifically on major infrastructure projects" (119). Beatley posits that the general public is more supportive of public transit than elected officials might tend to be because a large portion of the voting public happens to be male, and these citizens, usually private car drivers, are in favor, naturally, of alleviating car traffic.

Another city excelling in the area of innovative transport is Freiburg, whose current transport policy underwent a slow evolution process dating back to the late 1960s and early 1970s. The four primary aims of Freiburg's transport policy, developed during this period, are:

- Reducing car traffic within town
- Giving priority to environmentally friendly means of transport
- Promoting traffic calming as much as possible, except on a few main roads
- Enforcing restricted parking for cars

The majority of Freiburg's public transit is made on its extensive system of trams, which, though spanning an entire length of only 27 kilometers, carries most of the ridership to and within the city. Many improvements have either been made or are currently underway to ensure that most of the population is within approximately 500 meters to a transit stop. Other improvements include the reservation of exclusive lanes, separate from cars, for the trams, and electronically activated traffic lights, like Zurich's system. Furthermore, Freiburg was the first German city to introduce the eco-ticket, "a single-fare system, easy to understand, in which one ticket could be used to ride anywhere on the city's transit system" (121). Because of these efforts, Freiburg boasts a ridership that has risen from 27 million annual trips in 194 to approximately 65 million trips in the late nineties.

22. Beatley, Timothy. (2000). Chapter 5: Taming the Auto: The Promise of Car-Free Cities. *Green Urbanism: Learning from European Cities*. 137-165.

Despite its public transport innovations, the use of private car is on an upward trend in areas of the European Union; “if current trends continue in the Netherlands, for instance, it is predicted that a 70 percent increase in car use will occur by 2010” (137). In response to this dilemma, the European Union has adopted measures and policies to curtail car use, and Beatley discusses these in this chapter.

One of these measures is the creation of a network called “Car Free Cities,” consisting of approximately sixty cities, many of which have signed the Copenhagen Declaration, expressing a commitment to curbing car use. A popular method of alleviating traffic problems among these cities is the creation of pedestrian-friendly environments, like Vienna’s aesthetically pleasing areas filled with art, sculpture and fountains and Freiburg’s sight-filled historical district, off limits to cars. The reconfiguration of neighborhood streets has also proven to make a substantial difference, such as Odense’s constraint of auto use to make parks and play-areas for children.

Other traffic-calming strategies include “the concept of the *woonerf* (or “living street or yard”), pioneered in the Netherlands, speed bumps, curb and sidewalk extensions, raised brickwork, bollards and physical barriers of all types, and the creative use of trees (placement of trees in streets and parking lots)” (139-140). Beatley even mentions briefly a town in the Netherlands---unnamed by the author, unfortunately--- that uses sheep as a way of slowing and discouraging traffic.

Reducing automobile use is given high priority in many European cities, but few cities demonstrate Amsterdam’s degree of dedication, in Beatley’s estimation. By way of referendum, residents have endorsed such measures as “improvements in public transit, making parking areas in the central areas more expensive, road pricing and guiding land use decisions” (140). Moreover, Amsterdam’s approach represents a strategy increasingly common Europe, favoring no single solution but a “series of interlocking strategies” to produce desired effects (142).

Aggressive parking strategies have also played a part in Europe’s effort to curb car use. Again, Amsterdam is one of the most aggressive cities in its enforcement of parking regulations; among its policies is a limitation of parking spaces new businesses are permitted to have in public transport-accessible locations. In the locations closest to public transport stops and stations, for instance, businesses are given no more than one parking space per ten employees, a restriction that has limited traffic in particular areas dramatically. Bologna is another city Beatley gives credit as being a vanguard in the area of discouraging car use by parking restriction: visitors by car have to pay relatively high parking fees, certain parking spaces can be used by residents only, and in some cases residents even have to pay parking fees. Some sections of Bologna have access limited to residents, business owners and taxis only during designated hours, enforced by electronic equipment to verify vehicles have required permits.

Car-sharing is another increasingly popular phenomenon in Europe, and car-sharing companies are propagating at a healthy rate, according to Beasley. As evidence of this, an organization called European Car Sharing has been created to coordinate, supervise and represent these car-sharing companies. “Currently, 40 car-sharing companies are members, serving 300 European cities. There are now some 38,000 subscribers, and annual growth is impressive. In 1991, there were only 1,000 subscribers” (151). As an incentive, Amsterdam has made contracts with car-sharing companies to designate specific parking areas allocated to customers. “Other cities have put money into

starting car-sharing programs and attempting to find companies willing to operate them. Edinburgh, Scotland, has taken this approach. Other cities, including Amsterdam again, have provided advertising assistance” (152).

Finally, Beatley discusses road pricing at the end of this chapter and its effect on changing travel behavior. “Charging a financial premium for cars wishing to enter the city at particular times of the day---road pricing or congestion pricing---has been in use for a number of years in several European cities” (156). In Oslo, for instance, a method of charging cars electronically has been in practice since the late 1970s. The toll, charged to vehicles entering the center of the city and averaging approximately \$1.70, generates about 65 million pounds in revenue each year. While Beatley grants that the reduction of traffic past the toll areas is modest---averaging about 2 to 5 percent---there has been increased use of public transit since the toll was initiated.

23. Beatley, Timothy. (2000). Chapter 6: Bicycles: Low-Tech Ecological Mobility. *Green Urbanism: Learning from European Cities*. 166-193.

Many cities in Europe have developed and continue to develop extensive and impressive bicycle networks. Berlin has 800 kilometers of bike lanes, and Freiburg has 410 kilometers. Vienna has more than doubled its bicycle network since the late 1980s and now has more than 500 kilometers. Copenhagen has about 300 kilometers of bike lanes and now has a policy of installing bike lanes along all major streets. As a result of this bicycle-friendly approach, cycle use within Copenhagen has increased 65 percent since the 1970s.

Explaining high bicycle use throughout Europe is many cities’ willingness to make investments for roads and alterations of urban environments in order to accommodate bike use. Actions typically taken to facilitate cycle use include the creation of extensive bicycle trails and separated bicycle lanes, often with separate traffic signals. The city of Delft, for example, has created a “fine-mesh bicycle network,” linking virtually all major destinations within the city by trail. Over a five-year period, the city undertook a series of improvements and investments, including creating new bicycle lanes and constructing bridges and tunnels to connect routes. Bicycle usage went up---now accounting for 43 percent of all trips---and injuries and fatalities went down.

In the Netherlands, there are 17 million bicycles nationally, more bicycles than people, according to Beatley. “Nationally, about 27 percent of all trips are made by bicycle and about 40 percent for trips shorter than 2.5 kilometers. The Dutch government has embraced the bicycle as a major element in solving its mobility problems in the future, and the Second Structure Scheme for Traffic and Transport set down the goal of increasing bicycle use by 30 percent by 2010” (168). A national bicycle plan has been prepared, and significant national subsidies have gone toward improving bicycle facilities and enhancing bicycle safety. A number of communities in the Netherlands are also implementing “cycle to work” campaigns. In the Southern Province of Zeeland, about 100 companies, representing about 3,000 individuals, instituted such a program, resulting in an estimated 800 fewer tons of carbon dioxide emissions in 1997.

Beatley posits that policy accounts for the difference in bicycle use in the United States compared to Europe. In contrast to Europe, the U.S. has done little to promote bicycle use. In the Netherlands, Denmark, Germany and Switzerland, various levels of

government have constructed extensive systems of bikeways and bike lanes with completely separate rights of way. In other words, bicycling has thrived in those countries that have adopted policies to make bicycling faster, safer and more convenient. “Bicycling remains at low levels in the U.S. cities because cyclists are treated as second-class travelers, somehow not worthy of their legal right to share streets with cars. At the same time, there are few separate bikeways where bicyclists would be better protected against inconsiderate motorists.

24. From ELTIS Web/ Web Sources: <http://www.eltis.org/en/indexcse.htm>

24a. Services for Transport Users

According to research, recent decades have suffered a decline in use of public modes of transportation in most areas of Europe. This phenomenon is not due to lack of availability, generally, but an increased accessibility to use of private transportation. The use of private cars is alluring to the general public because of a perceived sense of comfort, flexibility and security. Also contributing to this trend are other common barriers to public transport:

- Logistical barriers: lack of ticket integration, uncoordinated timetables.
- Financial barriers: cost differential between public and private transport
- Psychological barriers: poor perception of travel time and image, lack of control over journey, poor perception of true cost of private car travel
- Institutional barriers: impact of competition between operators, impact of deregulation
- Information barriers: lack of appropriate information, lack of coordinated information
- Physical barriers: accessibility, comfort, and travel time differential.
- Social barriers: personal safety and security.

Momentum and MOSAIC, two research programs funded by the EU, have paid close attention to mobility management strategies implemented by members of the European Union. Various measures meant to overcome some of the abovementioned barriers are discussed in the article, but one is given primary focus: the emerging trend of mobility management centers, such as Munster's Mobilstations and Wuppertal's MobiCenter, promoting the use of alternative transport and providing commuters with services such as timetable information, carpooling schemes, purchasing tickets and parking.

24b. Walking and Cycling

Though the modal share of cycling throughout Europe is around 5-10% overall, two countries boast a markedly higher average of trips by bicycle: the Netherlands with 29% and Denmark with 17%. Countries that exhibit higher rates of cycle travel generally give special status to cyclists, reflecting their importance in providing environmental benefits to urban areas. To encourage cycling, authorities should:

- Consider cycling as a realistic means of transport and develop a bicycle policy
- Give priority to cyclists and if necessary change priority rules for cars
- Encourage employers, factories and shops to provide sufficient and safe cycle parking
- Promote the bicycle as official vehicles for the police, administration and political officials
- Encourage shops to offer free delivery of goods to cyclists

- Include facilities to public transport in an integrated plan.

Simultaneously, promotion of cycle use can be achieved through discouraging car use. Walking can also be encouraged as an alternative by providing pedestrians with adequate space, lighting and police surveillance. Cycling and walking are the cleanest, safest, most environmentally friendly and therefore most sustainable modes of transport. Though walking and cycling is still considered a minor activity in most European cities, certain areas such as the Netherlands, Denmark and UK have proven that these modes are viable given adequate promotion and allocation of incentives.

24c. Environmental Impacts

This article enumerates the various environmental impacts of transport activity, both traffic and infrastructure related.

Traffic related:

- solid, fluid and gaseous emissions
- noise and vibrations
- accidents involving humans and animals
- consumption of resources
- wastes

Infrastructure related:

- severance
- land-take
- sealing of surfaces, bridges and dams
- visual intrusion
- consumption of resources
- wastes

Adverse effects on human health, acoustic nuisances, emissions, accidents, human induced global climate change and acidification are some of many effects of transport activity. The main factor contributing to these problems has been an increase in distances traveled throughout Europe. Possible solutions to the situation are technical (the development of alternative energy sources), regulatory (traffic calming, parking restrictions and speed limits), and planning-oriented (improvement of existing special structures, including a carefully strategic placement of housing, work places and shops). As for technical options, Manchester and Bologna, for example, have introduced electric light city railways. Bremen has utilized successful planning in the creation of housing areas that minimize dependency on cars. Practicing regulatory measures, Edinburgh has created bus priority measures and Leeds high occupancy vehicle lanes.

24d. Road and Traffic Management

Statistics indicate that most vehicular urban trips in Europe are made by car, and that private car ownership is continuing to rise. Increased road traffic has resulted in various

operational and environmental problems. Contrary to previous thought, the construction of new roads is not a practical or viable solution. In fact, recent research has discovered that the development of new road networks may only increase growth in traffic. Increasing the efficiency of existing road space, however, has proven a successful option in the alleviation of urban transport problems and other attendant issues. Among the measures that have been taken to achieve success in this undertaking:

- coordination of traffic signals to minimize traffic and travel time
- control of urban parking, such as priority regulation (for shoppers, for instance) and remote parking (park and ride on public transport)
- traffic calming, comprised of restrictions on vehicle speed, use of horizontal and vertical deflection and use of colored and textured asphalts to break up road surface
- priority lanes (HOV schemes)
- special road design for cyclists and pedestrians

24e. Socio-Economic Effects of Transport

This article concerns not only the socio-economic effects of transport, but the way in which transport influences health and thus economy.

Health promoting:

- Exercise
- Employment
- Education
- Shops
- Recreation
- Social support networks
- Health services
- Countryside
- Recreation

Health damaging:

- Accidents
- Pollution (carbon monoxide, nitrogen oxides, hydrocarbons, ozone, carbon dioxide, lead, benzene)
- Noise and vibration
- Stress and anxiety
- Danger

24f. Demand Management and Pricing

Research has indicated that it is possible to reduce private car use and increase the use of public transport by implementing integrated measures that enhance quality and performance. Despite awareness of problems linked with traffic congestion, car

ownership has spread across Europe, with a 38% increase from 1983 to 1994. To ameliorate the problem, a number of approaches have been considered and implemented:

- Reducing the number of trips (teleworking via computer and fax; on-line shopping; video and teleconferencing)
- Reducing the impact of trips (switching time of travel and encouraging less urgent trips to take place outside peak times; linking trips and encouraging travelers to combine trips and destinations instead of visiting destinations separately; trip modification and encouraging shorter travel distances to alternative destinations)
- Modal Shift (improving public transport, reducing car usage)

In addition to these suggestions, road-pricing is increasingly regarded as an effective means to deterring traffic, though few actual examples exist of road-based demand management worldwide. The European Commission has produced a “Green Paper” entitled “Towards Fair and Efficient Pricing in Transport”

(<http://europa.eu.int/en/record/green/gp003en.pdf>) that delineates a fair and efficient pricing strategy:

- Charges should be linked as closely as possible to underlying costs.
- Charges should be highly differentiated to encourage behavioral adjustment.
- The price structure should be clear to the transport user.
- Charging should be non-discriminatory across modes and nationals of different states and revenues should flow to authorities in countries where costs are incurred
- Transport prices of journeys should be better aligned with the cost to society of these journeys
- The full costs of all infrastructure networks should be recovered from the transport user in the long run, unless infrastructure has been constructed for other policy reasons
- Imposing additional charges for simple revenue raising purposes is likely to lead to distortions.

24g. Transport for People with Reduced Mobility

UK research suggests that 142 of 1000 of the adult population have a sensory, physical or mental restriction. The failure to provide transport to this 14% of the population may force people into unemployment or residential care, creating a financial burden on the state. New public transport vehicles usually offer greater accessibility than older vehicles by offering low-floor access, ramps, audio and visual information systems and other features. The creation and impact of these special vehicles is impaired, however, due to the slow turnover of public transport vehicles, which usually have a lifespan of 30 years or more. Even when special transportation is designed, efforts need to be made to ensure that passengers are provided with special assistance when needed and are treated with respect. An example of special transport worth attention is Liege-Vervier TEC’s launching of a new bus service specially designed for people with restricted mobility, which includes fully equipped buses that operate door-to-door in the Liege and Verviers

regions of Belgium. Outside the realm of public transport, issues concerning physically- or mentally-impaired car users include special parking accommodations and permits.

24h. Financing Urban and Regional Public Transport

Public transport funding has experienced change due to the public transport's dual nature as both commercial and social service. Typically, public authorities subsidized public transport infrastructures in the past, requiring heavy expenditure without sharing the cost of investment with transport users. In the face of current budget crises, which include rising needs in the health and welfare sectors, public transport has responded by relying on private sources of borrowing. Funding sources have also varied. In the past, funding was derived from general and global taxation, but increasingly specific transport taxation is being implemented. Whatever political choices are made concerning the pricing of public transport, it is important that operating deficits be brought under control. This requires a constant effort on the behalf of transport companies to maintain high productivity and improvement in transport quality. Finally, it is suggested that transport companies maximize profits by activities such as tourism transport, car sharing, vehicle maintenance for third parties and the renting of space for advertising. An example illustrating innovative and effective public transport funding is Edinburgh's implementation of a new public transport system aimed at dissuading people from using their cars by offering an attractive bus service. Private-sector operators have funded the project for the most part, but the public sector contributed 15 million pounds to funding.

24i. Transport and Land Use

Two primary aspects of transport are considered by ELTIS and addressed in this article. The first concerns general spatial and land use patterns that have an effect on transport capacity, pertaining to suburbanization and urban sprawl. The second relates to spatial and land use requirements of transport infrastructure and requires researchers to distinguish between different transport modes that have varying land use requirements. Higher population densities in urban areas are usually associated with lower demand for travel. Research had discovered that North American cities have the lowest population densities and the highest fuel consumption rates per capita. South East Asian cities evince a different phenomenon, showing some of the lowest fuel consumption rates per capita and some of the highest population densities in the world. In 1987, Rickaly compared six European settlement patterns and concluded that compact city design reduces the need for travel and results in shorter trip lengths by 9-14%. On a similar note, the amount of traffic attracted to shopping destinations depends on the location of the facility. An out of town London market, for example, attracted 95% of shoppers by car, while a supermarket in inner London had only 33% of its clientele travel by car. In the EU context, the Fifth Action Program of the EC has proposed various land use measures that endeavor to reduce transport needs. Efficient and environmentally rational location decisions need to be made, as well as the development of spatial structures that reduce transport travel distances.

24j. Integration, Intermodality and Organization of Transport

Traditionally, public authority is in charge of organizing and funding public transport as well as choosing how public transport services will be produced. Nonetheless, the delegation of these public services is giving way more and more to direct management, with transport organizing authorities increasingly to the fore. Such a system enhances competition between the various operators, provided it is not distorted by a small number of operators building up dominant positions. Intermodality, which is the essential notion of transport within the framework within sustained mobility, should be developed and maintained as comprehensively as possible. In effect, optimal overall management of transport modes as a whole is how public transport will successfully dominate the need of individual transport. In order to encourage individuals to combine the two modes, the transport services should be wide-ranging, adapted and integrated and seek to reduce breaks in journey to a minimum in terms of time and space.

25. Bovy, PHL. (2000). Innovative Approaches to Demand Management in The Netherlands. *ITE Journal*, 70(8), 41-47.

This article primarily concerns the congestion-pricing plan utilized by the Netherlands, considered a vital strategy in shifting the demand of car use, especially in peak periods, to other time periods, modes, and even destinations. Also contained in the article is a brief summary of objectives for demand management as well as examples of successful and innovative demand-management strategies employed by the Netherlands. The majority of the article makes explicit the Dutch congestion-pricing approach: its setup, logistics and estimated future impact on travel demand. By the end of his piece, P.H.L. Bovy critiques the implementation approach adopted thus far, pointing out that European transport policymaking has been guided by two basis but conflicting goals: improving accessibility to achieve economic gains and reducing the negative impacts of motorized transport. Many measures originally intended to improve accessibility have proven detrimental to the environment; out of all possible solutions to transport problems, however, Bovy points out that congestion pricing is a method of accessibility improvement and demand management without the impact of increased car travel or deterioration of the environment. Bovy concludes “economic developments make congestion tolling necessary, while technological developments make it possible. As a means of distributing scarce space, [congestion tolling] will become as self-evident as parking fees in city centers” (47).

26. Fabian, L. (2001). Automated People Movers Ready for Urban Use. *Transportation Planning*. 26(1), 1-3.

Transit professionals attending the 2001 ASCE conference in San Francisco paid special attention to Automated People Mover (APM) projects abroad, exploring possibilities for similar transit solutions to be implemented in the United States. The Orestad mini-metro being built in Copenhagen, Denmark will offer around the clock service every ninety seconds, and value capture from development sites near its stations will cover most

development costs. Additionally, the APM will offer service to Copenhagen's main airport. Presently, 99 APMs carry 3.5 million passengers in Singapore, France and Japan; in the future, it is estimated just as many passengers will be carried on APMs in development in Canada, Italy and Greece. In some instances, airport and transit planners are cooperating to connect rail stations, parking structures and car rental centers.

27. Carding, Tony. (1997). Truckers Decry Bans. *Traffic World*, 251(4), 44-45.

“According to data collected by the TLN,” Tony Carding writes, “Greece’s recent introduction of a prohibition on road haulage movements on Sundays brings the number of European countries imposing such restrictions to 17, with a total of 48 different bans” (44). Peter Overvliet of the TLN explained, “The reasons of these traffic bans are so different---it is not pragmatic and it is not well thought out” (44). Some of the restrictions have been placed to ease heavy traffic in villages, while others have been created to increase road safety and alleviate congestion during holiday periods. For obvious reasons, the TLN seek a solution that keeps key European road routes open around the clock for international traffic, since the proliferation of uncoordinated bans jeopardizes future efficient road haulage.

28. Martin, B. *Motorcycling and Congestion*. A report prepared by Halcrow Group Limited for Centre for Transport Studies, UCL, UK.

The Government encourages alternative modes of travel that could help to reduce overall levels of congestion and pollution. Various groups have suggested that the increased use of motorcycles could result in lower congestion, reduced fuel consumption and thus lower emission of pollutants. The objectives of the research are to estimate the effects of transfer of trips from cars to motorcycles in terms of congestion and network performance and to estimate, to the extent possible without substantial new work, the consequential effects on pollution, noise, interaction with other traffic, road infrastructure, etc.

For the study to assess the network-wide effects of an increase in TWMV usage, it was necessary to estimate the extent to which people could gain benefit by switching to motorcycle when compared to those using private vehicles or public transport. The impact that such usage has on road safety, noise, emissions and the demand for road space were estimated.

Once these relationships were understood it was possible to extrapolate these findings forward to assess the impact of increased usage. There were, however, a number of inherent uncertainties within this approach, which were considered within the research project. These, and other more general issues, are:

- Use of motorcycles. Motorcycling currently represents a small proportion of total travel in the U.K. However, it can be an attractive mode in congested areas such as central London.
- Occupancy of road space. The spatial advantages of encouraging motorcycle usage may be dependent upon whether new users transfer from car or bus.

- Behavior of motorcyclists. Surveys concerning journey time and video were undertaken to estimate the extent that different road layouts could result in different levels of journey timesavings.
- The environmental impact of a switch to motorcycling. Estimates of both noise and vehicle emissions were considered.
- Accidents to motorcyclists. Motorcyclists are one of the most vulnerable groups of road users. The effects of an increase of motorcycle use on accidents were estimated. In addition, an attempt was made to determine whether any particular circumstances in which motorcyclist accidents significantly exceed those observed for car users.

In order that the overall research program met the objectives of the study, researchers participating in the project:

- examined past research
- investigated some relevant behavioral characteristics of motorcyclists
- determined the journey time savings that motorcyclists might experience in differing situations
- estimated the environmental impacts of different levels of motorcycle usage
- estimated the safety implication of motorcycle usage
- estimated how all these factors might change with increased usage; and
- identified the issues that required further investigation.

29. Nilsson, A. *Reallocating Road Space for Motor Vehicles to Bicycles: Effects on Motor Vehicle Speed and Cyclists' Attitudes.* Lund University, Sweden.

Swedish traffic authorities are currently faced with a difficult task: simultaneously promoting bicycle use and reducing traffic injuries. Furthermore, it is hard to build safe, attractive, totally separated bicycle facilities within urban areas considering spatial, economical and political restrictions. Nonetheless, most Swedish cities try to build physically separated bicycle facilities. The result is typically a bicycle network consisting of several kinds of separated facilities, of varying quality, on stretches. This causes continuity problems and leads to problems at crossings. On the other hand, bicycle lanes are cheap and take little space compared to physically separated bicycle facilities. They could therefore help creating a consistent and continuous bicycle network.

This paper reports the effects on motor vehicle speed and cyclists' attitudes of re-allocating road space for motor vehicles to bicycles by creating bicycle lanes. These were two of the indicators that were used in the research project. The project was designed to examine how bicycle lanes affect cyclist safety and the encouraging cycling in Swedish urban traffic. In the evaluation, fourteen streets within built-up areas in Sweden were studied before and after bicycle lanes were introduced. The evaluation also included studies of accident statistics and behavioral and interactional patterns.

Motor vehicle speeds were measured on midblock-locations and it was noted if there was a bicycle traveling next to the vehicle. Six hundred cyclists traveling on the streets

were asked questions about the street environment and interaction with other road users. The hypotheses were:

- a) If motor vehicle speeds are generally lower after bicycle lanes have been installed, this involves a safety improvement. However, the speed reducing effect of a cyclist next to the vehicle is also of interest for cyclists' safety; before the bicycle lanes were introduced, the presence of a cyclist next to the vehicle had a speed reducing effect of 2 km/h on motor vehicles.
- b) If cyclists' attitudes are more positive after bicycle lanes have been installed (when controlling for characteristics of the cyclists before and after), this implies that acceptance of cycling on the street has increased. Before the bicycle lanes were introduced, the streets were generally evaluated negatively.

30. Wigan, M.R. (2002). Motorcycles as a Full Mode of Transportation. *Transportation Research Report, 1818, 39-46.*

Motorcycles, including mopeds and scooters, provide an efficient means of transport, which can be used for a full range of transport purposes and over a range of distances that cannot realistically be met by bicycles. Much data has been assembled and interpreted predicting factors such as emissions, travel movements, speeds, distances and attitudes. Special attention is paid to the car ownership and choice characteristics of motorcycle owning households. Flow forecasting for motorcycles is difficult, and a technique using GIS crash data and the results of a major case control study in the same area are shown to provide a means of base level estimation. The available data on capacity impacts of motorcycles are collected, and a series of practical measures, trials and policy issues are summarized that emerge from taking this broader view of this form of transport.

31. Salem. H. Cost Benefit Analysis Using Ramp Metering: Field Results, a Report Produced by INRETS. <http://www.inrets.fr/nojs/ur/gretia/Reconsdesdonnees-Fr-Habib.htm>.

Because of congestion, freeway traffic flow becomes lower than capacity, thus making the utilization of the expensive infrastructure non optimal. One proposed way of ameliorating this situation is ramp metering by use of traffic lights at the freeway on-ramps. This control measure aims at limiting access to the freeway mainstream to achieve and maintain capacity flow. Moreover, ramp metering has an impact on the route choice behavior of drivers and may be purposed by employed as a dynamic assignment tool aiming at a better utilization of corridor networks.

This paper summarizes the main features of the INRETS strategy--- namely ALINEA--- and focuses on its past, present and future field implementations in several European countries. Because the field implementations addressed in this paper are quite numerous, only few summarized results can be mentioned for each of them. Field trials have been designed and executed over a period of several months to investigate corridor traffic phenomena and the impact of ramp metering measures on corridor traffic using ALINEA strategy. More specifically, the reported field trials include a comprehensive data collection from the overall network (Corridor Peripherique) over several weeks with and

without ramp metering.

32. Victoria Transport Policy Institute. *From Successful TDM Programs.*
<http://www.vtpi.org/tdm/tdm71.htm>.

32a. Jowit, Juliette. (2001). *How to think people out of their vehicles.* *Financial Times*, Sep 11, 2001.
<http://globalarchive.ft.com/globalarchive/article.html?id=010911001424&query=Transport#docAnchor010911001424>.

Community Transportation Management Programs.
www.travelsmart.transport.wa.gov.au; www.socialdata.de.

When 8,000 Perth households were helped to analyze their journeys, car use fell by 14 per cent with a shift to public transport and cycling. The concept behind this modal shift, called “individualized marketing,” involved contacting households to offer advice about personal transport. Interested clientele could obtain information through mail, telephone hotline, or even a personal visit from a consultant who analyzed information about the trips they made and suggested viable alternatives to private transport. Socialdata, a German-based consultancy, claims to have developed this idea and spent ten years researching before launching a trial in Perth. The initial trial of 1997, involving more than 800 households in south Perth, showed a 10% decrease in private car journeys and vehicle miles, with a shift to public transport and cycling. A subsequent trial taking place more than a year later showed that the decrease in use of private transport and the shift to alternative modes was sustained. In 2000, Western Australia’s Department for Planning and Infrastructure extended the project to 8,000 households in South Perth, with even more noticeable results; car journeys and mileage fell 14 percent and walking, cycling and use of public transport rose again. The trial, which took three months, cost AUS\$1.3m, an expense that included new bus stops in the suburbs, printed material and surveys. The success of the Perth project persuaded the international public transport union---UITP---to hold a series of trials in Europe, although only on public transport. Forty-five results were collected and only one, a project in Oporto in northern Portugal, failed to decrease traffic.

32b. CNN. (2000). *Hasselt, Belgium Reduces Automobile Travel With Free Transit.*
www.cnn.com.

68,000 people live in the Belgium town of Hasselt; another 20,000 people commute in and out every day. Faced with rising debt and traffic congestion, the mayor decided to abandon plans to build a third ring road around the town in 1999. Instead, he closed one of the two existing roads, planted more trees in its place, laid more pedestrian walkways and cycle tracks, increased the frequency and quality of the bus service, and announced that public transport would be free of charge. A year later, research has revealed that use of public transport has increased by 800%. As a result, business has increased for merchants, accidents have been significantly reduced, and traffic fatalities have decreased

dramatically. One of the reasons the measure was adopted was a shortage of funds; free buses were a cheaper alternative to other transport modes considered. Before the change, the city had slowly been losing its population, but since the new measures were adopted, the population has been rising 25 times faster than it was previously sinking, due in part to widely available free transport.

32c. Bogota Car Free Day.

www.alcaldiabogota.gov.co/sinmicarroenbogota/sinmicarroeng.htm.

The city of Bogota, Columbia first established an official Car Free Day on February 24th, 2000, organized by Mayor Enrique Penalosa and The Commons, an international environmental organization. It was one of the first car free days organized in a developing country. The mayor attributed the experiment's success to an effective advertising campaign that urged citizen participation, stressing the importance of environmental responsibility and community effort. About the experiment, the mayor also said, "A city of seven million inhabitants functioned well without cars. This exercise allowed us to catch a glimpse of what must be the transportation system of the city in ten or fifteen years. Most important of all was the sense of community present that day. Surveys revealed that 87% of the citizens were in agreement with the Car Free Day; 89% did not have any difficulty with the transportation system used; 92% said there was no absenteeism at their office, school or university; and 88% said they would like to have another car free day." Because of the program's success, plans are in development to make streets entirely car-free between the hours of 6:00 a.m. and 9:00 a.m. and 4:30 p.m. and 7:30 p.m. by the year 2015.

32d. Copenhagen Free Bike Program. www.cios.com.

In 1995, the Free City-Bike Program was implemented by the City of Copenhagen. One thousand specially designed free City-Bikes were stationed at 120 stands around the City at train and subway stations, parking lots and large housing blocks. The bikes were also stationed around common final destinations, such as office buildings, shopping districts, parks and other tourist attractions. For a deposit equivalent to roughly three U.S. dollars, anyone can take a bike and cycle wherever they want. When the bike is returned to any bike stand within the area, the user gets their deposit back. With the cooperation of sponsors, the project proved such a success that 500 more bikes were added when Copenhagen was named the "European Culture City" in 1996. The number of bikes increased by 300 in 1998 for a total of more than 2,000 bikes.

33. Multi-Functional Card For Crowd Management.

www.epommweb.org/examples/examples.html.

Netherlands government has made the optimization of transport and traffic in its Arnhem-Nijmegen region one of its primary objectives. To achieve this goal has necessitated a modal shift from car to modes of public transport such as carpooling, vanpooling,

bicycling and other transportation. Formerly, Transportation Demand Management has concentrated on commuter and business travel, but now the focus has shifted to concerns relating to recreational travel, particularly around large stadium events. The project of the Gelredome stadium has proven a successful in reducing car use, improving public transport accessibility and promoting a cleaner environment. One measure that contributed to this success was the creation of the “clubcard of Vitesse Arnhem,” which allowed football fans free access to all bus services two hours before and two hours after each game. Primarily, the main goals of the Arnhem mobility plan have been to prevent parking problems around the stadium and ensure optimal traffic flow for visitors of the Gelredome. Achieving this has required:

- Public transport in the region, or by train to Arnhem Central Station and with the shuttle to Gelredome stadium
- Organized transport from different locations in the region, as well as other parts of the Netherlands
- Shuttle transport from large parking spaces from the south, north and Arnhem
- Shuttle transportation and quick transportation in luxury buses from satellite parking areas
- Parking at the Gelredome
- Parking places for bicycles, with approximately 1600 separate areas for storage

Because of this project, some conclusions have been reached:

- A paid parking policy is required
- Shuttles require monitoring
- Two large satellite parking areas must be developed
- Consultation with surrounding cities needs to be maintained
- Each parking area needs six stewards for security
- Electric road signs at highways are needed

34. Camara, P. Mobility Management in Europe: The Need for Change in Legislations and Taxation Systems. www.epommweb.org/examples/examples.html.

Some of the primary barriers to future development of mobility management in Europe are legislation and taxation measures that may penalize any financial incentive to promote alternative commuting and business travel. The European Commission has shown concern about these fiscal barriers and is investigating tax incentives and disincentives to commuter and business transport. Part of this process has included a study conducted by the Oscar Faber consultancy, reviewing EU members’ taxation measures. Some of the preliminary results have identified areas where tax systems may provide unequal treatment between car commuting, business travel and travel by alternative modes:

- tax concessions for commuting expenses
- tax treatment of employer-provided commuting benefits
- tax treatment of the reimbursement of business travel expenses
- taxation which applies to the private benefit of company cars and how it is applied

The European Commission has recognized the potential of mobility management in creating sustainable transport policies and has also recognized the barriers that hinder the full-scale implementation of some sustainable transport policies. Countries such as the UK, Belgium and Italy have successfully started to eliminate these barriers by creating new legislation and introducing tax incentives to encourage alternatives to car use.

35. Schreffler, Eric. (1999). Vanpooling the Dutch Way. International TDM Column. *TDM Review*, 7(2), 13.

In early 1995, the Dutch Ministry asked Organizational Coaching (a Dutch research consultancy) to explore the pros and cons of implementing vanpooling programs in the Netherlands. After discovering that the possibilities for successful vanpooling existed, Organizational Coaching were then asked to establish pilot projects. The results are the focus of this article. First, important differences between the Dutch and U.S. vanpooling situation were discovered:

- In the U.S, vanpooling finds its origin primarily in regional ridesharing Efforts and mainly in urban and suburban areas. In the Netherlands, Vanpooling finds its origin in employer-sponsored programs in primarily rural surroundings for industrial areas.
- Vanpoolers in the U.S. are typically better paid, white collar workers. In the Dutch situation, vanpoolers are mostly low paid, low educated industrial workers who are offered “buspooling” in minibuses.
- Vans in the U.S. tend to be much more comfortable.

The goal to attract new clients to Vanpooling in the Netherlands involved:

- A marketing concept
- Finding vehicles
- Preparing a step-by-step plan for implementing vanpooling, including all kinds of arrangements for drivers, passengers, payment, etc.
- Find pilot organizations.

After these steps were achieved, the pilot process was carried forth and the outcome revealed obstacles hindering the widespread adoption of vanpooling in general, including high van prices and lack of HOV lanes. Nonetheless, vanpooling pilot programs confirmed user satisfaction and support, and changes are currently taking place in the

Netherlands that are making the future implementation of vanpooling programs likelihood; political pressure is growing to change the Dutch fiscal and transportation law in favor of vanpooling, and the Ministry of Transport has advised all relevant government agencies to accept vans in bus lanes.

36. Wagner, C. & Shaheen, S. (1998). Car Sharing and Mobility Management in Europe. *TDM Review*, 6(4), 14-16.

The personal vehicle has become the dominant form of mobility in many countries throughout Europe and North America. As a result, public transit has found it increasingly difficult to attract and retain passengers. This article describes an important movement toward new mobility management in which competition no longer favors a particular mode. Research has discovered that the integration of collective and private transportation might better ensure a sustainable approach to mobility. Car sharing is one example of this integration. In Switzerland and Germany, car sharing has offered a transportation service for more than 10 years. Presently, Mobility CarSharing Switzerland serves more than 20,000 people at 600 stations in 300 cities and towns throughout Switzerland and manages a fleet of 900 cars. Using a car sharing system involves three steps:

- Making a reservation on a vehicle
- A customer's traveling to a car station where a vehicle has been reserved
- Billing, usually on a monthly basis

Already some mobility services exist in Europe, such as Autodate in the Netherlands, which services more than 85,000 customers. At present, many transit agencies, CSOs, and mobility centers are beginning to provide a variety of car sharing products and other mobility services based on smart cards and communication technology. Based on the success of this and other car sharing programs, recommendations have been made to help the implementation of car sharing in the future:

- **Complementing Existing Transportation Systems and Services:** Mobility packages are based on a variety of traffic modes, which can be used by customers in conjunction with car sharing. Partnerships with existing transportation institutions are an important success factor for car sharing operations and businesses.
- **Maintain a Balanced Mix of Users and Locations:** Maintaining a Balanced mix of users is important to car sharing success.
- **Design Interfaces and Multimodal Interchanges:** Modal interfaces such Smart cards should be designed to reduce intermodal switching times so modal transferring does not require more than three minutes.
- **Consider Advanced Electronic and Wireless Technology:** New Technologies can provide real-time access to information, reservations, ticketing and billing.

- Market Standards and Marketing: In the future, national or even International standards for products and services will be increasingly important.

37. Victory, Louis (1998). The Development of Mobility Management in Nottinghamshire. European Conference on Mobility Management (ECOMM). East Midlands Conference Centre, Nottinghamshire.

Unlike much of Europe, where mobility management is still in its infancy, Nottinghamshire has a long history of alternative thinking about traffic management. In 1991, traffic congestion pressures were becoming so great that demand management was seen as the only option in Nottinghamshire. Initially, the city and county bonded together to jointly adopt a parking strategy which more than quadrupled daily parking charges in order to discourage car commuters from using City Center Parking spaces. Subsequently, Nottinghamshire's car-curbing efforts have concentrated on commuter plans. Nottinghamshire County Council launched the UK's first commuter plan, called STEPS, in April 1996, with a target of a 30 percent reduction in drive alone commuting journeys by its staff by April 1999. The key elements of STEPS included a PR campaign, a comprehensive car share scheme, discounted public transport passes and improvements in facilities for cyclists. After eighteen months of operation, the operation proved successful, with a survey indicating a 17 percent reduction in drive alone journeys. Moreover, Nottinghamshire City Council became aware of exploratory work taking place in Australia involving Travel Blending and also implemented a pilot program itself. Travel Blending describes a way for individuals to reduce the use of car by:

- Thinking about activities and travel in advance
- Blending modes appropriately to purpose or distance
- Blending activities
- Blending over time (making small sustainable changes over time)

Though a small-scale pilot, Nottinghamshire's experiment in Travel Blending revealed that Travel Blending could have a major impact on travel behavior and adds a significant improvement to what can be achieved through Commuter Planning.

38. Hillman, Mayer. (2001). *Prioritizing Policy and Practice to Favor Walking*. World Transport Policy and Practice, 7(4), 39-44.

Recent research suggests that from a number of social, economic and environmental viewpoints public interest would be best served if travel journeys were made by foot instead of motorized means. This being the case, one might expect transport priorities to favor pedestrians whose primary mode of transport is walking; however, a survey of policy and practice in U.K. reveals instead a discrimination against pedestrians

who favor this kind of travel. This article suggests ways that this discrimination might be reversed to ensure a higher rate of walking and improved pedestrian conditions.

Hillman contends that walking “is deserving of far more consideration in public policy than it is accorded at present” (39). National Travel Survey data compiled in the U.K. reveal that, despite a decline in the rate of walking, journeys made by foot account for a significant percentage of all transport, from between a quarter to a third of travel. In contrast to motorized transport, the more walking can be encouraged as a means of travel, the greater the social, environmental, energy saving and health benefits. Despite these obvious benefits, however, “careless interpretations of and misleading judgments on the available evidence stand in the way of a wider appreciation of the compelling case for allotting walking a more substantial role in transport policy and practice” (39).

Key changes in policy and practice are suggested by Hillman to compensate for the miscalculations, misjudgment and discrimination authorities have made in the transport sphere:

- Reducing motor traffic impacts. Both the volume of motorized vehicles and the speed with which they are driven need to be reduced to ensure favorable walking and pedestrian conditions.
- The planning process. Many advances can be made in the encouraging of walking by way of land use planning. Decisions about land use planning should be made with awareness for the convenience and safety of pedestrians and the quality of their environment. “For instance, a charge could be put on parking at shopping centers, with the revenue used both to subsidize delivery services to customers, and business rates for smaller local shops, a high proportion of whose customers reach them on foot and who therefore do not add to the adverse externalities of car traffic’ (42).
- Broadening the appraisal process. Advances can also be made if authorities broaden the factors they take into consideration when determining what cost-effective strategies to adopt when making transport investments. “For instance, [they would consider] the public benefits of promoting health through encouraging walking and improving the environment at the local and global levels by reducing air pollution and greenhouse gas emissions” (42).
- The pedestrian environment. A reallocation of road space can also be made to favor pedestrian and walking conditions. Improvement of the pedestrian environment would require local authorities to invest far more in pedestrian-oriented measures. “These include traffic calming, 20 mph residential zones and the creation of safe routes for children to reach leisure facilities”, among other things (43). Hillerman argues that, given the many dangers pedestrians are exposed to when traveling by foot, improvements in the pedestrian environment hold more promise, perhaps, than any other measure that would promote pedestrian walking.

Hillman concludes that policy reform in the past has proven difficult, given authorities’ habit of pandering to the public’s addition to motorized transport and the fallacious assumption that transport dilemmas might be solved through innovations in public transport. Hillman faults the unsustainability of these measures and argues that

strategies to reduce the volume and speed would best serve public interest, containing the promise to improve pedestrian conditions and encourage public walking and, in the process, meet social, health, environmental, local and global objectives at relatively low cost.

39. Gremzoe, Lars. (2001). Copenhagen on Foot: Thirty Years of Planning and Development. *World Transport Policy and Practice*, 7(4), 19-28.

Through the years, Copenhagen has acquired a reputation as one of the most innovative cities in the realm of improving walking conditions. A testimony to Copenhagen's achievements in this arena is the fact that more and more people spend time using the city's car-free spaces for a multitude of different activities, whether necessary (work, errands) or optional (leisure). Data on these changes of urban culture have been recorded since the 1960s in a series of surveys and indicate major changes in traffic behavior and public life. Moreover, these surveys indicate that since 1968 car-free activities have quadrupled in the car-free zones of Copenhagen. What might account for the city's success in promoting car-free activity and pedestrian conditions? Gremzoe devotes this matter some speculation in this article.

Through various measures and policies, Copenhagen has transformed the center of the city from a once car-dominated area to a pedestrian and "soft traffic-oriented place" (19). Copenhagen's first Pedestrianized street, Stroegget, currently has about 80,000 people walking through a relatively narrow street (10 to 12 meters wide) during any summer day or night. Once a main street crowded with buses, lorries and cars, Stroegget was changed in 1962 to a pedestrian-only area. Surprised by the obvious success of their experiment (pedestrian traffic become greater than that of cars on other wide streets), traffic planners realized the potential of creating pleasant pedestrian space to reduce traffic problems. As Gremzoe describes, officials gave people "space for walking--and so [they] did" (22). Since Stroegget opened to pedestrians, "the number of people staying in the [pedestrian] spaces has been growing proportionately with the number of car-free square meters that had been made available to pedestrians. Every time Copenhagen has added another 14 m (2) for pedestrian use, a new person has come along and settled in to enjoy the city" (24).

"Where other cities have produced a series of inventive new designs of public space, spread out as pedestrian islands in a sea of traffic, Copenhagen has reduced traffic in the inner city and made it a pleasant place to stroll" (20). In a series of steps, Copenhagen has reduced access to the city center by car, taking away traffic lanes and reducing parking in order to change public space from parking and traffic areas to "people places" (26). "Data that documented the growing need for more space for people on foot---versus the never-ending need for more parking---have been important for the technical and political decisions that had to be made. So behind the success of pedestrian planning in Copenhagen is the important lesson that there is a great need for data and knowledge [about] the activities of people in cities to be able to plan and design successfully for people on foot" (26).

40. Brog, Werner and James, Bruce. (2001). Increasing Walking Trips Through TravelSmart Individualized Marketing. *World Transportation Policy and Practice*, 7(4), 61-67.

In Perth, Australia, the mode share for walking has declined over the past fifteen years in favor of an increase in car trips. The need to arrest the decline of walking and increase its mode share has been identified as a desirable outcome for transport objectives set to be achieved by 2029. Pilot tests in Perth, conducted in association with TravelSmart and its application of “Individualized Marketing,” have revealed promise in changing the travel behavior of Perth citizens. “The results showed that walking captured half of the car trips which converted to walking, cycling and public transport. For the 35,000 people in the City of South Perth, this meant an additional 4,800 walk trips per day. This coupled with the 1,200 walking legs of public transport trips provided an overall 6,000 extra walk trips” (61).

This article outlines the potential of converting car trips to walking trips, particularly through TravelSmart’s “Individualized Marketing” program. “To determine the possibility for replacing car trips it [was] necessary to test each individual trip [of participants in surveys] to see if there was an objective use of the car (e.g. business use of the car, car trip within a longer transport chain, distance is too far to walk, etc.). The interactive approach of the in-depth technique, coupled with each individual’s travel diary [provided] an avenue clearly differentiating between people’s subjective and objective situations, unlike traditional market research that relies solely on determining people’s subjective situation. Therefore, behavioral change measures should not just be based on ‘hard policies’ like system improvements, but also on ‘soft policies’ like communication, motivation and---last but not least---information” (62-63). The implementation of TravelSmart’s in-depth research methodology---achieved primarily through surveys and interviews with participants---revealed that “up to 15% of car trips are ‘in principle’ changeable to walking,” according to Perth citizens, and that shopping trips along with personal trips have the greatest potential to change from mobilized means of transport to walking (65).

Based on some of these findings, James and Brog conclude that intervention is able to achieve large-scale changes in transportation behavior in favor of walking, without the need to resort to “hard policy” measures. In Perth, it was discovered that “walking as a mode is able to capture half of the changed car trips and double that of cycling and public transport trips combined...The extent of the change from car trips to walking trips shows that this intervention had the potential to achieve 60% of the Perth Metropolitan Strategy target for walking and a mode share not seen since the early 1980s” (66).

41. Tolley, Rodney. (2001). Unfulfilled Aspirations: A Review of the Select Committee Report on *Walking in Towns and Cities in Britain*. *World Transport Policy and Practice*, 7(4), 44-50.

In Britain, walking can be viewed as an important but alarmingly declining mode of transport. In late 2001, spurred to action by this trend, the Environment, Transport and

Regional Affairs Committee of the House of Commons conducted an inquiry into the expenditure, administration and policy of Government towards walking in towns and cities. The result of this inquiry, the Select Committee Report, is the focus of attention in Tolley's article. Tolley views the report as "uncompromisingly critical of the government, arguing that the attention, action and priority accorded to walking failed to match its importance and were inadequate to reverse the longstanding trend of decline" (44). Among the report's recommendations was a call for a National Walking Strategy that would encourage transport by foot, halting the decline of walking, having fallen from 34% to 27% of all journeys since the mid-eighties. Moreover, the committee "flatly contradicted the government view that although walking could be made easier, more pleasant and safer, none of this is going to have a major impact on total vehicle mileage, air pollution or global warming" (48). On the contrary, one of the report's contentions, citing copious research and the government's own "Air Quality Strategy" report, is that walking would have a noticeable impact on pollution and congestion in urban areas. Explanations for the decline of walking, according to Tolley, are wide-ranging, but a chief contributing factor is the government's position---or lack thereof---about promoting walking in the UK, coupled with poor pedestrian conditions and the treatment of walkers with "contempt" (45).

42. Pucher, John. (2001). The Role of Public Policies in Promoting the Safety, Convenience and Popularity of Bicycling. *World Transport Policy and Practice*, 7(4), 75-80.

John Pucher's article is structured as a response and refutation of sorts to an earlier essay written by Heath Maddox that appeared in *World Transport Policy and Practice*. According to Pucher, Maddox questions the potential of public policies to encourage bicycling. This response to Maddox critique argues that Maddox seriously misinterpreted the concept of public policy, "considering only a small subset of the many policies that can facilitate bicycling. He does not adequately examine the impacts of special cycling facilities. Moreover, Maddox ignores virtually all other transport policies as well as all land-use, housing, taxation, education, training, law enforcement and public relations policies" (75). In contrast to Maddox, Pucher emphasizes a wide range of public policies to increase the safety, convenience and attractiveness of cycling. Furthermore, Pucher recommends that by stressing the health benefits of cycling, necessary public and political support might be generated for the creation of such policies.

Pucher's primary focus in his article is the promotion of bicycling through public health advocacy. In particular, Pucher aims much of his speculation at the U.S. The problem of obesity and inactivity having reached epidemic proportions in North America, there is near unanimous agreement on the behalf of health professionals for the need of more regular physical exercise. "Many official organizations now specifically advocate the promotion of walking and/or cycling to get around town as the easiest, most affordable and most accessible means of exercise for most people" (78). Even the low-density, sprawled areas of the U.S. are conducive to bicycle travel, in Pucher's estimation. Despite the seeming obstacle of land use patterns, "49% of all trips are shorter than 3 miles, 40% are shorter than 2 miles, and 28% percent are shorter than a mile," according to the U.S. Department of Transportation, making cycling not only a viable

alternative to motorized transport, but a potential benefit to health---killing two birds with one stone, so to speak. While stressing the health and other practical benefits of cycling is crucial to gathering political support, the author grants that this strategy will only succeed in tandem with a variety of other public policies. In particular, efforts need to be made to improve the “abominable safety record” of cycling in the U.S. (79).

In Beijing, China, where 9 million bicycles are still the most popular mode of transport and urban streets are divided in half for bikes and cars, rising congestion and affluence have brought the first reported closing of a busy road to bikes in an attempt to alleviate traffic. The new 7 a.m. to 8 p.m. rule forces cyclists to detour down a nearby street, giving East Xisi two lanes of cars in each direction. On the other hand, France has amended its National Traffic Code permit bicycles in pedestrian zones. On the French Caribbean island of La Reunion, a fleet of 60 two-passenger pedicabs is managed as an alternative transport system. The municipality also provides city employees with service bikes and has equipped local minibuses and taxis with bicycle racks.

**43. Dupuy, G.(1999). From the “Magic Circle” to “Automobile Dependence”:
Measurements and Political Implications. *Transport Policy*, 6(1), 1-17.**

According to Dupuy, automobile dependence is becoming an even greater obstacle to sustainable transport policies. This dependence is due mainly to the fact that the positive effects for drivers of the growth of the automobile system are greater than the negative effects of traffic congestion. The model described in this article is based on an analogy with telecommunications systems and presents these positive effects in terms of accessibility. On the basis of this model, quantitative measurements of the French situation were made. Results show the importance of positive effects, which make it extremely difficult to reduce automobile dependence. Taxing automobiles and automobile use, according to Dupuy, is not enough to discourage use. In place of these gambits, the author suggests the implementation of policies that would have a direct impact within the automobile system on the processes that generate these positive effects. These policies would achieve diminishing the positive aspects of private travel by diversifying vehicles and their ownership, modifying road networks (more but slower roads) and limiting the capillary of these networks.

44. Buethe, M; Demilie, L; Jourquin, B. (1999). *The International Impacts of a New Road Taxation Scheme in Switzerland*. Ashgate Publishing Company: Brookfield, VT.

Switzerland is an important transit country for freight traffic throughout Europe, and its population is very much concerned by the pollution and congestion that road traffic creates over its network. The geographic configuration of the country, its circuitous and mountainous network, tend to increase these problems and their impacts on the population. These concerns led the Swiss government to impose some restrictions on trucking over its territory. Since the early 1970s, transport movements by trucks weighing more than 28 tons are forbidden in Switzerland, and trucking is not allowed during the

night and on Sundays. The weight limitation has proven to be very effective in reducing the number of trucks traveling through Switzerland. Also, this maneuver has achieved the benefits of switching a percentage of goods transportation from road to rail and influencing truckers to take less congested routes through France and Austria.

45. Pitsiava-Latinopoulou, M, & Mustafa, MAS. (1998). IMPACTS OF TRAFFIC MANAGEMENT ON URBAN ROAD SAFETY: A CASE STUDY. *Traffic Safety on Two Continents*. Sponsored by: Swedish National Road and Transport Research Institute, Transportation Research Board, Forum of European Road Safety Research Institute, and Laboratorio Nacional de Engenharia Civil, Lisbon, Portugal. VTI konferens 9A part 6. 41-44.

Statistics indicate that accidents in urban areas contribute to about half of all accidents in the European Union. Traffic management in urban areas aims mainly at reducing traffic congestion and increasing mobility of people and goods. The link between urban traffic management and the impacts on safety is the main theme of the DUMAS (Developing Urban Management and Safety) project. The city of Katerini, Greece (population 70,000) was one of the candidate cities to be selected for study in this analysis. In the city, an integrated traffic development framework was accomplished during 1992-1994. Based on a comprehensive traffic management study, the city has changed to a pedestrian zone, and all traffic volume was diverted from the center of the city to a pair of ring roads, reducing traffic and accidents simultaneously.

46. MOST Final Brochure- Fourth Draft- January 20th, 2002. <http://www.mo.st/>

MOST (Mobility Management For The Next Decade) is an attempt at implementing pilot projects in 32 European locations with the aim of promoting the use of sustainable mobility strategies in all sectors of the economy. Essentially this ensures that planners have viable options to combat congestion and are thus able to plan with these strategies in mind.

47. Bradshaw, R. & Jones, P. (1998). TDM Trends in Europe. *International Association of Traffic and Safety Sciences Research*, 22(1).

48. MOSAIC, UR-95-SC.165: Final Report for Publication. <http://www.EPOMM.org>.

Additional Resources on the Internet

49. <http://mo.st> (MOST)

50. www.EPOMM.org (to get access to MOSAIC)

51. www.ELTIS.org (source of case studies)

52. www.carfree.com
53. www.doingyourbit.org.uk
54. www.local-transport.dft.gov.uk/travelplans