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Abstract

The impact of transportation on the environment and the residents of Christianshavn, a neighborhood in Copenhagen, Denmark, was investigated by surveying employees from three organizations in regards to their traffic patterns. Research on environmental effects and global initiatives taken to reduce such impacts supported recommendations encouraging the use of sustainable transportation among their employees. Christianshavn's Green Guide provided contacts and increased general awareness about environmental issues both globally and in the city.

Introduction

The city of Copenhagen, Denmark has long been characterized for its excellent opportunities for both public and non-motorized transportation. Unfortunately, despite these alternatives, over the past several years traffic congestion has increasingly become detrimental to the city. Citizens of Copenhagen find traffic congestion to be problematic, partly due to the increase of 17% in individual car ownership over the past two years.

The effects of heavy traffic congestion are much more complex than commonly viewed. Besides the obvious problems of being time consuming and endangering pedestrians and bikers, heavy traffic contributes negatively to the environment through carbon dioxide, carbon monoxide, and other greenhouse gas emissions. These gases, which contribute to global warming, are a concern in every major metropolis around the world, and have been identified to be problematic in Christianshavn, a neighborhood of Copenhagen.

The liaison for this project, Anja Puggaard, is a Green Guide in Christianshavn. Green Guides are local environmental guides who work for sustainable transportation in the areas where they are employed. There are about 100 Green Guides stationed all over Denmark who are financially supported by Miljostyrelsen, the Danish Environmental Protection Agency. Also interested in the project are representatives from NOAH, the Danish section of Friends of the Earth International, a non-profit organization devoted to permanent and full solutions to environmental problems. This project has aided both Anja Puggaard and NOAH in understanding current transportation trends by opening up a line of communication between three organizations in Christianshavn, (the

Environmental Protection Agency, Unibank, and the Foreign Ministry) and understanding the current traffic patterns of a total of 500 of their employees.

To complement the well-planned bicycle routes and bus services available in Copenhagen and to encourage more citizens to utilize sustainable transportation, a mini-Metro will be completed in 2002. It is hoped that this Metro will reduce the amount of traffic congestion and promote the use of public transportation with its appeal of convenient stops and frequent trains (every 90 seconds). Research on current statistics and initiatives taken in cities around the globe helped to better predict the effect of the Metro on the city of Christianshavn. Sources that were utilized include both websites and books from the Union of Concerned Scientists, various private and governmental organizations, and experts on transportation initiatives worldwide.

Central to this project was the survey that was distributed to approximately 500 employees of the three organizations in Christianshavn, along with several companies outside of the city who participated for their own benefit. The survey was based on a similar study previously done at the Environmental Protection Agency by Niels Ladefoged, and the questions were revised and new ones created based on the results of this first survey. Our results indicated that the employees already strongly support sustainable transportation, as many ride bicycles and take public transportation to work. There were many helpful suggestions for improvements in Copenhagen's public transportation system, in addition to suggestions to the companies for making more facilities for bikers.

Surveying and then interviewing the employees of these companies fulfilled the objectives of the project by providing a better understanding of the reasons behind their

transportation choices. It also gave a good indication of incentives by the organization that would encourage them to change their transportation habits. Extensive background research yielded information regarding effective solutions that cities and businesses around the globe have implemented that complement solutions posed by their governments to help combat environmental concerns. Both the surveys and the background research assisted in analyzing the results and providing the companies with concrete suggestions for improvement in their employee's transportation patterns. These analyses and suggestions follow in this report, along with an explanation of how this Interactive Qualifying Project far exceeded both our expectations and the requirements of Worcester Polytechnic Institute.

According to the WPI course catalogue for 2001-2002, "the objective of an Interactive Qualifying Project is to enable WPI graduates to understand, as citizens and professionals, how their careers will affect the larger society of which they are part" (37). This project has more than exceeded both these requirements and fulfilled the expectations for an international experience. Researching transportation in the United States offered a perspective from which to start, but as residents of Copenhagen and commuters to Christianshavn, we have experienced both traffic and social issues firsthand. Working with Anja and other environmentally aware citizens of Copenhagen has increased our awareness of the status of transportation both here and in the United States, and has made the differences between our cultures apparent. Because of the effect of this project on our personal perspectives overseas, we have included an afterword section, which summarizes our personal experiences here in Copenhagen and how we intend to use what we have learned both in our futures at WPI and our careers.

Literature Review

Before surveying the employees of the Environmental Protection Agency, Unibank, and the Foreign Ministry, research on the true environmental problems and successful programs to combat these problems needed to be completed. The research covered in this chapter served as a basis for the survey and focus group questions. It also helped determine which initiatives the participating companies could successfully implement to promote sustainable transportation among their employees.

Sustainable transportation is defined as meeting the demand for transportation while keeping environmental, social, and economic impacts at a rate that allows such resources to replenish themselves. Researching initiatives taken by governments and companies around the globe will provide a strong basis for the recommendations for the projected improvements of the transportation situation in Christianshavn.

The Effect of Transportation on the Environment

The effects of transportation on the environment are immeasurable, and vary for every area of the world. Although the project is specific to Copenhagen, Denmark, research was conducted into the situation in the United States, the detriments of criteria such as fuel emissions, noise pollution, and the hidden costs of transportation are similar everywhere. The following section investigates these effects both in the United States and in general, and presents facts to use as a basis for the recommendations and conclusions.

The State of U.S. Transportation as Defined by the Union of Concerned Scientists

The U.S. General Accounting office projected that it will only take 15 years for road congestion in the U.S. to triple, based on 1990 statistics. This calculation was made including a 20% increase in road capacity, which is practically unattainable.

Americans spend one billion hours stuck in traffic every year, wasting two billion gallons of gasoline and costing the economy anywhere from $10 billion to $30 billion – enough to fund the entire federal environment program. If congestion triples, it will cost the nation up to $50 billion a year, more than the federal government now spends on low-income housing, veterans benefits, and the war on drugs, combined (Gordon 3).

The severe congestion is directly related to the fact that there are simply too many miles being driven with too few passengers per car or truck. It is estimated that "one-half of all trips Americans take, and at least three-quarters of all commutes, are made by a single person, alone in a car" (Gordon 4). In order to make this possible, Americans own enough cars to put every single American in one, and no one would have to sit in the back seat. Those cars were driven two trillion miles in 1990, a number that is growing at a rate of 3% per year (Gordon 4).

The worst effects of American transportation habits are seen on the environment. Cars and trucks are the largest single source of air pollution and a major contributor to global warming. They emit carbon monoxides, reactive hydrocarbons (forming smog), and the principal greenhouse gas, carbon dioxide. Twenty pounds of carbon dioxide are produced for every gallon of gasoline (Gordon 4). Overall emissions of pollutants are projected to increase by almost 40% by 2010 due to a steady increase in driving under more and more congested conditions.

Motor vehicles are responsible for polluting land and water as well. Oil spills taint water across the country and motor vehicles require huge amounts of irreplaceable land. "In cities, upwards of one-third of the land is taken up by cars, trucks, roads, and parking lots. Nationwide, more land is now devoted to the automobile than to housing" (Gordon 4).

The pollution, congestion, and damage to health caused by a dependence on motor vehicles are the "hidden costs" of the American transportation system. These costs are "hidden" because they are not figured into the price of gasoline or road tolls, allowing fuel to remain inexpensive and the majority of roads to go free of charge. Just because the cost of transportation is currently viewed in dollars, it does not mean that these costs are not mounting unchecked. This balance will be paid with the health and welfare of American citizens (Gordon 4).

Kyoto Accord

In December of 1997, 175 nations met and agreed to the Kyoto Protocol. This agreement legally binds 39 different countries to reduce their fuel emissions in 1990 by 5.2 percent by the year 2010. This accord specified that the United States must reduce emissions by 7 percent, and is scheduled for further discussion in the Senate.

The Kyoto Accord has been the subject of much controversy since then, and there are many different opinions on whether or not the United States should ratify such a demanding agreement. The general concern is that mandatory reduction of greenhouse gas emissions will have a negative effect on jobs and domestic trade. Because the Accord only required 39 developed countries to lower their emissions standards,

companies in the United States are worried that the developing countries will take advantage of the fact that they are not required to improve fuel emissions. The negative effects of this Accord might simply be the result of the changing world economy; however, the Senate will not ratify the Accord unless it is revised to include developing countries.

The United States signed the Accord on November 12, 2000, and is currently looking to revise the treaty to include developing countries, as well as trading pollution credits between countries to make the Accord more appealing to the Senate for ratification. Pollution credits are given to companies who are under current emission standards and if unused, can be traded much like stocks. The Senate has not yet approved ratification, and claims that until the criteria are raised for other countries, they will not ratify.

Agenda 21

Agenda 21 is the United Nation's proposal for the integration of development and the environment. The agenda calls on the global community to act in cooperation to reach sustainable levels of development.

For more information about Agenda 21, please see Appendix B.

Congestion and the Environment

Congestion cuts transportation efficiency. The overcrowded roads waste time and energy, generate extra pollution, harm human health, and damage the economy. The Federal Highway Administration (FHWA) estimates that 1.4 billion gallons of fuel is

wasted due to congestion annually. This makes up nearly 2 percent of the total energy used for highway passenger transport. The US Department of Transportation estimates that congestion costs each driver $375 annually in extra fuel and maintenance expenses. "According to an FHWA estimate, in just three years, between 1985 and 1988, traffic delays from road congestion increased by 57 percent" (Gordon 25).

The inefficiency is not merely due to increased time on the road. Longer trips, reduced speed and frequent acceleration due to stop-and-go movement increase air pollution and greenhouse gas emissions. When average speeds drop from 35 mph to 10 mph, carbon dioxide emissions double. Hydrocarbon and carbon monoxide emissions triple when average speed goes below 35 mph relative to emissions when average speed is at 55 mph (Gordon 25).

There are immediate health hazards related to green house gas emissions. In congested areas, high carbon monoxide concentrations can restrict oxygen flow to the brain of a driver sitting in traffic, impairing driving performance (Gordon 25). "Exposure to ozone can cause chest tightness, coughing, head aches, and nausea as well as pulmonary disease, heart disease, and cancer. Aggressive behavior and physiological reactions have been linked to exposure to congested traffic conditions" (Gordon 25).

Economically, traffic congestion is a huge strain on the system. Because of increased numbers of accidents, labor and vehicle operating costs are higher, and insurance rates rise. The cost of doing business is also impacted because of the decrease in productivity related to slower rates of transport of people and goods. "By some estimates, crowding on our highways is responsible for a loss of $73 billion a year to the nation's economy, or 2 percent of gross national product" (Gordon 25).

Work Commute

Only one-third of all local miles traveled are work-related in the U.S., but because of specific commuting times, the worst congestion is often related to this type of transport. In 1983, 75 percent of commuters traveled alone in cars, light trucks and vans, 15 percent carpooled, and only 5 percent used public transit. Since these figures are for the entire country, the percentage of public transit commuters may seem low compared to statistics from major metropolises. More relevant statistics from cities show that public transit accounts for 25 percent of people commuting in Denver, Colorado and 88 percent in New York City, NY. The use of mass transit dramatically reduces energy consumption and environmental impacts per passenger of commuting (Gordon 26).

Indirect Energy Use

Not all energy use from transportation is used in the form of motor vehicles burning fossil fuels. In fact, one-third of total transportation energy, making up 14% of all U.S. energy use, is consumed in processes related to transportation. These processes include producing fuels, building and maintaining infrastructure, manufacturing and repairing vehicles, and other related support activities (Gordon 35).

The process of making and distributing transportation fuels is the most significant of the above energy uses indirectly related to transportation. For every barrel of oil used directly for transportation, ¼ of a barrel is used to fund the extraction and refinement of crude oil as well as the distribution of the finished product (Gordon 35).

The Greenhouse Effect

The greenhouse effect is the result of solar radiation that is reflected back into the atmosphere, and is prevented from reaching space by a layer of clouds and atmospheric gases. Transportation is the second highest cause of greenhouse gasses in the United States, and in addition to affecting ambient air quality, also affects water quality, land use, and produces noise pollution.

For more information about the Greenhouse Effect, see Appendix A.

"Hidden Costs of Transportation"

In order to understand the total costs of transportation, beyond the price of gasoline and insurance, the energy and environmental costs must be measured in monetary terms. These costs include, health-care expenses and crop losses attributed to air pollution, costs to militarize the Middle East to protect oil imports, lost economic productivity due to traffic congestion, cleanup costs of oil spills, costs to mitigate greenhouse-gas emissions, and deaths and injuries from traffic accidents (Gordon 39). "Together the external costs that can be readily valued range from $130 billion to $285 billion a year—as much as $2.50 per gallon of gasoline, or $0.15 per mile driven. Needless to say, none of these "side effect" costs associated with our transportation sector is accounted for in today's price of oil or cost of driving" (Gordon 39). The Union of Concerned Scientists clearly feels that fuel costs should be reconsidered.

Initiatives in the United States

Many of the cities in the United States have undergone major efforts to reduce traffic flow by creating a public transportation system. Elements such as the extent of commuting, the distance commuted, and the most feasible types of transportation have been studied, and what results is a public transport system unique to the city for which it is built.

San Francisco, California

San Francisco's area transit system (BART, for Bay Area Rapid Transit) was the first public rail system built in the U.S. since World War II. A six-year study began in 1972 in order to assess the impact that this new system had on the urban area around it.

With 71 miles of track and 34 stations (most with parking lots attached), the BART system encouraged park-and-ride commuters to utilize it. Unlike the other cities mentioned in this review, BART did not impact economic growth in the Bay Area, nor did it have a crucial effect on surrounding land use. Although it did integrate into the area with minimal environmental impact, it did not relieve traffic congestion. Those commuters who took BART instead of driving relieved the traffic on the roads, which encouraged trips into the city by people who would otherwise have been deterred by the traffic congestion, therefore congesting the roads with the same number of cars as before.

The San Francisco study revealed that only a limited impact would occur with the addition of rail transit. "Existing local conditions and the enactment of supportive policies were more important in determining the influence of a rail system on an urban area" (Weiner 116).

The Capitol Region Transportation Plan

In response to the guidelines set in the federal Clean Air Act of 1990, Connecticut created The Capitol Region Transportation Plan. The federal Clean Air Act of 1990 was enacted in response to the serious air pollution and or smog problems being experienced by many metropolitan areas of the United States. The Act requires "metropolitan areas to develop transportation plans that help reduce vehicle emissions that contribute to smog" (Capitol 14).

The Capitol Region Transportation Plan is a program designed to meet the forecasted transportation needs of the greater Hartford region in 2010. This program considers several "transit alternatives" in order to make recommendations on how to improve transportation within the guidelines of the Clean Air Act of 1990. This plan includes full analysis of the costs and impacts of each recommendation, and extensive background on the state of the existing transportation system.

The cornerstone of this plan is the usage of the Griffin Corridor. The state purchased land throughout the northwest area of Hartford with the intention of creating a light rail system; this land is known as the Griffin Corridor. The 18.7-mile corridor has potential uses other than just a light rail transit system. The plan assesses the value of using this land to build freeways, or to pave the land for the specific use of buses or even to make no new developments at all. Despite the flexibility of using the land for bus transit ways, the recommendation is that a light rail system be implemented. The estimates for a reduction in hydrocarbons was assessed at a 0.06% decrease, for carbon

monoxide a 0.07% decrease, and for nitrous oxides a 0.04% decrease, all of which are greenhouse gases.

Improvements to the major existing freeway that runs through Hartford were also central to this plan. The possible improvements considered include widening; adding a high occupancy vehicle lane to promote ridesharing; adding lanes specified for buses; adding a rail system that connects Hartford to New Britain; a town west of Hartford; and adding a rail system that would span all the way to New Haven, a town southwest of Hartford. The forecasted decrease in green house gases associated with widening the existing highway was more than double that of the next best option, of adding bus specific lanes.

The Capitol Region Transportation Plan makes policy specific recommendations as well as infrastructure related suggestions. The plan encourages the State Legislature to adopt the California new car emissions standards. This initiative is attractive because its implementation represents a possible 30-35% decrease in emissions at a cost of merely $60-$130 per new car (14). This is a highly effective way to use policy to influence industry.

Another policy related recommendation is to strive for a 1-4% decrease in hydrocarbon emissions. The suggestions made in this plan, if implemented, represent a 1.1% decrease in emissions, but the plan clearly states that this should not be settled for. Technological advances, such as zero-emission fuel cells, should be investigated and policy should be implemented to drive its development. This ensures that the future of policy making will evolve with technology.

The principles of the Capitol Region Transportation Plan represent an extremely thoughtful initiative with sustainability at its core. This plan can be used as a model for developing agendas related to the improvement of infrastructure, policy and procedure. The in depth analysis of environmental and economic impacts creates a clear foundation for the recommendations. In summary, the future of sustainable transportation will rely on forward thinking initiatives like this one.

Portland, Oregon

Portland is hailed as the great future transit metropolis of the twenty-first century. There are many factors working in the city's favor: pro-environmental legislation, a farsighted, detailed plan, boundaries on urban growth, and wide public support (Cervero 416). The population of Portland and the surrounding suburbs is predicted to grow by fifty percent over the next twenty years, and with this predicted growth comes a concentrated effort to create a successful transit metropolis, contained within a protective greenbelt.

In the 1970's, when it became necessary to upgrade Portland's public transit, a light rail system was chosen over a freeway or bus system because of the proposed superior services it provided. In 1998, the east-side line connected 24 kilometers of land, and a west-side line opened as well. It is projected that within the next few years, the system will run for 93 kilometers, connecting all quadrants of the region (Cervero 416). Part of the success of Portland's system has resulted from the strong community support the city has received, both from businesses and organizations such as 1,000 Friends of Oregon. and activist neighborhoods.

U.S. Government and Private Sector Cooperation

In 1998, the Transportation Equity Act for the 21st-Century was passed in the United States. 91% of all U.S. commuters use an automobile as their primary form of transportation to and from work, and 92% of that group drives alone. These commuting habits are the target of this legislation. It is designed to offer employers incentives in the form of tax breaks for participating in Commuter Choice Programs (CCPs). These programs encourage the use of alternatives to single occupancy vehicles for transportation to and from work. These alternatives include carpooling, vanpooling and telecommuting.

The tax incentives for participation in these CCPs are wide-ranging. They include tax exemption of up to $65 per month per employee to be used for vanpooling or transit passes. The employers are also exempt from any payroll taxes on this money for which they may have been liable. Furthermore, businesses may offer their employees up to $175 per month to "cash out" their parking spots. Also employers will receive tax breaks for offering employees the option to telecommute, and providing facilities such as bike racks and locker rooms to promote cycling to and from work.

If a business with 25,000 employees is free from payroll taxes on $65 per employee (per month), this would add up to a tax exemption on $19.5 million per year, or savings of over $1 million per year. In turn, each employee would save $218 per year on the taxes that they would have otherwise paid.

There are several corporations that are currently participating in these programs, including thousands of employers in the New York City area, a branch of American

Express located in Minneapolis, Minnesota and WRQ Inc. located in Seattle, Washington all of which will be discussed here.

A program called "Transit Check" is currently running in the New York City metropolitan area. The monthly transit vouchers, which are good for commuter rail, subway and bus transportation, are distributed by the employers at very little or no cost to the employee. The vouchers are administered as a fringe benefit, or a pre-tax salary deduction as described earlier.

The American Express MetroPass program in Minneapolis is a similar CCP. The Minneapolis Regional Transit Agency offers American Express a discount on buying large quantities of transit passes. These savings are passed on to their employees and further subsidized by the corporation. In the end, their employees pay only $17 per month for unlimited local transportation.

One of the more ambitious CCPs can be found in the Seattle area at a business software company called WRQ Inc. They believe that "an employee that commutes easily and more contentedly works more productively." One example of the incentives offered to the employees is a $20 per month bonus for employees who opt to drive less than four times during that month. WRQ Inc. also offers secure bike rooms, showers and lockers for those that choose to cycle, and a loaner Geo Metro for any employee to sign out if they need to run errands during the day. One employee said these programs "keep my family from needing another car." This CCP is also a good example of the importance of company wide participation. The CEO, Doug Walker rides his bike 29 kilometers each way to work every day.

(http://www.sustainableUSA.org/proceedings/LS303.cfm).

Global Initiatives

To better comprehend the traffic situation in Copenhagen, one must study initiatives from around the globe. Although cities in the United States display a wide variety of modes of public transportation, different criteria can be found in global cities. European cities are more apt to take into account the number of commuters who use a form of non-motorized transport, such as walking or biking, as such forms of commuting are more popular there than in the United States. Many European cities also benefited from early planning efforts by their governments.

Stockholm, Sweden

The benefits to the transportation system in Stockholm result from early planning by the city's government. Unlike most cities around the World War II period, Stockholm did not become highway-oriented, but instead planned a city ideal for the use of public transportation. This began in the post-WWII period, when housing was scarce for immigrants and factory workers. Because of the lack of housing, the government began constructing housing complexes near cities and workplaces. This followed urban planner Ebenezer Howard's idea of "satellite towns", or towns outside of Stockholm that were connected to the city by railways. The government used tax incentives and land use to lure people into these towns and convince them to stay. In order to discourage the use of cars to reach Stockholm, the towns were planned so that the majority of housing was within walking distance of a rail stop (Cervero 109-112).

The original satellite towns were planned to have a balance of housing and workers, but the newer "new towns" differ in this respect, as a few of them have a significantly higher number of residents than employees. Also, while the first generation towns were planned in great detail, the later towns evolved specifically to suit the needs of their residents. The benefit of the new towns as opposed to the old ones is that the balance between jobs and housing is no longer the primary objective in designing the towns. As a result, a smoothly run electric train system became the centerpiece of Stockholm and the surrounding satellite communities, allowing people to take jobs in any community, not necessarily the one they live in (Cervero 120).

An interesting phenomenon has occurred since the satellite towns were developed. Built with the intention of allowing people to live in a satellite town and commute to work in Stockholm, the satellite system seems to have had the opposite effect. Currently, less than one out of three workers actually live in the community they work in. Instead, more workers actually live in Stockholm and commute to work in an outside town. These towns, built to be self-sufficient, are far from it, as they import workers and export their residents to jobs elsewhere (Cervero 124). This does not indicate a lack of success on the part of the public transport system, only an outcome that is different than the one predicted.

Stockholm's experiences indicate that satellite towns do not need to be self-sufficient to be effective. In fact, the importation and exportation of labor between the towns has increased the use of the train and reduced the number of personal automobiles. Also, when Stockholm and the San Francisco Bay Area were compared for home-work transportation patterns, while both have similar sized train systems, San Francisco

residents drove 2.4 times more than residents of Stockholm (Cervero 129). This proves the effectiveness of Stockholm's early planning for land used for public transport, not the Bay area's auto-centered transport pattern. "Stockholm's experiences suggest . . . only when community-based planning and design add up to a coherent whole can a sustainable transit metropolis begin to take form" (Cervero 130).

Munich, Germany

Munich is a unique city for its travel features because it is a municipality in an "auto-oriented society" (Cervero 214). Prior to 1990, residents of Germany owned more cars than in any other European country, internationally second only to the United States. Furthermore, the extensive highways in Germany (called the Autobahns) have no speed limits, which help to link car ownership to personal freedom and power, making automobile use more appealing. In contrast, one of the most pro-environmental movements anywhere exists in Germany, strongly advocating any other mode of transportation besides the car. These contradicting undercurrents in Germany help to create an attitude among the population that agrees, in general, that cars are appealing, but public transit is the best option for cities and therefore should be further explored. "Munich reminds us that good-quality transit is wholly consonant with a high quality of living as well as environmental and economic sustainability" (Cervero 232).

Munich's extensive transit system has resulted from multiple efforts on its behalf. The regional transit authority, MVV, ensures that trains and bus services are closely related and correlate with each other. There are three levels of rail services, and a bus system serving the commuters in and out of Munich. The fares are efficient and unified;

the physical design is appropriate and makes transport easy for passengers, allowing for fast connections and short stops. Another appeal for the use of transportation has been the park-and-ride programs extended to allow for more spaces, and have since been most frequently quoted as the reason commuters decided to use public transportation (Cervero 227).

Munich's simple, efficient design for public transportation, along with its respect for the views of all contrasting political and environmental opinions, have all been major players in the city's continuing efforts for a "greener" transportation option.

Ottawa, Canada

Ottawa's public transportation system, unlike most major cities, is an extensive bus system, which has all the benefits of a railway-based system, along with the ability of the vehicles to leave and return to major roadways, reducing the need for stops and transfers. The most unique, and some say effective, element of this system is a roadway reserved just for buses, called the Transitway. "The Transitway plays a dual role: it both funnels buses into the built-up core, and, since buses can leave the guide way, provides an efficient conduit for transfer-free connections to the spread-out suburbs" (Cervero 238). Ottawa's regional planning and a clear vision of the future resulted in a well-designed and well-used public transport system.

In the 1970's, a planning committee in Ottawa decided to install the Transitway system, which led to new development policies that called for an increase in the number of jobs available near Transit stops. Office and commercial buildings are the first to be added within a five-minute walk of the Transit stations, followed by high-rise apartments

and condominiums, designed to attract more people to use public transport to get to work. The success of this system might be attributed to the fact that the government first planned a land-use strategy for the future, and then built a transport system to accommodate that plan. In contrast to Munich, park-and-ride situations have been discouraged, thus reducing parking costs and the number of cars on the road. The good planning and recognition of busing as the cheapest and fastest solution for this city both contributed to the success of the Transitway in Ottawa.

Nottingham, England

Nottingham is a city located about 193 kilometers north of London, England, with a population of 560,000 and about 236,600 jobs located in the city. The city is connected to London and other cities in England by train, and there are plans for a regional light-rail transit system to connect Nottingham with the suburbs around it. However, most of the regional public transportation is provided by bus services. There is a good bus network, but the system is often slowed down by traffic congestion in many areas of the city. For those who do not use public transportation, many highways have reached their full capacity at peak hours, and there are frequent traffic jams going in and out of the city.

In January of 1996, a three-year research project was done on the city to help improve mobility management, which is defined as "strategies aimed at reducing the amount of road traffic by encouraging changes in behaviour on the part of organisations and individuals" (Nottingham 7). The city has become interested in mobility management because of the traffic congestion problems and because of a growing concern for the environmental effects of the transportation situation. Many companies

have agreed to participate in this movement by encouraging their companies to use public transportation, raffling off bicycles, and conducting studies on their employees as to how they get to work.

The most effective of these initiatives taken have been "Green Commuter Plans," which will "assist strategies to reduce traffic emissions, to promote physical exercise by supporting walking and cycling and to reduce accidents" (Nottingham, 20). They will also assist companies in meeting the requirements set by local Agenda 21 contracts and the World Health Organization. The government in Nottingham has admirably taken control of the transportation problem by conducting studies and proposing effective solutions to the congestion in the city.

"In Town, Without My Car!", Europe

In the past, towns and cities have taken individual steps to improve awareness of alternative transportation in their area. These programs have worked well in the past and are an excellent way to encourage citizens to use public transportation. Because the pollution and harmful side effects of heavy traffic continue to increase in Europe, the European Commission and the Directorate General Environment decided to organize a European-wide campaign for a day of reduced traffic and increased public transportation, called "In town, without my car!"

The first "In town, without my car!" day was in France on 22 September, 1998 with 35 French towns participating. The European Union supported these measures, and thus decided to open the campaign to more countries, with France and Italy participating in the first European edition of the day on 22 September 1999. Sixty-six French towns

and ninety-two Italian towns participated in the day by limiting certain areas of the town to only pedestrians, cyclists, and public transportation.

The days proved to be very successful, and showed a 10% increase in the use of public transportation, and reported an increased number of cyclists and pedestrians in town. Most inhabitants mentioned that the best part of the day was the ability to enjoy the sights and historical aspects of the city with a reduced noise level, improvement in the air quality, and the relaxed atmosphere of the town. Further benefits became obvious after surveying the participants of "In town, without my car!" Eighty-five percent of people consider this day to be a good idea. There was no reduction in economic activity, and a significant number of shopkeepers reported an increase in people in the store as opposed to any other weekday. The environmental benefits were outstanding, and included a 50% decrease in noise level and between a 20% and 50% decrease in air pollutants.

The first true European-wide day was held on September 22, 2000. The common cause was identified as the reduction of traffic nuisance in cities. The idea was not to prohibit traffic but to develop awareness in more people and to seek appropriate realistic solutions together. Seventy million Europeans in 760 towns and cities participated in this day, which was found to be hugely successful.

A telephone survey completed in six of the towns after the day showed an overwhelming majority pleased with the day and more educated on traffic issues. Eighty-two percent of the population wanted to see the day happen again, some as often as once a month. Forty-six percent claimed that they were not inconvenienced by the lack of a

car and an increase of fifty percent in the use of public transportation indicated a general willingness to try collective transport for the day.

The environmental benefits were outstanding in every city tested. Tests showed up to an eighty-five percent reduction in carbon monoxide in the air, and anywhere between a ten and fifty percent reduction in primary polluting agents. Better bicycle facilities provided for the day contributed to a reduced number of cars, and included loaning bikes to the general public, repair stands around town, and manned parking lots with new lock systems. These increased security measures pleased many cyclists and encouraged more people to cycle to work.

Publicity was effective, including promotion with leaflets, information on city internet sites, advertisement on television and radio, and posters around town. Shopkeepers were among the few who showed concern about the day, as they were worried about deserted streets and a lack of customers. A few shopkeepers indicated fewer purchases, but many were pleased with having more relaxed customers.

In general, "In town, without my car!" 2000 was very successful. It showed similar interests of citizens and political figures, and indicated a readiness of some to modify aspects of their behavior.

Initiatives in Denmark

A brief history on the transportation system in Copenhagen will help to assess the current system and how it affects the residents of the city. Copenhagen has many characteristics similar to the countries researched above, and can benefit from their

experiences in areas such as satellite towns, bus systems, and the incorporation of light rail systems into modern cities.

Copenhagen

The public transportation system in Copenhagen is the result of the efforts of multiple organizations, not all of them working towards the same purpose. "Land-use and transport planning and development are institutionally split" (Cervero 134). Coordination results from checks and balances, and has resulted in a competent and useful system for the city that contains almost two-fifths of the country's population.

Under the state level of transportation, there are twelve regional departments of transportation, one of which is Copenhagen itself. Divided up among these regional departments, there are 275 municipalities, including one for the Copenhagen area. The regional departments deal with general land use such as whether a certain area should be developed or not. At the municipal level, the detailed planning of highways, public transportation and bicycle routes is considered. Because of the many different regional plans around Copenhagen, in 2000, a governing body called HUR was developed. HUR, the Municipality Development Council makes sure that the land use planning is coordinated within the five or six regional departments in the greater Copenhagen area. Since its creation, HUR has devised a land use plan, and in two years, intends to make a transportation plan. (For interview see Appendix D.)

Copenhagen contains several different kinds of transit systems. The state railway agency operates the S-train, a commuter railroad within a 40-kilometer radius of Copenhagen. Copenhagen Transport operates urban rail services, which are almost

indistinguishable from the S-train services. Private railways supplement these, and Copenhagen's bus transit system operates about 1,100 buses (Cervero 134).

The land-use plan in and around Copenhagen follows the Finger Plan of 1947, which concentrates land development and growth in "fingers" that end at five different historical towns, leaving green wedges between these developed areas. The thought behind this plan was that if growth was concentrated along rail lines, the majority of commuters could reach Copenhagen with ease. "Most of the stated objectives of the Finger Plan and subsequent updates have been framed around principles of regional accessibility and sustainability- principles that are today widely accepted, but which in the early postwar years were not that common or well articulated" (Cervero 136). The Finger Plan became the backbone of the region, and a way for the population to visualize future growth, thus encouraging public support and participation.

The city has encouraged the use of the various forms of transportation by mandating that all public functions be held within one kilometer of a train station. Shopping malls and office buildings have been built around and even over the rail stations, and there is enough land around the stations in Copenhagen to accommodate growth over the next thirty years (Cervero 146). Since the main goal of the transit system has been to reduce the number of cars going in and out of the city, the government has encouraged other modes of transportation as well, namely non-motorized types.

Copenhagen's medieval street patterns and old buildings have helped to turn it into what is today one of the largest pedestrian networks anywhere (Cervero 148). Many of the streets in the city have been converted to pedestrian-only streets, and still more, although they allow cars, give priority to pedestrians and cyclists. Besides the

pedestrian-oriented streets, squares and public spaces encourage people to relax and enjoy the city life. Because of these spaces, "the average number of people sitting and mulling around civic squares and pedestrian streets during daylight hours rose from 1,750 in 1968 to 5,900 in 1995. These often overlooked occurrences are part of the heart and soul of the city" (Cervero 149).

Thirty four percent of Copenhagen's residents commute to and from work by bicycle (Cervero 149). Not only does the city build trails and roads expressly for bicycle use, but they have introduced a bike-lease program for people to "borrow" a bike to get somewhere that is just too long to walk, but too short to take the train or bus. This increases the number of people getting to train stations by non-motorized means. Copenhagen's public transportation system can only be expected to improve in the years to come (Cervero 152).

Green Transport Week, Denmark

In association with Europe's "In town, without my car!" campaign, during the week of September 18-24, 2000, Danish municipalities and organizations carried out a number of activities in the national Green Transport Week. Forty-five local authorities and seven counties decided to be official participants in the week, which was largely a success in the cities that participated.

Bicycle traffic received the most attention from almost all the localities, which carried out activities that focused attention on cycling. Campaigns were aimed at commuters to encourage them to go to work on bicycles, and also at children who are normally brought to school by car, to encourage them to find new modes of transport.

Car-free areas were put into place in eleven municipalities, some for the entire week and some only on September 22. There were various activities set up around the city to increase awareness of new technologies such as electrical cars, and in many car-free areas, street parties and fairs were set up to enliven the areas.

Overall, the Green Transport Week in Denmark was a success. The criteria set for increasing awareness and the number of activities generated were all exceeded; however, it is difficult to determine the long-term environmental impact of the week, as only limited studies have been done.

There were many participants involved in organizing the week. Activities at local schools were successful, and assessments have shown that there was indeed less traffic at schools during the week. Bicycle transport was a main focus of the week, and local authorities managed to direct attention to many different aspects of bicycle use. The car-free areas around the cities were well received, and provided areas for many different activities.

Some improvements for the next Green Transport Week include better interplay between local projects and public transport authorities in order to improve benefits like free travel for those who wish to use public transportation. Car sharing did not receive much attention during the week, and activities focused on carpooling did not have an impact on previous use. National themes were useful to draw attention to the week, but it would help to focus on more specific target groups in the future.

Initiatives in Hillerød

Information on programs in Hillerød, taken from a brochure written for people working with environmental issues and planners for events in townships and counties, included suggestions for promoting environmentally friendly commuting, and how to encourage companies to use commuter planning with their employees.

A company in Hillerød, Denmark, called ATP, started a project to promote sustainable transportation among their employees in 1997, in conjunction with local townships and other partners. ATP is a company of 550 employees in an office building about five kilometers from the center of Hillerød. Three out of four employees go to work by car, and most of those employees live about 25 kilometers away from work. To start the project, ATP participated in interviews and talked to employees about what would convince them to change their habits.

ATP devised with a list of suggestions to put into use for their employees, including such ideas as organized carpooling, providing company bicycles from work to the train station, allowing employees to take the company bicycles on the train home, and including a bicycle repair shop at the office building and extending facilities for cyclists. The company also introduced the possibility of working from home, and made the point that employees who live further away would receive the PCs needed for working at home first. Nine out of ten employees consider these issues to be relevant, and about half of the employees said that these changes might affect their choice in transportation.

ATP addressed different ways to motivate companies to create similar initiatives on their own. Benefits for society include cheaper transportation, less pollution, less energy used for transportation, and less traffic on the roads. Benefits for the companies

themselves were listed as having more contented employees leading to better customer service and a better image for the company. Common interests include better heath for all concerned and fewer accidents on the roads. Most important were the benefits for the employees, which included less stress, better health, better social interaction, and cheaper transportation to work.

After listing examples of such initiatives taken in Denmark, Holland, and England, the brochure included a list of suggestions for companies who wish to start such a program. Companies should make sure the point of view for the program comes from the companies' own structures and traditions. They should make agreements with the leaders of the companies regarding who should be involved and when the program should run. Dialogues with employees and support from a leader are important, as well as motivating employees who are truly interested in implementing the program and seeing it work. They should have a strategy for getting an idea of the current transport habits in order to determine what should be done to implement the plan, and when choosing benefit options, make sure to include benefits for people who already use sustainable transportation. This brochure offered a comprehensive list of possibilities and suggestions, and provided excellent background and many ideas for companies that wish to implement a similar program with their own employees (Penlerplaner).

An interview was later conducted with Mino Josefi, who helped with the program with ATP and was one of the people who wrote Pendlerplaner. To read her comments about the program and its successes and problem areas, please see a summary of the interview in Appendix E.

Current U.S. Policies and Programs

The United States Environmental Protection Agency (EPA) monitors six major air pollutants with monitoring stations all over the country. These pollutants include carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter and sulfur dioxide. The levels of these six gases, measured at thousands of stations all over the country have all shown some improvement in the last 20 years. Between 1900 and 1970, the emissions of the six principal pollutants increased greatly, and had the Clean Air Act of 1970 not been passed, the levels would have continued to increase.

Both governmental and non-governmental agencies in the United States have recognized the impact that transportation has on the environment and the greenhouse effect. Legislation by the government, including the Clean Air Act, and campaigns by private organizations have been started to reduce fuel emissions and improve the environment as it relates to current transportation patterns.

United States Policy Action

In 1970 the United States Environmental Protection Agency put the Clean Air Act into effect. The Clean Air Act (CAA) imposed a set of primary and secondary regulations called National Ambient Air Quality Standards (NAAQS) for any air pollutant, which has an adverse effect on human health. The NAAQS set primary standards necessary to protect human health and secondary standards required to protect public welfare from any known or anticipated affects associated with air pollutants. The CAA regulated stationary sources of pollutants such as industrial facilities and power plants as well as mobile sources. Mobile sources include trucks, cars and other

automobiles for transportation purposes. The six pollutants that were regulated are the same that are now monitored by the EPA (Powell, 1998).

Part of the CAA included motor vehicle provisions. These emission standards and control requirements applied to manufacturers of new motor vehicles and new engines. The EPA forces automobile companies to comply with their regulations by implementing a certification program, testing both during production and while in use, inspection and maintenance programs, and onboard emissions diagnostic systems. Under the CAA, provisions have evolved following precedents set under the California emissions control program. The U.S. Congress has begun to move toward a scheme of prescribing control requirements by statute rather than delegating the standards to the EPA. This scheme focuses on the environment with little concern for cost effectiveness and technological feasibility (Powell, 1998).

The 1990 amendments tightened the mobile source emissions standards and forced manufacturers to reduce tailpipe emissions gradually. Hydrocarbons had to be reduced by 35%, and NOx reduced by 60% in all vehicles sold in 1996. The law also required an additional 50% reduction by 2003 unless the EPA determines this not necessary, not technologically feasible or cost effective (Powell 1998).

Presidential and Congressional Action

President Clinton, before leaving office, took administrative measures designed to help protect and save the environment. On December 20, 2000, Clinton approved pollution control rules that will force huge reductions in large truck and bus emissions over the next 10 years. The new rules subject diesel-powered vehicles to requirements

that would reduce emissions of soot and smog-producing material by more than 90 percent. This strict control over diesel-powered vehicles is even stricter than the standards for cars and light-trucks that Clinton put into place over a year ago. These restrictions are said to reduce pollutants that pose a hazard to human health by millions of tons. The changes will take effect in 2006. Part of this plan that was settled by the White House will take effect in two steps, with 80 percent of all diesel fuel to be nearly sulfur free beginning in 2006 and the rest by 2010. The other two main provisions of these new rules would not affect the fuel itself, but the manufacturers of engines. One provision will require a 95 percent reduction in nitrogen oxide emissions, the main ingredient in smog, and will apply to half of all new heavy duty vehicle engines produced in 2007, the rest to follow in 2010. The other will require a 90 percent reduction of particulate emissions and will take place in one step in 2010. President Bush has recently announced his plans to roll back many of the environmental protection measures that Clinton put into effect in the next 4 years.

Congress, along with the Environmental Protection Agency (EPA), has passed environmental legislation that has aided in the reduction of greenhouse gas emissions as well. One of the most successful measures has been the Corporate Average Fuel Economy (CAFÉ) Standards, which were passed in 1975. The standards require that the new cars average 27.5 mpg and light trucks average 20.7 mpg. Automobile manufacturers can make vehicles with lower mileage as long as enough of their vehicles exceed the standards that they average out to the CAFÉ allowances. (http://www.sierraclub.org/globalwarming/cleancars/cafe/BiggestSingleStep.pdf)

United States Environmental Protection Agency Action

The EPA has a Transportation and Air Quality (TRAQ) Center that provides state and local air quality regulators and transportation planners with information regarding programs and mobile source incentive-based programs, partnership opportunities and grand funding sources. (http://www.epa.gov/otaq/transp.htm)

The Sierra Club Actions

The Sierra Club is a non-governmental organization in the United States concerned with most environmental issues that exist. It is currently running a Global Warming Campaign. It provides news and press releases regarding global warming and encourages others to join in its campaign as well as exhibit a sense of activist mentality. It has also produced a report on Sport Utility Vehicles and their effects on global warming. SUV's produce 43 percent more global warming pollution and 47 percent more air pollution than an average car. Because the U.S. Government classifies these SUV's as light trucks, they are not subject to the policies that affect cars and therefore are able to use more gas at a less efficient rate than the average car. America's cars and light trucks alone produce almost 20 percent of the U.S. CO2 pollution and transportation is continuing to be the fastest growing sector of air pollution in the country.

The Sierra Club is also sponsoring a Clean Car Campaign. This campaign's goal is to increase the fuel efficiency of automobiles because it is the biggest step that the U.S. can take to reduce the consumption of fossil fuels and reduce global warming pollution. It is pushing for stricter regulations similar to the CAFÉ standards of 1975. The organization believes that this is the single most effective step that the U.S. can take to

reduce emissions and conserve energy and oil. The suggested standards of 45 mpg for cars and 34 mpg for light trucks would cut CO2 pollution by 600 million tons.

Greenpeace Actions

Greenpeace is the leading independent campaigning organization in the U.S. that uses non-violent direct action to expose environmental problems and to promote solutions. One of their six most pressing campaigns is the campaign to stop global warming. Their efforts include working to phase fossil fuels out and pointing out clean energy solutions such as solar and wind power. Though it has not taken any recent action to help reduce fuel emissions and promote sustainable transportation, Greenpeace continues to promote the use of alternative fuel and power sources.

Union of Concerned Scientists Campaigns

The Union of Concerned Scientists (UCS) works to develop and promote strategies to reduce negative environmental, public health and economic impacts of the U.S. transportation system. Currently it is working on several initiatives including a Clean Car Campaign, Zero-Emission-Vehicle Program, Advanced Technology Incentives and raising fuel economy standards. The UCS helped persuade the EPA to adopt new standards eliminating air pollution loopholes for SUV's, minivans and trucks and have helped demonstrate the feasibility of constructing SUV's with better fuel economy and cleaner emissions. The UCS has persuaded 4 U.S. states to retain stringent auto emission standards, including a zero-emission-vehicle program while there has been enormous pressure to reduce standards and create a weaker federal program. By forming

a coalition, it has recently helped secure the reauthorization of a federal transportation bill that will allow local and public input into transportation projects as well as shift federal money away from highways and into alternatives such as clean fuel buses and pedestrian applications.

Psychology of Transportation Choices

The psychology behind the choices people make about transportation are complicated, and involve many different issues. This section is an overview of the reasons for different transportation choices, and discusses the factors in people's lives that can influence their decisions.

Environmental Consciousness and Greening Lifestyles

In recent years, the concept of environmental or ecological lifestyles has grown from implying a simple and natural life to a technically and aesthetically sophisticated term. The term "ecological" now suggests new technologies and energy saving techniques for modern residences and workplaces, and this new inference has helped raise environmental consciousness.

Studies have shown that globally, environmental concern and awareness has been growing. It also seems that people's cultures are the key to explaining the many perceptions of environmental issues. In Germany for instance, the nuclear energy issue and the motorcar debate are most integrated into the culture. Great Britain is most concerned with the protection of nature and all problems related to the destruction of

landscapes. Sometimes the car symbolizes an economy centered national identity while other times it is a symbol of amoral development, destroying society.

Behavior and Attitudes Towards Transportation

A study done in Sweden People fall into one of two main types when considering their modes of transportation. They are either car drivers or users of bicycles and public transportation. Each of these two types are broken down into 3 sub-types. Car drivers are broken down into passionate drivers, everyday drivers and leisure time drivers. Cyclists and users of public transportation are broken down into users of heart, users of convenience and users of necessity. Though there are general descriptions of these types, studies have reconstructed them using characteristics found in the data (Jensen 4).

Passionate car drivers are more frequently men than women and are generally employed persons between the ages of 30 and 60. The drivers care greatly for their car and also love to drive it. They do not believe that driving causes major environmental problems and usually believe that the taxes on cars should be lowered.

Everyday car drivers use their cars for their commute to and from work because it is often the easiest and quickest way. This group is made of a majority of 30-60 year old men who are usually salaried workers with a finished education. They are usually drivers of habit and are understanding of the environmental problems that driving creates but don't like to admit that their own driving contributes to them.

Leisure time drivers make up the largest group and use their cars for shopping and errands, as well as the transport of children and for weekend visits to friends and family. This group is composed of all ages, but a few more women than men. These drivers

often believe that if the public transportation was better and could meet their needs that they would like to get rid of the car and use the money for other expenses.

Those people who cycle and use public transportation because of heart or desire are primarily women and voluntarily choose to use these forms of transportation, often out of a desire not to own or drive a car. They have a concern for the environment and are aware of traffic's contribution to these problems. These travelers are also willing to pay what it costs to protect the environment for future generations.

Those who ride bicycles and use public transportation out of convenience are generally city people and are young or younger than most. The household income of this group is on the lower end of the spectrum and they use these modes of transportation because it suits their needs of transport. Often times they live close to their workplace and do not need to have a car, as it would be merely a nuisance more than a help.

Cyclist and public transportation users out of necessity are most often people who cannot afford a car or perhaps are incapable of driving, such as handicapped or elderly people. The young people in this group are often in the middle of their education and have no vocational training. Their understandings of environmental problems range from a large interest of green transportation to a complete lack of interest and denial of problems with the environment completely.

These categories explain attitudes toward transportation and the environment, however, differences have been found between the behavior and the attitude expressed in these mobility types (Jensen 4). There is a major inconsistency between how people would like to act and how they actually do act. The people who were surveyed for this study on mobility types expressed their satisfaction and enjoyment of driving a car, but at

the same time wished for fewer cars on the roads and an increase in driving-related taxes to reduce traffic. This is a common social dilemma: caring about one's self-interests, while carrying a concern for the general community as well.

Car drivers are most often aware of this inconsistency but it has become more of a theoretical problem for them. Because this inconsistency rarely shows practical meaning for them, they acknowledge the problem but do not attempt to fix it by driving less or getting rid of the car. There is not a problem in actually deciding whether or not to have a car either. The issue of the environmental problems that a car creates is never brought to light, because drivers never seriously consider not owning or driving a car.

One of the main reasons is that driving cars has become so highly integrated into society that people who are used to driving cannot imagine life without a car (Jensen 5). Car ownership has become a 'natural' part of life and continues to be looked at in that way. Studies have shown that the actual behavior of drivers does not go along with their knowledge and interest in the environment. This could possibly be explained by the fact that in general, people believe in limiting cars for the sake of the environment, but they do not wish to pay the price themselves (Jensen 6).

Two conceptual pairs, Freedom and Limitation and Independence and Dependence, have been suggested as ways to help understand the contradictions of transportation attitudes and behavior. These conceptions can be used to explain some of the transport behavior in modern society because they encompass some of the common features of the behavior.

Modern society has related freedom to the ability to chose between different things outside of the individual. It is the consumer's free choice that is emphasized,

including the choice to purchase a car, thus representing freedom itself. Freedom is not a concept equal to the concept of a car, but in recent times they have come together to symbolize modernity (Jensen 6). The freedom of driving a car is a contradiction in itself. The more people 'freely' choose to drive cars, the more limitations they put on themselves by increasing traffic jams and rush hour problems. Freedom has then become a limitation rather than a choice. Since the only solution to more cars is to build more roads and highways, this further limits the ability to walk freely, and also limits driving through various ways.

Car drivers are not the only people who use independence as an argument for their choice of transport. Users of public transportation and cyclists also feel liberated by their mode of transportation. "When one in today's society feels 'hung up' on a million things in daily life, the sensation of being independent of time and space can seem essential" (Jensen 19). Though it seems that one gains independence by owning a car, the daily use creates a dependency on the car itself, and for some, the lack of a car is liberating. The car has become a symbol of freedom, independence, power, speed, control, prestige and consumption in the modern society. These benefits may be obtained by driving a car, but often overlooked is the dependency that is created by its daily use (Jensen 5).

By dividing travelers into types and focusing on the differences it is easier to see that more than one strategy is needed to change transport behavior. Though it is not realistic to create a separate system for each of the six types of people, it may be possible to come closer to a solution by targeting several of the groups at once. Also, a general concern for the environment is not enough. Instead, behavior must be changed to protect the environment, and this is a general responsibility. Limitations that encompass all

behaviors are important, but there must be alternatives so that everyone feels encouraged to participate. These six different attitudes should be considered when devising a policy or attempting to promote behavioral change.

Gender Differences in Transportation Behavior

It is difficult to encourage new behavior regarding different modes of transportation because of the consequences resulting from the change. Changes in transportation habits affect several aspects of one's life, and therefore are expected to affect different groups of people in different ways. In Sweden, it has been discovered that the two gender groups, male and female, use transportation in very separate ways.

Data from a 1996 survey done in Sweden shows that men traveled more than 50 percent longer distances than women and mainly by car and airplane. Women were shown to use public transportation and walk longer distances than men, making these their primary modes of transport (Carlsson-Kanyama 5).

This study revealed that men of all age groups had access to a car more often than women did. This could be influenced by the possession of a driver's license. The access to a car also results from having the income to support owning one. Since the men in the study generally had higher incomes than the women, this might have contributed to their higher access to a car.

The location of a person's workplace affects what type of transportation they use. In Sweden, a majority of the women work in the service and care sectors, which are often located near city centers, making public transportation convenient. Men work mainly in

large industrial areas or service areas outside the cities, often requiring a car or even a plane to get to work.

Choice of transportation with men and women is also affected by the way leisure time is spent. Men are more likely to spend their time taking advantage of sports, outdoor activities and restaurants, which require a large amount of transportation. Women in Sweden spend their leisure time doing more home oriented activities which require little or no transportation.

Men and women's choices in transportation seem to be related to social and economic variables such as independence and individualism. Men have been indicated to have more individualistic values and lifestyles than women. By owning a car, motorcycle, or bicycle, a person has freedom and is independent of the public transportation schedules.

Many factors play into why men and women choose different modes of transportation, including location of work, level of income and their lifestyle and consumption levels. When researching sustainable consumption patterns, it is pertinent to consider who pollutes the most as well as who pollutes most because of their transportation habits and social characteristics (Carlsson-Kanyama 6).

Methodology

The purpose of this project was to determine the current level of use of public transportation in Christianshavn and to encourage companies to promote sustainable transport for their employees. The current transportation patterns of employees from the Environmental Protection Agency, the Foreign Ministry, and Unibank were unknown. For this reason, a questionnaire was necessary to survey approximately 500 employees in these companies in Christianshavn. This survey revealed the transportation choices of 45 employees from Unibank, 25 from the Foreign Ministry, and 210 from the Environmental Protection Agency. These results helped us to plan the focus groups to determine the reasons behind them and which initiatives would be most effective for the companies to encourage sustainable transportation among their employees.

Questionnaire

The questionnaire that was used for this project went through many different revisions before a final draft was approved by both our liaison and the contacts at the companies. It is based on a similar survey completed at the Milijøstyrelsen or Danish Environmental Protection Agency this past year, but certain questions had to be revised and edited, and others needed to be added, based on the results from the previous survey.

Søren Jensen undertook a similar project at the Miljøstyrelsen, though the focus of his survey slightly differed. He was interested in information regarding work related transport, whereas our interest was in home-to-work transport. This questionnaire was used as the starting point for our survey. An English translation was made, and the questions were thoroughly analyzed. The questions that were found to be appropriate for

the survey already existed in Danish, therefore several hours of writing and translating were avoided.

Once the EPA's survey questions were translated, hypotheses were formulated to confirm the purpose of each question. The researchers designed questions whose answers would clearly confirm or deny their initial assumptions. The feedback and direction from many experts allowed us to concentrate the survey so that every question had a clear purpose. Questions were added to determine the general use of the "harbor buses," the Metro, and commuter bicycles if the company provided them. A discussion question was added to the end of the questionnaire that asked for concrete suggestions as to what the companies could do during the week of 22 September, "In town, without my car! 2002". This question was also addressed during the focus group interviews.

Please see the acknowledgements page for a list of these experts to whom we are extremely grateful.

One of the main purposes of this survey was to establish a base of information detailing categories of people and the different types of transportation they use. People were categorized by their age, sex, whether or not they combine their commute with personal errands, the number of cars owned by their household and whether or not they come to and leave from work at the same time everyday. Discovering the impact that these factors have on choice of transportation assisted researchers in targeting specific groups for conclusions and recommendations.

Several questions were specifically tailored to uncover the benefits and drawbacks of each type of transportation. This insight was extremely useful in identifying the changes that need to be made in order to make sustainable transportation more attractive.

The researchers have learned from the experiences of several experts that a viable alternative must be offered in order to effectively ask for change.

Due to the large number of people in Jensen's organization, it was necessary to seek an alternative to paper survey distribution. Niels Ladefoged from the Energistyrelsen, another department of the Environmental Ministry, created a Microsoft Access document to be distributed on his company's intranet. This required knowledge of ASP programming language in order to define commands and create the survey format. Microsoft Access was utilized to turn simple tables made up of questions and their corresponding inputs, into a functioning survey. The program compiled a database of all the users and their corresponding answers. This allowed for easy distribution, collection and analysis of the results.

Again, Ladefoged's Access document was used as a starting point for our survey. Although distributing the survey on the network would save countless hours of photocopying, distributing, collecting and analyzing paper surveys, none of the researchers was at all familiar with MS Access. The researchers recognized that the time saved by utilizing MS Access instead of paper copies would far outweigh the time necessary to learn this program.

Creating the updated MS Access document began with developing the list of questions, based on the previous survey and interviews with professionals in the field. Once the questions were finalized, they were inputted in Access in a table format that included instructions for answering them. A separate table was created that listed the options corresponding to these questions. The next step was determining the appropriate input type for each question. Input types are a way to classify different kinds of

questions. For example, a multiple choice question where the employee could only select one option is defined as a "radio" input type, and a multiple choice question where up to three answers could be selected is defined as a "checkbox" input type.

Determining the input type finalized the questions, and allowed the researchers to turn their focus to the page layout. Questions were grouped on each page; the pages were grouped into subsections; and the subsections were grouped into three sections that made up the entire survey. Separate tables were created for each level of organization.

The survey included many questions that sent the user to a different subsection based on the previous answer. For example, one question asks the employee how he or she commutes to work. The researchers were interested in the employees' reasoning behind this choice; therefore, based on their choice, they were sent to questions specific to their indicated mode of transportation. This setup required a table to be created, which resembled a huge flow chart that arranged all the questions in the order that they would be presented to the user, based on the user's answers.

The intranet survey was distributed to the Environmental Protection Agency to almost 500 people. Unibank distributed paper copies to about 60 people, 43 of whom responded. The Foreign Ministry sent the hardcopy of the survey out over email, and 34 people responded to that. A database was created automatically from the intranet survey, and the other two companies' answers were entered into a separate database.

These questions were used for statistical purposes and to develop the more in-depth questions to be used for the focus groups. Factors such as the convenience of public transportation, better coordination between bus and train stops, and better conditions for cyclists all contribute to the reasons behind choices in transportation, and

were very helpful when making suggestions and offering recommendations to the companies.

This questionnaire was similar to a mail survey, as it was distributed through the organizations over the company's intranet, on paper, or over email. The researchers included a cover letter describing the project and how the results would be used, and it was be distributed together with the survey. Employees were asked to complete the survey as soon as they received it. Since the survey asked questions about the employees' transportation to work the previous day, filling it out immediately ensured more accurate data. The sample of people filling out the survey had already been selected (the employees of the three organizations), so the questions were based on the current number of employees. There were limits to this sample size, because the organizations were not fully represented by the employees surveyed. There was only one division represented from Unibank, and only one division from the Foreign Ministry. With over 1000 employees in each of these two organizations, the 45 responses from Unibank and the 25 responses from the Foreign Ministry could not represent the commuting habits of the organizations as a whole.

Another factor that may have affected the results of the survey was the fact that the entire Environmental Protection Agency participated in the survey. The 450 employees from this organization are most likely more environmentally aware than the average employees, and having so many responses from this one organization may have produced unusual results.

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IQP/MQP SCANNING PROJECT

When the questionnaire was distributed to each company, the cover letter asked for people who would volunteer to participate in a focus group. Asking for volunteers ensured that the participants would be willing to discuss the issues, and that they could speak English, which was important since the researchers were moderating the groups. Determining the questions to use for the focus groups was based on topics that were not adequately covered in the survey, as well as questions that might provoke discussion.

The researchers found that the most effective questions for promoting group discussion were those that asked for ideas on improving the public transportation and facilities in the companies themselves. As Professor Vernon-Gerstenfeld said in her interview, everyone likes to complain about traffic, so it did not take much encouragement to elicit responses to the questions. There were many suggestions, including extending the route of the harbor buses, providing shuttles to popular bus stops, and improving the shower and locker facilities for bikers. These ideas were instrumental in providing suggestions to the companies for initiatives to take with their employees.

Not only did the employees provide suggestions for improvements, but they also offered excellent explanations as to why they choose their specific mode of transportation. The primary reasons for driving a car were that the people needed the flexibility to drive where they wanted to. Most drivers dropped off a child at daycare in the morning, and may have carpooled with a spouse or co worker. Bus and train users were frustrated with the crowded facilities and late trains, but they enjoyed being able to read or write during their commute to work. The primary reasons for biking were the exercise and flexibility that riding a bike provided.

During the focus groups, the moderator established a clear objective for the group, defined the rules and guidelines to be used during the interview, and introduced the project. The moderator facilitated the discussion created by the participants. The questions were created with the purpose of promoting a discussion among these participants. Notes were taken to record what the employees suggested, and then summarized later in Appendices F-H.

Confidentiality in the interviewing process was established. This was also the moderator's job as they introduced the project and the rules to guide the focus group. By establishing a rule of confidentiality, participants were more at ease and were more willing to provide information on sensitive subjects. Each subject, as well as the moderator, had to agree to complete confidentiality in order to conduct an effective interview. There are no names used in the summary of the focus group.

More detailed information about the results of the focus group can be found in the Results and Conclusions section.

Residential Interviews

As newcomers to the state of transportation in Christianshavn, it was important for us to understand all sides of the issue. The research done prior to arrival in Copenhagen helped understand the effects of transportation choices, while the questionnaire outlines the perspective of the employees directly involved in the transportation. The last to be understood was the concerns of the Christianshavn residents.

The residents of Christianshavn are affected by heavy traffic, but the exact nature and extent of this impact was unknown. As foreigners, the researchers were interested in the point of view of not only the employees at the companies in Christianshavn, but the citizens and residents of the neighborhood.

The problems that are associated with heavy traffic include air pollution, noise and dangerous situations for bikers and other pedestrians. The residents of Christianshavn feel these impacts more than the commuting employees; therefore the residential population must be interviewed to supplement the employee surveys. Therefore, street or residential interviews were conducted for the researchers' personal benefit, to better understand the position of the general population as it relates to traffic. Results are not included in statistical format, but are mentioned in the results section and can be read about in the Afterword section of this report.

Results and Conclusions

This project, an analysis and evaluation of commuter traffic patterns at three organizations in Christianshavn, was based on a survey that was supplemented by focus groups, personal interviews, and previous background research. The combination of these methods created an excellent basis for recommendations to the organizations. This section consists of a statistical analysis of the survey results, a presentation of the focus group discussions, and a list of conclusions that substantiate our recommendations to the three organizations and the public transportation companies in Copenhagen to promote sustainable transportation.

Survey Analysis

The survey was distributed to the three organizations in different ways, and this may or may not have affected its return rate. A division of Unibank comprising 57 employees received the survey on paper, and 45 people completed it. A division of the Foreign Ministry 48 received the survey as an attachment to an email, which they filled out and emailed back to our account. There were 25 surveys returned. The Environmental Protection Agency distributed the questionnaire over the company's intranet to 418 people, and 203 responded. In general, the return rate was more than respectable and allowed for accurate generalizations to be made about the companies (Figure 1).

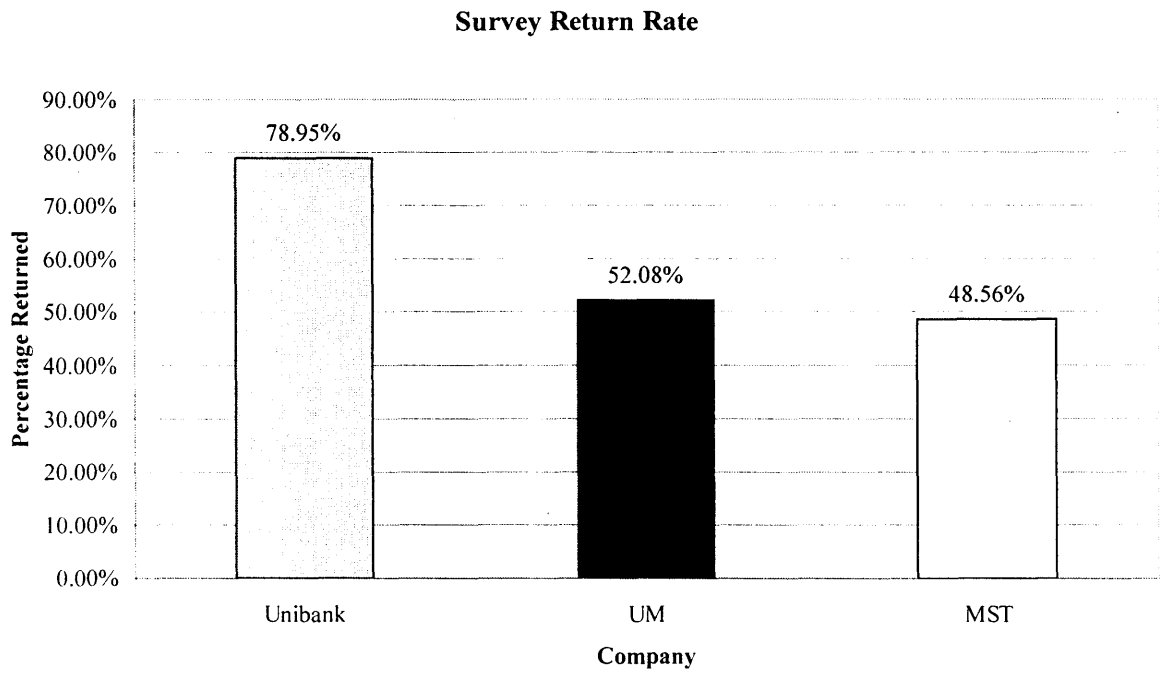

Figure 1: Survey Return Rate

Gender and age group were the largest and most basic areas of breakdown for the data (Figure 2). A much larger number of women than men returned the survey. 13 men and 31 women at Unibank, and 79 men and 124 women at the EPA returned the survey. There are many more women than men, but for these two companies, it reflects the whole organizations' composition by gender. At the Foreign Ministry, 17 women and 8 men returned the survey, which does not reflect the company as a whole, but does reflect the make up of those surveyed. This information had to be considered when making assumptions based on gender.

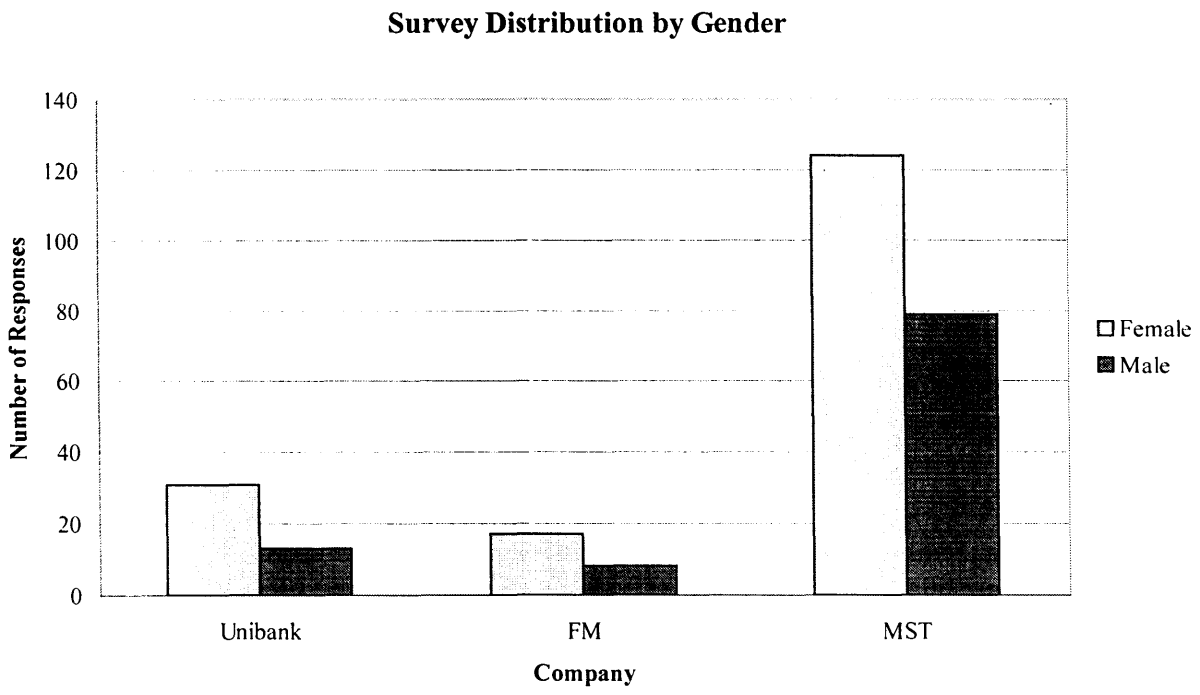

Figure 2: Survey Distribution By Gender

The age breakdown for the survey was similar to the psychological study that we discussed in the literature review. Most car drivers were over age 51, and most cyclists were between 30 and 40 years of age.

Originally, we believed that the results of the survey might be skewed in some way because of the large distribution at the EPA as opposed to the other two companies. However, after analyzing the results, it is not believed that these differences in distribution significantly affected them, as each company contained a similar percentage of car drivers. cyclists, and public transportation users.

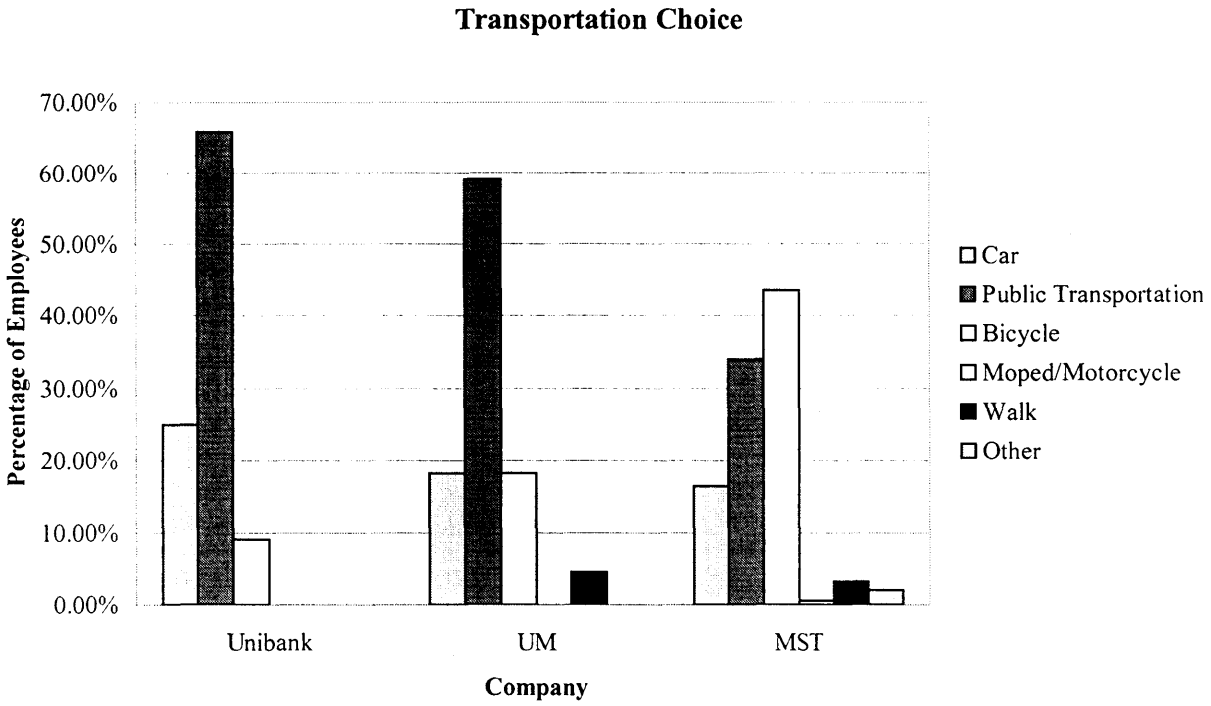

Figure 3: Transportation Choice Among Three Companies

As the objective of the project is to provide ideas for realistic, appealing modes of sustainable transportation, we were very interested in the daily habits of the car drivers. The survey revealed that the majority of employees who ran errands 3 to 5 days per week were car drivers, primarily because of the flexibility that driving the car allowed. The number of cars owned by the household was higher for car drivers, as was the access to a car everyday.

The percentage of car drivers that arrived at work alone every day was 75% for the Foreign Ministry, 40% at Unibank, and nearly 97% at MST(Figure 4).

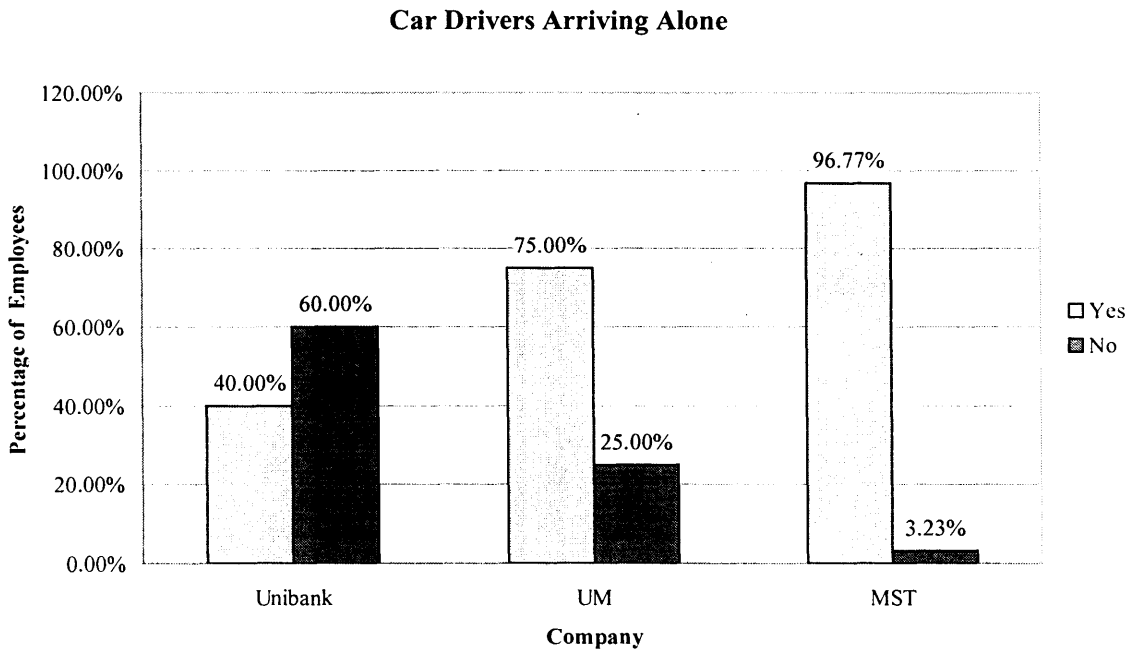

Figure 4: Percentage of Car Drivers Arriving at Work Alone

This is a significant percentage for each company, but over 20% of all the employees surveyed indicated an interest in carpooling . On the survey, if the employee answered that they were interested, they were referred to a question that asked them what it would take for them to start carpooling. The most popular answers in this section were finding a coworker who lived close to wear they lived, and the use of a company car (Figure 6). If the employee answered that they were not interested in carpooling, they were referred to a series of questions that asked them about specific programs that might make them more interested. The main reasons for not carpooling included not knowing anyone nearby to ride with and needing to run errands after work (Figure 5).

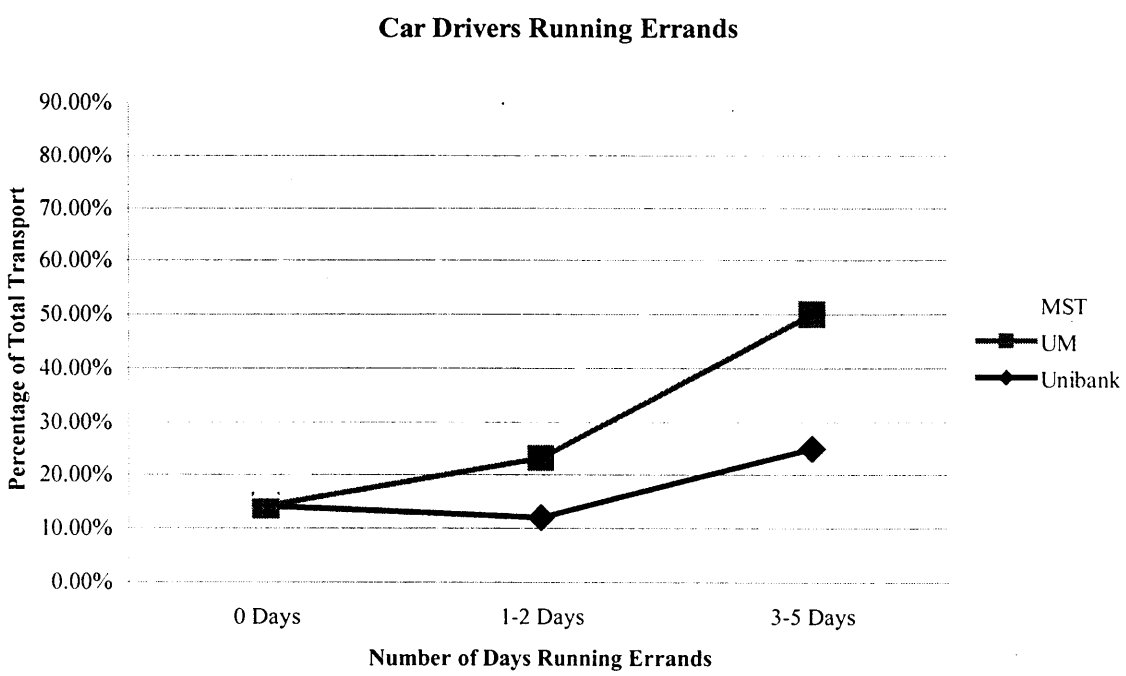

Figure 5: Percentage of Car Drivers with Errands

There was only one employee who said that guaranteed spots for carpoolers would not increase his interest in carpooling, making this a good idea for a company initiative. A guaranteed ride home program was also popular, and many employees indicated that if their company would help them find someone to ride with, they would be interested in carpooling.

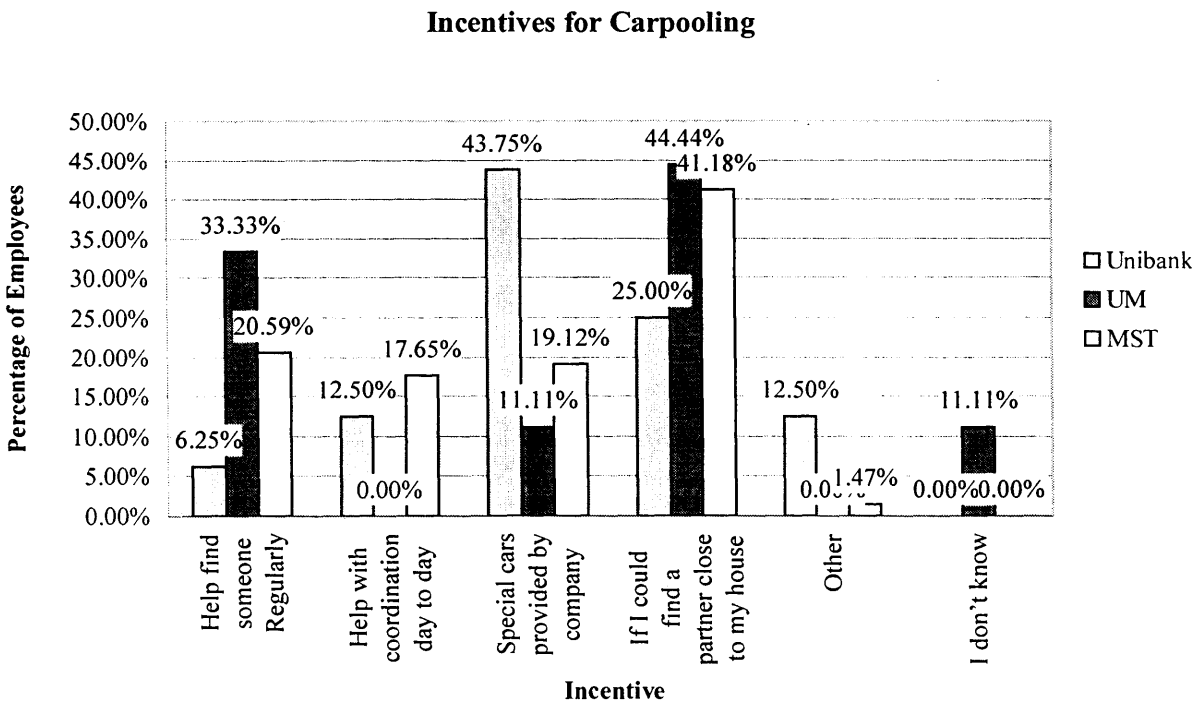

Figure 6: Incentives to Promote Carpooling

Employees who take public transportation are, on average, satisfied with this mode of transport, but there are factors that make it both uncomfortable for daily commuters and unappealing for car drivers. Everyone who took the survey reported the disadvantages for public transportation, making the suggestions valid for use in designing company initiatives. The main disadvantage was the lack of comfort on the buses and trains, due to overcrowding. There were complaints about the trains and buses being consistently late, and inconvenient stop locations. A lack of direct bus lines for many commuters was listed as another main disadvantage of using public transportation.

One significant difference between the three companies' responses was the interest level in implementing initiatives to promote sustainable transportation. At the EPA and at Unibank, there were large percentages of employees who thought their company should be more proactive in encouraging the use of alternative modes of

transportation. However, at the Foreign Ministry, 87% of the employees reported that they did not support their company in implementing new initiatives.

A slight difference was expected, but we did not expect this opposition to company initiatives. We conclude that in this case, the small sample size of this organization did adversely affect the responses. The EPA works with environmental issues every day, and there is already a strong desire among the employees to implement programs that will help the environment. We suggest that the Foreign Ministry increase awareness of environmental and transportation concerns, so the employees fully understand the widespread benefits of encouraging the use of sustainable transportation.

Focus Group Results

The focus groups turned out to be the most effective way to glean inside information about the transportation choices of the employees. The first focus group was conducted at Unibank with three of its employees. One of the employees drove a car to work, one took the train and the bus, and one rode his bicycle in the summer and took public transportation in the winter. The contrast between the three of these worked well in initiating discussion about the three different modes of travel, and the small size of the group provided a good atmosphere for relaxed conversation. The public transportation users liked their mode of travel, but were very frustrated with the overcrowded and delayed buses and trains. Many of these frustrations were reasons why the driver preferred her car to public transportation. This discussion was consistent with many of the comments and suggestions written on the surveys.

The first focus group at the EPA was conducted with three employees who all rode their bicycles to work. The employees all had very similar opinions, as they all used the same mode of transportation. The survey revealed that cyclists are generally the most satisfied with their daily commute, and these three employees supported those results. As with most of the cyclists who answered the survey, the interviewees would not consider another mode of transportation. They rode their bicycles for convenience, because it was the fastest and the cheapest, and because it was the most environmentally friendly option. They all agreed that the heavy traffic both in Christianshavn and on the roads leading to it was dangerous to their daily commute, and one employee mentioned that sometimes she finds it difficult to breathe because of the pollution from exhaust. These employees helped us understand both the positive and negative points of taking a bicycle to work.

The second focus group at the EPA was conducted with three car drivers. This proved to be one of the most interesting groups because it provided a perspective that we had not considered in great detail before this interview. The car drivers made very interesting points about Copenhagen's attitude about cars in the city. Many people have suggested that cars be banned from the city. However, the employees said that if that happened, Copenhagen would lose business since car drivers do not feel that a sufficient alternative is available, and would not come into the city for the shopping or nightlife. They also said that there were not enough park and ride programs to make the trains realistic for car drivers. They suggested more direct bus lines and more convenient Metro stops to make public transportation more appealing.

A synopsis of all three focus groups can be found in Appendices F, G, and H.

Conclusions

Combining background research about other company initiatives and using the comments provided on the surveys and during the focus groups created the suggestions for the organizations in Christianshavn. Many of the comments from the employees were similar, and many of their suggestions for improvement were the same from all three companies. The results from the surveys and the comments during the focus groups resulted in several definite conclusions upon which we could base our recommendations.

The first conclusion is that several alternative modes of transportation must be offered if employees are to be encouraged to change their commuting choice. There is not one mode of transportation that is a practical option for everyone, so there must be alternatives. The most popular modes of transportation, according to the survey, are bicycles and public transportation. Many car drivers have indicated an interest in these two forms of transportation, but several improvements must be made if they are to be a practical and appealing option.

One of the biggest complaints of public transportation users was the overcrowding of the buses and trains. For employees who commute from Central Station, but the bus ride to Christianshavn is often so crowded that they sometimes have to wait for three or four buses to come until they can even get on one. This complaint of overcrowding applied to most of the public transportation users, for both buses and trains. This low comfort level also contributes to why many car drivers and cyclists refuse to take public transportation. Besides comfort, there were inconveniences associated with this form of transport as well. The focus groups indicated that many buses and trains run late, which is a problem for employees who need to be at work at a specific time.

A mode of transportation that has been overlooked in the past is the harbor bus. This is a relatively new division of the bus system, and comprises two ferries that run on the canal that separates Christianshavn from downtown Copenhagen. They are hardly used, but this is not because the employees are uninterested, but because the stops are in the wrong place. Since the companies in Christianshavn are all located near harbor bus stops on the canal, a stop within a five minute walk of Central Station would make this a popular and appealing mode of public transportation, and might help to fill the currently almost empty ferries.

One of the most popular modes of transportation in Copenhagen is the bicycle. The majority of employees ride their bikes to work, but one of the common complaints was the lack of adequate shower and locker facilities for bikers (Figure 7). At Unibank, for example, one employee was waiting for months to get a locker in the basement where he could keep a change of clothes. There are many such employees, and possibly many more who would ride their bicycles if there were better facilities for them. At Unibank, the facilities for men and women are about equal; however, there are significantly more male employees, resulting in overcrowding of the locker rooms. Only one building contains a ventilated drying room for wet clothes, and there is a lack of covered bicycle parking at every company. As mentioned before, cyclists are very pleased in general with their mode of transportation, and they would ride their bicycles even with inadequate facilities at the workplace. However, more extensive facilities would be a major improvement for current bicycle riders, and would make this mode of transportation more appealing to other employees.

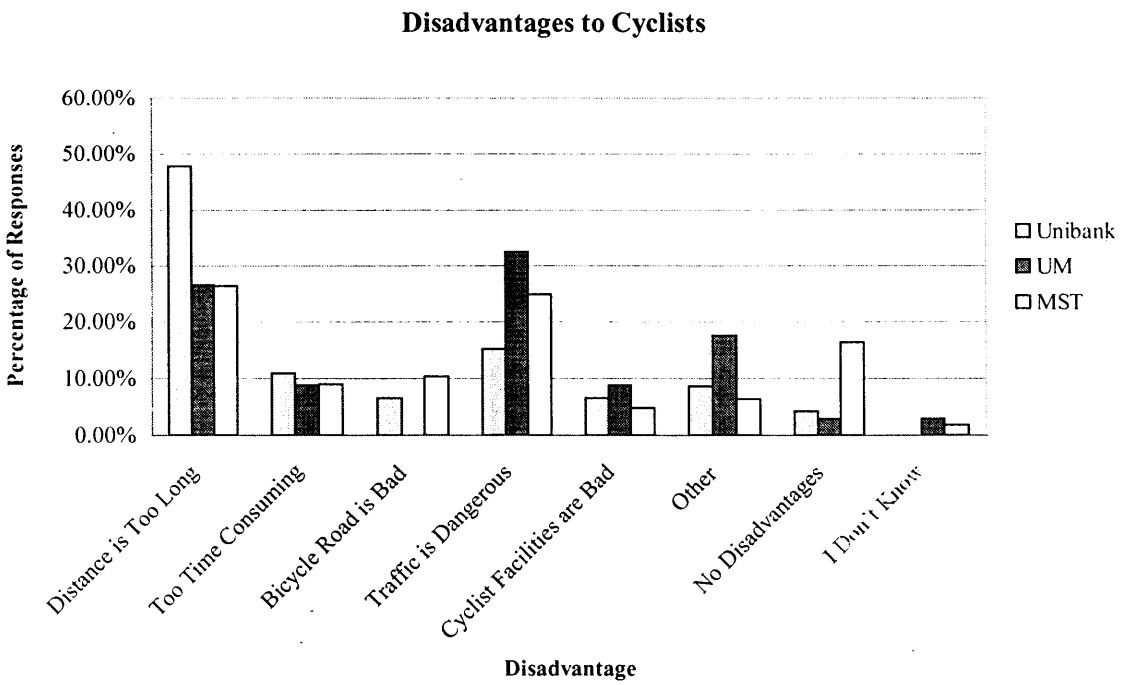

Figure 7: Most Popular Disadvantages to Cyclists

The final conclusion is that information about current modes of transportation is inadequate, as many employees are not aware of their existence. During one focus group at the EPA, none of the cyclists knew if there were shower facilities or covered parking areas available for them to use, and they all said they would be very surprised if these facilities existed at the other two companies. The Metro stop in Christianshavn is currently under construction on a main road less than one kilometer away from the EPA, yet the employees didn't know where the stop was or when it was scheduled to open. If new programs are to be successful, the level of advertising and publicizing these programs must be to the extent that every employee is aware of them.

The recommendations to the companies based on these conclusions are available in the next section.

Recommendations for Company Initiatives

The following recommendations to employers are based on extensive background research, survey results, and comments made during focus groups at two of the organizations. They have clear benefits to both the employee and employer. These programs and improvements can be offered as incentives to the employees, which will both attract new and retain existing quality workers. Research has shown that increased employee involvement in the implementation of these initiatives directly relates to an increase in the success of the program.

-Improve facilities and implement programs for cyclists.

The results of the survey revealed several changes that the companies could implement to make cycling to work a more appealing option for their employees. Employees who already ride their bicycles to work appear to be satisfied with their daily experience. Seventy eight percent of MST cyclists said that improvements in public transportation, cycling, or carpooling would not entice them to change their mode of transportation, implying that they are already very happy with their choice. However, improvements in facilities and programs for cyclists will make this form of transport more attractive to employees who do not currently ride a bicycle to work.

These recommendations are based on background research on successfully implemented programs, survey results, and discussion raised during the focus groups, where even current cyclists indicated that the following initiatives would be welcome improvements to their daily commute.

-Better facilities for cyclists at the workplace

During the focus groups, employees from MST and Unibank were either dissatisfied with the facilities at work, or they were not aware of exactly what the company offers. One of the male employees at Unibank had been on a waiting list for months to get a locker, while one of his female coworkers has a locker even though she does not ride a bicycle to work. The cyclists at MST were not fully aware of facilities that their company offered, and stated that the amount of sheltered bicycle parking is insufficient. The surveys indicated a demand for improvements on the company bicycles, raingear and helmets provided, and a rewards program for cyclists. In order to encourage more employees to bicycle to work, we recommend that the following improvements and programs be implemented by the organizations:

- Increase number of lockers
- Improve and expand shower facilities
- Provide ventilated drying rooms
- Provide sheltered bicycle parking
- Provide a workshop for free bicycle repair
- Provide company-owned bicycles equipped with lights
- Provide raingear and helmets
- Implement a rewards program providing economic incentives for cyclists (i.e. discounted canteen prices)

-Promote Carpooling

The survey results have indicated that 40% of car drivers surveyed from Unibank, 75% of drivers surveyed from the Foreign Ministry, and 97% of drivers surveyed from MST arrive at work alone in their cars. However, the results have also shown that at least twenty percent of their employees are interested in carpooling. There is obviously some interest in carpooling, but for the program to be successful, it must be promoted within each company. Initiatives must be taken to help assist those interested in carpooling. Out of all employees surveyed, only one stated that parking spots for carpoolers would not change his opinions on carpooling. This indicates that many would begin carpooling if they were guaranteed parking spots at the company. One of the most significant reasons for not carpooling was that the driver did not know of anyone nearby that they could ride with. Our interview with Mino Josefi, who helped implement a successful carpooling database program, and the results gathered from the surveys suggest that creating a database of all those interested in carpooling would increase the number of carpoolers. This database could include all three companies surveyed, as well as other companies in Christianshavn. Many employees indicated an interest in working together with employees from other companies to implement these programs, and this carpool database would be an excellent way to do that. The close vicinity of the many companies in Christianshavn creates a large pool of possible carpoolers.

-Devote parking spots to carpooler cars

-Create database to help those interested in carpooling find each other

-(Those that are not interested, what it would take table)

-Coordinate carpooling with companies on Christianshavn

-Implement guaranteed ride home program

-Offer a company vehicle to be signed out for running errands

-Promote and expand telecommuting

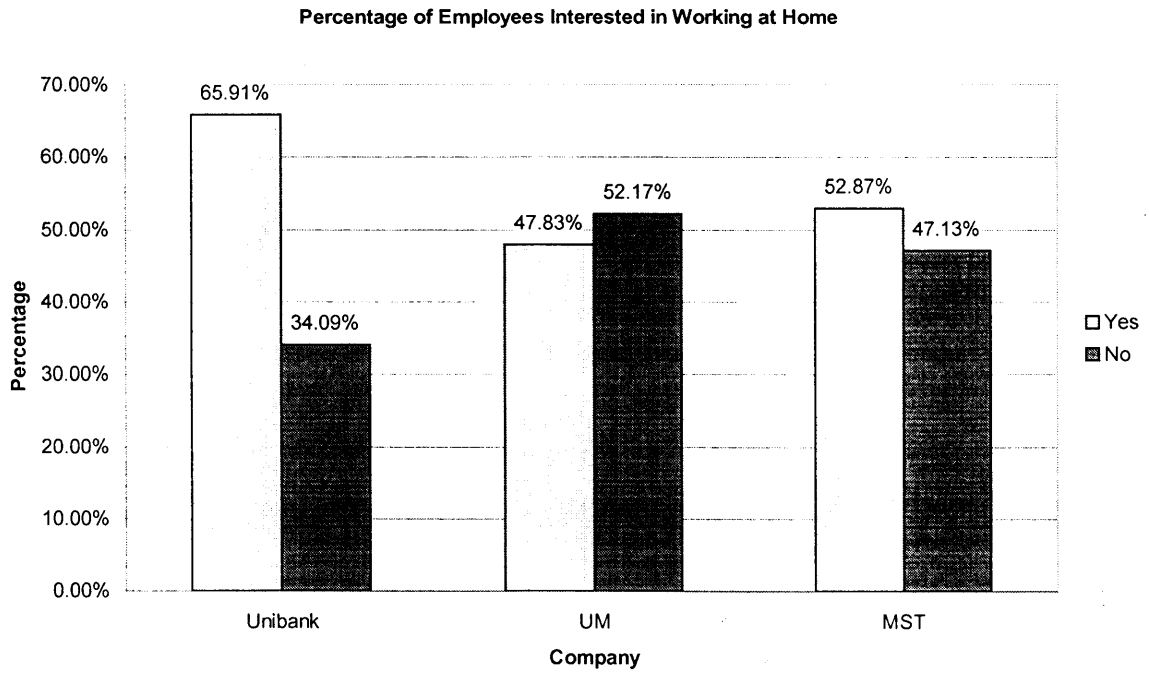

Figure 8: Percentage of Employees Interested in Telecommuting

The idea of telecommuting was a question on the survey, and also came up during several of the focus groups. The employees at Unibank obviously find this option appealing (66% said that they were interested in working at home) and there was a strong interest from the other two companies as well (Figure 8). During the focus groups at MST, all of the interviewees indicated a desire to learn more about this option, and said that they felt it would be well-received by the company as a whole.

-Promote the use of Public Transportation

One of the biggest problems in the companies was the lack of knowledge about public transportation options.

Implement rewards program for public transportation users (canteen prices)

Subsidize public transportation

Offer portable PCs and phones for those that use the train to get work done

Set up Public Transportation info center

Provide shuttle for local employees directly to and from central station

Recommendations for Public Transportation System

Along with the aforementioned company programs, several improvements to the public transportation system itself were identified in the survey and focus groups. Among car drivers surveyed at MST, 40% said that they would use the train if there were a direct bus from the station to their workplace. Focus group discussion revealed that the existing bus route that connects Central Station to Christianshavn (Bus #8) is uncomfortably overcrowded during peak commuting hours. The bulk of this crowd is made up of those commuting only to the Parliament, making this bus an unappealing option to those traveling to points beyond.

An option that will lessen the congestion on trains and buses is the Mini Metro scheduled to open in 2002. There is a conveniently located stop in Christianshavn, however focus group discussion have indicated that many employees are unaware of its existence even though it is less than one kilometer from their workplace. Adopting this new mode of transportation will take time. This process can be expedited by raising

awareness of the metro and its routes through increased publicity. The following diagram (Figure 9) shows the current interest level in the Metro among all those surveyed. The significant percentage of "I don't know" responses (25%) indicates the need for increased advertising.

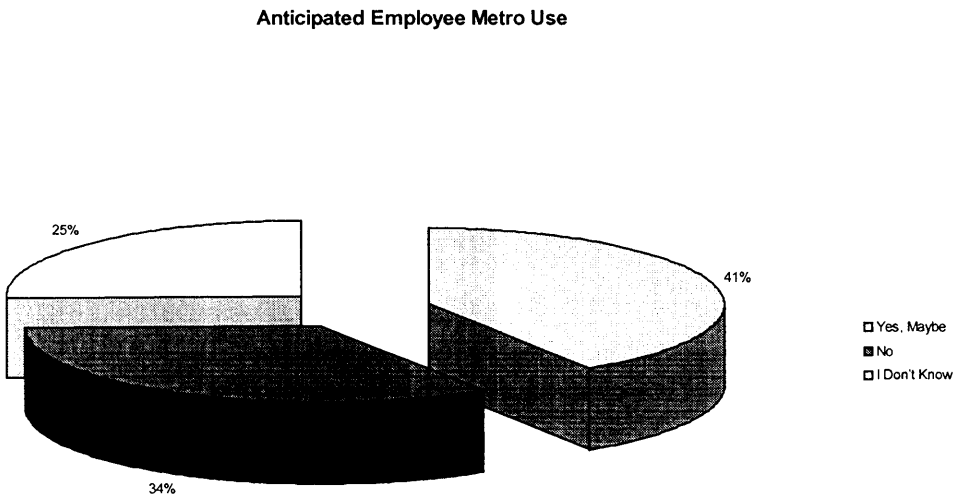

Figure 9: Anticipated Employee Metro Use

The three most common disadvantages of the public transportation system were that it was too time consuming, too unreliable, and that the buses were uncomfortable because of crowds. In order to make public transportation more appealing, these concerns must be addressed; therefore we make the following recommendations:

- Improve organization and planning of routes and connections
- Provide direct buses between central station and Parliament and/or Christianshavn
- Extend harbor bus route to Central Station and Dybbolsbro
- More boats

- Increase awareness of Metro
- Distribute Metro maps

-Expand park and ride programs

- fee for parking good for transportation fare

Recommendations for the Township of Copenhagen

The question on the survey displayed above indicates that a primary disadvantage for cyclists is heavy traffic. The dangerous situations that traffic creates were brought up at all of the focus groups, and many cyclists felt unsafe on the roads. During the focus group at Unibank, one of the employees mentioned that the bicycle route from Central Station to Christianshavn is very unsafe, due to the combination of insufficient bike lanes and heavy traffic during commuting hours. When asked about the use of company bicycles to commute to and from the train station, the employees said that this would be a more appealing option if the route was safer for cyclists. To encourage employees to ride bicycles to and from work, and to entice more people to take a bicycle to the train station, the roads must be made safe for cyclists, especially on this route.

Heavy traffic on the roads is not the only condition that makes cycling unsafe. During commuting hours, the current bicycle lanes are often so full that many cyclists feel unsafe while riding. We suggest that the Township of Copenhagen do traffic and congestion studies to discover which bicycle paths are most in need of improvement.

Another suggestion that was taken from several survey responses was for the city to reopen the bicycle route that runs through Parliament. This route separated the cyclists

from the traffic on the roads, and was an convenient shortcut for people riding from the Central Station area.

These improvements are important for the safety and satisfaction of the many employees who take their bicycles to work in Christianshavn. They were suggested by these employees, and would receive widespread support from the citizens of Copenhagen. We suggest that the township investigate the following solutions to these problems.

- Expand and improve bicycle lane system around the city of Copenhagen
- Build a safe route for cyclists between Central Station and parliament and/or Christianshavn
- Reopen bicycle route that runs through Parliament

Conduct studies on traffic and congestion on current bicycle lanes

Afterword

Our experience with this project has far surpassed any of our expectations for an overseas IQP. Working with Anja Puggaard on promoting sustainable transportation in Christianshavn has opened our eyes to environmental concerns, new initiatives for the future, and the passion and awareness of so many people in this city. What we have learned cannot be eloquently expressed in an objective report, therefore, we invite you to enjoy this afterword section as an attempt by each one of us to explain the life-changing experience that this IQP in Copenhagen became to us.

Sarah

In looking back, I realize that before my experience in Copenhagen, my understanding of an IQP consisted of an inadequate, flat definition. I thought it was a project showing how technology helps society and I took it to be just one step closer to graduating. My PQP work seemed fairly routine and at times, boring and monotonous. I did not know the intricacies and deeper lessons that my IQP had in store for me once I had the opportunity to live and work in Copenhagen, Denmark.

At first, transportation seemed so wonderfully organized, there were fewer cars on the streets than I had ever seen and my commute to and from work seemed pretty easy. However, after living in Copenhagen for a few weeks, I found myself becoming frustrated when buses were crowded and angry when I had to wait too long to catch the bus. This made me soon realize that though public transportation in Denmark was far better than in America, there were still many problems with it. After talking with residents and being contacted by many professionals in the area, I also realized just how

important transportation and our study of it was to the people of Copenhagen. I think that it was about this time, that I began to understand the depth of meaning in my IQP.

More and more people would contact us every week, and meetings with people from the Danish Transportation Council, the Miljøstyrelsen and other organizations would fill our schedules. Soon, so many people were interested in what we were doing, that offers for help surrounded us. The professionals we spoke with explained the transportation situation and other studies which had been done as well as what the mentality of the Danes was. This helped us in editing the survey and determining what of our recommendations would prove to be feasible. Again and again, helpful people would offer their services to us, showing their interest in promoting sustainable transportation.

As weeks flew by, my project partners and I rode bikes to work, experiencing the traffic and bike routes for ourselves. I noticed the many bikers commuting to work, and as I rode the bus, I looked into cars to see who was driving alone. I was becoming a Danish citizen, and began to research these transportation issues as if they were the most important things to me, and with as much heart as my passionate liaison continues to do. The devotion and determination that became apparent in the people I worked with daily served as a motivation for me to do my best, and before long, I realized that my heart really was in this. I knew then, that the work I was doing would benefit so many people around Copenhagen, and that the report I created would not collect dust on someone's shelf. The recommendations that I would make would be read by many, and analyzed in order to help alleviate the transportation issues in the area.

I can say now, with confidence, that what I did in Copenhagen, Denmark, went above and beyond the expectations and intentions of any WPI project. The research and

technology used will help many people each day to understand why people travel the way they do. The recommendations will be read and listened to, as we were professional researchers who understood by experience, the situations created in Copenhagen. The true definition of IQP is much more than a flat, textbook definition and I now know that my project in Christianshavn truly defines it.

Sam

My expectations for this IQP were based almost entirely on the experiences of my friends. They had completed projects at centers around the world, and came back telling stories of hard work, and homesickness. My understanding of an IQP from WPI's perspective was an opportunity for students with different backgrounds to work together on a project that relates technology to society. This experience far exceeded my, and WPI's expectations.

Truth be told, Copenhagen was not the first choice on my Global Opportunities Program application. I applied to London and thankfully, wasn't accepted. All I knew about London was that my friends had fun there. My application was an attempt to follow in my friends' footsteps, and reproduce the experience that they had. When I received the offer to be made eligible for an opening in the Copenhagen Project Center, it struck me as fate's hand hard at work. Of course, I turned to my friends to see if anyone had been there, but with no luck, I had to make a decision for myself.

That decision to break away from the beaten path proved to be one of the best decisions I have ever made. My Copenhagen experience was filled with challenges and people that I would not trade for anything. I had the privilege of working with partners

that shared my enthusiasm for this project, not just a good grade on their IQP. I worked with some passionate people who have devoted their lives to the environment and ensuring that our actions do not impede the future generations' right to life. I never had any question as to whether or not our work here fit into any larger picture than a Bachelor of Science degree.

WPI's expectations were easily met and exceeded. I worked with students that I would not have worked with on campus, and I gained experience that I will use throughout my entire career. Along with public speaking and professional writing, I had to reassess my ability to work as a member of a team. Being faced with obstacle after deadline after obstacle, and doing whatever necessary to overcome them made me realize that something was going on here. That "something" was the design of the IQP in action. WPI did not just expect us to relate technology to society in some way; they expected us to learn what it takes to get a project done when you don't have ideal conditions. WPI expected us to do some growing up in the teamwork department so that we would not have to when we went out into the professional world. Most of all, WPI expected us to leave Copenhagen with a huge sense of pride in our accomplishment, and the knowledge that we have made a difference in a foreign land.

My experience here in Copenhagen was extraordinary on a personal and academic level. I am so glad that I was not accepted to the London Project Center, and that I took advantage of the opportunity to come to Denmark.

Lauren

When asked to rank our preferences for an IQP, Sam, Sarah, and I all put this project as our first choice. We knew that the subject would involve us with environmental concerns, but we had no concept of how much. As soon as we arrived in Copenhagen, we realized what passionate and devoted people we were lucky enough to be working with. Anja Puggaard, our liaison, is working for causes that she might not live to see resolved, and yet she is infectious in her desire to make a difference. The second day at work, we had a meeting with Anette Enemark, a civil engineer downtown, where she told us that she loved working with transportation issues, because she thought "transportation was the best thing in the world." Our project has interested many people around the city, but pleasantly surprising was that these people did not observe from a distance. Instead, they consciously searched us out and did everything they could to help in any way possible. Danes are quiet people- they don't talk on the bus or initiate conversation with strangers- but once approached, they are some of the warmest and most caring people I've ever met.

One morning, I took the bus to work, but got off three stops early to walk the rest of the way. I was almost to the main bridge that leads to Christianshavn when the drawbridge went up, stopping traffic for about ten minutes. There were cars and buses lined up for a little while, but what amazed me was that there were more bicycles stopped than cars. Copenhagen is known worldwide for the number of residents who use bicycles, but that fact was not made real to me until I stood on a bridge, the only pedestrian among twice as many bicycles than cars.

This is just one example of the general awareness of environmental concerns that is ever-present in this amazing city. The general population holds a deep concern for the preservation of the city, and ranks that more important than their own transportation preference. This is in such contrast to the American attitude that everyone must own and drive a car that it took some getting used to at first. I have since been converted to a bicycle rider, and I ride next to the residents of Copenhagen, usually getting to work faster than anyone driving a car or taking the bus. I feel lucky to have been part of this IQP, as it has increased not only my awareness of environmental issues, but also my appreciation of those who are working to save the world we live in. It seems to me that almost everyone in this city is willing to do their part, and I am interested to observe the attitudes in the United States after being surrounded with people like this.

Living in Copenhagen for seven weeks has given me the opportunity to be a resident of the city, not just a visitor, and that has helped tremendously with my understanding of the project. I can understand the overcrowded buses, I too am angered by dangerous roads without bike lanes, and I see the limited parking spaces available in Christianshavn. This Interactive Qualifying Project has not only made me aware of the effect of technology on our ever-changing society, but living and working overseas has opened my mind to how my stay at WPI and my future career can make a difference in the world. I am truly grateful to WPI for giving me the opportunity for such an amazing project and experience.

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Appendix A: The Greenhouse Effect

The greenhouse effect is the result of solar radiation that is reflected back into the atmosphere, and is prevented from reaching space by a layer of clouds and atmospheric gases. This solar radiation keeps the planet warm enough for life and this is how the sun controls the earth's climate. Though this effect is a natural one, recent scientific studies show that the greenhouse effect is being increased by the release of gases into the air that are causing the Earth's temperature to rise. This phenomenon is called global warming. Greenhouse gases include carbon dioxide as well as methane. Methane emissions are caused by agriculture, landfills and other sources. 81 percent of the green house gas released in the US is Carbon Dioxide (CO2). Carbon dioxide emissions are caused mainly by the combustion of fossil fuels (Nat'l Air Quality).

The United States is the number one producer of greenhouse gases, and in the past 25 years, carbon dioxide emissions have increased enough to account for 30 percent of those gases. Transportation in the United States has also become the number two source of greenhouse gas. Transportation and its related activities can have negative effects on environmental quality, human health and overall quality of life. These impacts result greatly from the use of fossil fuels in cars and other combustion engines. Since 1970, highway passenger miles have nearly doubled and the miles per capita for every mode of transportation have increased by 5,400 miles. Transportation is also the nation's largest source of many of the air pollutants that are covered in the 1970 Clean Air Act. The U.S. Department of transportation believes that carbon dioxide emissions could possibly increase by 1.3 percent by the year 2010 due to slow energy efficiency gains and the rising numbers of vehicles on the road. The total amount of air pollution from cars and

other vehicles is much less than 1970; however, it is relative because the number of cars on the road has dramatically increased.

Not only does transportation affect the ambient air quality, but it also affects water quality and quantity, species diversity and the wildlife's habitats. Transportation affects land use, plants and animal habitats and could possibly cause local water tables to change their draining patterns. Oil spills and improper disposal of used motor oil, as well as other chemicals related to transportation cause surface and groundwater contamination. Wildlife is often adversely affected by traffic, harmful emissions noise and lighting from highways, cars and other transportation modes (National Council on Air Quality).

Another type of pollution that is caused by transportation and is pertinent to our study is noise pollution. It is a large source of noise in the US, affecting mainly people who live near major highways and airports or in the flight paths of planes. Rarely does this noise cause hearing impairment but is more likely an annoyance to those who live nearby. Most policy measures are mainly aimed at reducing the noise or removing the receptor from the source (National Council on Air Quality). Progress has been made in the United States on reducing the exposure to annoying levels of aircraft noise. This is shown in noise standards and much quieter aircraft engines. In the US alone, the citizen significantly impacted by noise has dropped from six million to two million from 1976 to 1994.

Appendix B: Agenda 21

Agenda 21 is the United Nation's proposal for the integration of development and the environment. The agenda calls on the global community to act in cooperation to reach sustainable levels of development. This plan covers the "social and economic dimensions" of sustainability, the "conservation and management of resources for development", "strengthening the role of major groups" and "means of implementation." This outline offers the world an opportunity for progress in a sustainable direction, but requires a global effort.

Agenda 21 outlines the social and economic obstacles that must be overcome in order to reach a sustainable level of development. These issues include the need for a global collaboration in attaining sustainability, consumption patterns, poverty, promoting human health conditions, and integrating environment and development in decision-making.

Appendix C: Interview with Susan Vernon-Gerstenfeld, 2 March 2001

Professor Vernon-Gerstenfeld met with us to review the questions we will be using to survey the two companies, as well as the residential interview questions. She was very helpful in her suggestions and recommendations, and we will use her comments to improve our surveys for the companies.

We were planning on using closed-ended questions for the surveys, but Professor Vernon-Gerstenfeld reminded us that sometimes raw data is easier to analyze than answers grouped into categories. For example, it might be more useful to know that the average age of the employee who rides a bicycle is 42, instead of knowing that the average age is between 40 and 51 years of age. We will certainly take this into consideration, but the final form of the questions also depends on what the companies are interested in and what can be most easily analyzed in the seven weeks allotted for the project.

For the residential interviews, Professor Vernon-Gerstenfeld made several excellent points. She reminded us that in order to obtain truly varied opinions, we should be on the streets at different times during the day. The early morning hours would be convenient for a different type of citizen than noon or evening, and we should take that into consideration when we conduct our interviews. She said to be careful of bias, as everyone generally likes to complain about traffic, and to weed out the constructive criticism from the complaints. She said to make the questions short and concise, and reminded us that a tape recorder might be useful to write the answers down later, but might be offensive to some people, so we should be ready with a pen and pencil also.

Finally, she reminded us to lay out all the disadvantages that we can think of about our study. This allows us to improve on what could go wrong with the study, and avoid errors that might come with not being aware of the potential problems. We are grateful to Professor Vernon-Gerstenfeld for her time, and will use her suggestions greatly when organizing our surveys.

Appendix D: Interview with Anette Enemark, 20 March 2001

On Tuesday March 20 we met with Anette Enemark, who is a civil engineer and urban planner from Transportradet, the Danish Transport Council. Transportradet is an independent group who gives advise on transportation issues such as the construction of roadways and bridges and the costs of different types of transportation. The group also gives 1.5 million DKK to universities to promote the study of transportation. Anette explained the public transportation system in Copenhagen as well as the rest of Denmark. She also described the state of urban planning within the country. She had many figures and facts describing the use of cars, bikes, buses and other forms of transportation and was able to explain many ways that car use has increased.

Under the state level of transportation, there are twelve regional departments of transportation, one of which is Copenhagen itself. Divided up among these regional departments, there are 275 municipalities, including one for the Copenhagen area. The regional departments deal with general land use such as whether a certain area should be developed or not. At the municipal level, the detailed planning of highways, public transportation and bicycle routes is considered. Because of the many different regional plans around Copenhagen, in 2000, a governing body called HUR was developed. HUR, the Municipality Development Council makes sure that the land use planning is coordinated within the five or six regional departments in the greater Copenhagen area. Since its creation, HUR has devised a land use plan, and in two years, intends to make a transportation plan.

Within Copenhagen and the outlying areas, there is an intricate system of public transport including trains and buses. The S-train is a very efficient system of railways

connecting the 5 towns which are part of the greater Copenhagen finger plan. A series of S-Buses connect these railways by creating bus routes between the fingers so that the trains are accessible to a larger population. The other system of buses runs in Copenhagen. They are fairly efficient with many bus lanes throughout the city, however, the old city's winding roads and traffic within make it difficult for buses to remain on a time schedule.

Anette explained to us that Copenhagen's state of transportation is very different from that of the entire country in that the public transportation system is greater within the city, necessitating a smaller number of cars. Between 1980 and 1998, the use of cars increased 30 billion kilometers per person, while the use of trains, buses, bicycles and walking remained the same. These figures are for the entire country of Denmark. We also found it surprising that in a study done, asking people what they did yesterday, the largest number of kilometers traveled was not home to work commuting, but the errands and shopping done in their spare time. For all of Denmark, the car continues to be the most used form of transportation, as well as the most dangerous form of transportation. Walking, busing and biking would all be less dangerous than traveling by car.

In the year 2000, 52 percent of families in Denmark owned at least one car. In comparison, only 25 percent of families owned cars in the municipality of Copenhagen. This is one example of how the transportation issues differ in Copenhagen from the rest of the country.

Appendix E: Interview with Mino Josefi, 23 April 2001

We requested to meet with Mino Josefi because she was one of the people in charge of the Pendlerplaner, which was discussed in the Literature Review. After reading the information pamphlet, we were interested in learning more about this program, and Mino went into great detail on the project.

The project started in the summer of 1997, at ATP, a company in Hillerød with 550 employees. A survey was distributed asking questions about transport to and from work, and with a 98% return rate, the information proved very helpful. This project focused on carpooling as the primary means of reducing the collective employee emissions, and focus groups were held with 20 of the employees to gather information on opinions about and ideas for carpooling. The employees were very interested in carpooling, and agreed that help from the company with coordinating people and rides would be an incentive to use this mode of transportation.

The carpooling idea worked for a while, but people started to drift away from this transportation because they couldn't find people to ride with. Mino mentioned that the Danish are not a tolerant people, and they were concerned about the safety of riding to work with people they didn't know. She also said that they were frustrated with carpooling because they did not have the time or the patience to wait extra minutes for a ride that is late or out of the way.

Regardless of these problems, the carpooling program met with great success in general. as 60 communities from around Denmark participated as well, resulting in 3.600 total people who carpool, 300 of which are located in Hillerød.

Another part of the project was installing a free bicycle repair shop at ATP, where 120 people participate in the bike group. With the three years of doing this project, the only aspect of it that the employees were totally satisfied with was this bicycle group. In addition to the repair shop, commuter bikes were provided free for employees who wished to use them, and free Klipcorts were provided so that commuters could take their bikes on the train. However, only two people used these Pendlerbikes, and only in the summer when the weather was nice. Employees at ATP use the bikes to run errands during the workday.

There were many other suggestions given to both ATP and the community of Hillerød as a part of this project. Working with HT (the company that runs the buses) to improve the bus system lead to some discoveries. Originally, an idea was to provide a personal bus that only ran from the train station to ATP, and could be used by their employees to get directly to work. However, this would cost HT in excess of 1.000.000 kroner per year, which was too expensive. HT agreed to install this bus if ATP would pay half of the price every year, but even 500.000 was too much for the company to pay.

The project at ATP is ending soon, but Hillerød participates in many different projects aimed at promoting sustainable transportation in the area. There is a 3-week campaign for employees to take their bicycle to work, which had many participants last year and was run not only at companies but also at the local high school to encourage school-age people to also ride their bikes.

Mino concluded with listing some of the problems that she has encountered by running this project. She said that it takes a long time for companies to become interested in these projects, and that they believe it is the community's job to fix the

traffic problems. In her opinion, the Pendlerpaner would work better in a larger city such as Copenhagen, where people generally live closer to each other ad to their jobs. People in the Hillerød area think that there are no problems with the transport situation, even though over 30.000 people drive in and out of the city every day. Mino said that in Denmark, people work hard, and they often feel as though taking public transport or riding a bicycle expends energy that could be better applied towards their jobs, not getting to their jobs. Danes want flexibility, and that, along with a sense of freedom and independence, can be best found in a car.

Mino was very helpful in describing her experiences with the transportation in Hillerød, and her opinions on the Danes' perspective of the situation shed new light on our project.

Appendix F: Focus Group Questions

How far is your commute to work and how do you get there?

Why do you choose those types of transportation?

What would make… …more appealing to you? (Ask about each)

…driving a car…

…riding a bike…

…taking the train…

…taking the bus…

…walking…

…taking the harbor bus…

What are your thoughts about the Metro?

Will you use it?

Will your family use it, to get to work and outside of work?

Will it help reduce the traffic problems in Copenhagen and outside of the city?

Do you think that traffic is a problem in Christianshavn?

Why?

If yes, what is the biggest problem?

Appendix G: Focus Group at Unibank, 25 April 2001

The Unibank focus group was conducted at the company with three employees. In order to preserve confidentiality, names will not be used. Instead, the employees will be referred to as Persons A B, and C.

Person A stated that he commuted 25 kilometers every day. In the winter, he takes a bus, a train, and then another bus to get to work, and that takes about 50 minutes. When the weather is nicer, he rides his bicycle to work, which takes about 45-55 minutes. Person B lives 75 kilometers away from work. She drives her car to the train station, takes a train to Copenhagen, and then a bus to Christianshavn, which takes about an hour and a half total. Person C drives her car to work. She rides with her husband, and drops of and picks up her daughter at daycare while traveling to and from work. She admits that paying for gas and parking gets expensive, but she likes the flexibility of driving to work, and she likes the time spent with her husband while driving to work.

Regarding the impact of transportation, there were a variety of opinions on the disadvantages of various forms of transport. Person A said that congestion and parking problems were the worst effects of too many cars. Interestingly, he mentioned that if he could drive straight to work at a consistent speed and had good parking facilities, he would drive a car. He thinks that overcrowded buses and late trains are the worst parts of public transportation. Person C agreed with this, and said she preferred driving because there were too many delays on the trains, and she didn't have time for them. She mentioned that she would probably take the bus if it was guaranteed to be on time and if it wasn't too crowded. Person B did not like to drive because she cannot read or write

like she can on the train, and feels that driving wastes time on the road that could be used for something else.

Person A liked riding his bicycle to work, but mentioned that the facilities at Unibank are not adequate for the number of cyclists who work there. He had been on the waiting list for several months to get a locker where he could keep clothes for work, and said that the men's locker rooms were overcrowded. There is plenty of room in the women's locker rooms, but they don't want co-ed locker rooms.

When asked about the Metro, there was a general consensus that it would not significantly relieve current traffic congestion. The buses that are currently overcrowded are not necessarily located near a future Metro stop, so these passengers will still have to crowd into the buses. Person A said that he plans on using the Metro as a part of his work commute, but he doesn't think it will make the commute any shorter, just slightly more convenient as it will save him from changing buses. He's looking forward to taking the Metro when it opens. Right now he has to fight to get on a bus that takes him from Central Station to work, and he doesn't think that the Metro will reduce the congestion. Person B said that she would take the Metro from Norreport Station, but Person C said that the Metro was not an option because she has to drop off her daughter at daycare.

The employees had many very good suggestions on improving the various forms of transportation enough for them to consider changing their habits. Person A suggested that since there are a few key stops that make the buses more crowded for everyone, there should be buses that only run from Central Station to Christainsborg for example. Since so many people who ride the #8 bus get off at Christiansborg, this would make the commute more convenient for them, and would make the #8 bus less crowded

and more appealing to people who need to take that bus to get to work. He said that letting people take their bikes on the train during peak hours would encourage more people to take public transportation. All three employees agreed that the bike ride from Central Station to Christianshavn is treacherous, and more bicycle lanes and stoplights would improve this ride and make it safer and more appealing. They mentioned that these suggestions would be great for the week of 22 September as a trail period to see if they were effective measures of reducing crowds.

Another suggestion was that many more people would use the Harborbuses if they had a stop closer to Central Station. Person A said that in the original plans, the ferries were supposed to stop by Central Station, but once it actually opened, this stop was cancelled. Since the #8 bus is so crowded and since traffic is so bad in the afternoons, many people (including the three in our focus groups) would prefer to take the Harborbus.

This focus group proved very helpful to our project, and gave excellent suggestions for the companies to use with their employees to encourage the use of sustainable transportation.

Appendix H: Focus Group for Car Drivers at MST, 1 May 2001

This focus group at MST consisted of three employees who took their cars to work every day. To preserve confidentiality, they will be referred to as Employees 1, 2, and 3.

Employee 1 drives 7 kilometers each way every day, which takes her 20-45 minutes, depending on the traffic. She used to ride her bicycle, but now has children to take to two different schools, so she needs the car to drop them off and pick them up, and to run errands after work. Employee 2 drives 8.7 kilometers each way, which takes him 25 minutes. He said that driving saves him time, since public transport would take about 45 minutes each way, and that driving is more relaxed, and more convenient when it is cold or rainy outside. Employee 3 drives 13 kilometers each way, which takes him 30 minutes, and saves 30 minutes since public transport would take one hour each way.

When asked about what they see as the disadvantages to driving a car, Employee 2 said that the main problem was the pollution it causes. On a more personal level, Employee 3 said that parking was limited and inconvenient, and all three agreed that driving was very expensive compared to other modes of transportation.

The employees were then asked what might make them want to ride their bikes to work. Employee 3 mentioned that if property were less expensive closer to MST, he might move closer and ride a bike, but right now he lives too far away and biking is not a realistic alternative. Employee 2 said that he rides his bike in the summer, and mentioned the three-week long campaign held at MST every year to encourage more people to ride their bicycles. Employee 1 reminded us that she used to take her bike to work, but now it is unrealistic because she needs to drop off her children at school.

When asked about public transportation, Employee 3 said that although there is a direct bus line from his home to MST, it has many detours and takes too long. He said that a more direct bus line with fewer stops would encourage him to use public transportation, since it wouldn't take as long. Employee 1 said that the biggest deterrence for her was that the buses were too overcrowded in the mornings. Employee 2 said that once the Metro opens, he might be encouraged to use that, because of the faster service and less crowding. Employee 3 said that the Metro has no stop near where he lives, so he won't use it, and Employee 1 said that if she wanted to use public transportation, she already lives near a bus stop and a train station. If she's not using her car, she takes a bike, not public transport.

All three employees agreed that traffic is a problem in Christianshavn. Employees 2 and 3 agreed that parking is a huge problem for car drivers, and Employee 1 mentioned that there are too many cars in the small neighborhood of Christianshavn. Employee 3 said that for the residents of Christianshavn, pollution and noise from the cars would be the major problem, but as Employee 2 said, it takes people a long time to break habits, and he thinks that it will be a long time before car drivers start taking public transportation. Telecommuting was mentioned as another option for reducing traffic, and they agreed that many people are interested and would participate. Employee 2 said that telecommuting would solve some internal capacity problems of too many people working at MST at the same time.

The three employees made some very good points about the positions of car drivers in general. One of the solutions posed for reducing traffic has been to reduce the number of parking spaces in the city, but Employee 3 said that this wasn't a good idea,

and that it doesn't reduce traffic. He said that if more parking spaces were available, more people would come into the city to shop and spend time at night and on the weekends. Getting rid of the option to drive into the city reduces Copenhagen solely to tourism, and he believes this will kill the many small businesses, as the city would empty out at night because there would be nowhere to park. He would personally rather shop in the city at the specialty shops, but is discouraged to stay in Copenhagen after work hours because of the lack of parking spaces. Park-and-ride solutions would help solve this problem, as it would allow people to drive their cars to a certain point, and would provide somewhere to park the car as they took public transport into the city. He agrees that Copenhagen, like many old cities, was not built for cars, but that park-and-ride stations would encourage drivers to come into the city more often. Employees 1 and 2 agreed with this, and said that the lack of parking spaces scares some economic activity away because of the lack of parking spaces.

This focus group proved very useful as it enlightened us to the perspective of car drivers, provided reasons for their driving a car to work, and offered possible solutions for the traffic problem in Copenhagen.

Appendix I: Focus Group at MST with Bikers, 1 May 2001

This focus group at MST was conducted with a total of three employees, all of whom ride their bicycles to work every day. One of the employees arrived late, so the first two people were interviewed together, and then he was interviewed alone. For this summary, however, all of the answers will be presented together, and the interviewees will be referred to as Person 1, 2, and 3 to preserve confidentiality.

Person 1 rides his bicycle 4-5 kilometers to and from work, which takes him about 20 minutes, Person 2 rides 6 kilometers each way, taking her 20-25 minutes, and Person 3 rides 4-5 kilometers about 15 minutes each way. Person 1 and Person 2 agreed that biking was the fastest way to get to work. Person 2 mentioned that biking is the cheapest way to travel, and Person 3 said that he has always had an interest in being environmentally friendly, and he has no interest in driving.

These three employees do not take public transportation, but they said it would be more appealing if the buses were faster and more comfortable. In regards to the harborbus, they all agreed that it was not an option since it only comes every half hour. Person 3 said that he thought the harborbus was for fun and for tourists, and was not a practical option for commuters. None of them plan to use the Metro on a daily basis (Person 3 said maybe when it rains) and agreed that it was about as attractive as taking the bus. Persons 1 and 2 said that it would help the traffic situation because of the large number of businesses in Christianshavn, however, Person 1 didn't know where the Metro stop in Christianshavn would be. This indicated that this mode of transport needs to be advertised much more before it opens. Person 3 said that the existence of the Metro would help mentally, as it would present an appealing and modern public transportation

system to the residents of Copenhagen, and he predicted that the bus lines close to the Metro routes would slowly disappear because people would choose the Metro over the bus.

All three people agreed that traffic is a problem in Christianshavn. They all said there were too many cars (30,000 daily over the bridge), and said that Torvegarde was too small a street to be so busy. The effects of heavy traffic were directly related to the biggest problems with riding a bicycle. The employees were mainly concerned about the dangerous situations presented by the traffic. Person 3 said that it was too dangerous for children to ride their bikes on the main streets, and Person 1 said that the bike lanes were too crowded to be safe. Pollution was mentioned not only as a negative effect of traffic, but as a problem for bikers. Person 2 said she often finds it difficult to breathe when biking past the buses because of the diesel exhaust. Person 3 agreed that the worst effect of traffic on Christianshavn was the air quality and constant flow of cars and noise.

We asked the employees for suggestions on initiatives that their company could take to promote various forms of transportation. Persons 2 and 3 said that many people would use the company bikes if more were provided. Also, bicycle garages would be very useful, especially in inclement weather, and Person 2 said that a workshop with free bike repair would be a good incentive. Person 3 suggested economic incentives provided by the company to employee who bike to work.

Person 1 said that some left wing political parties want to eliminate cars from Copenhagen, only leaving lanes for buses, bicycles, and some delivery vehicles. Although this is not a realistic alternative right now, both Person 1 and Person 2 agreed it would be a good idea for the week of 22 September. Ride sharing over a database was

mentioned for people who must drive to work. All three employees agreed that working from home or telecommuting would really be an option. However, one possible problem that was mentioned was that people might move farther away from work if they only had to go in 3 times a week, thereby increasing the length of their commute, and the probability that they would prefer driving a car.

We are grateful to the three participants in this focus group, as they provided a wide range of perspectives for bikers and gave us some good suggestions for the companies to use with their employees.

Appendix J: Cover Letter in Danish

Christianshavn, den 24. april 2001

Til ansatte hos Miljøstyrelsen, Udenrigsministeriet og Unibank A/S

Vi er en gruppe på tre studerende fra USA som laver dette projekt i samarbejde med Christians-havns Grønne Guide Anja Puggaard og Bente Hessellund Andersen fra Lokal Agenda 21 Netværket på Christianshavn. Denne spørgeskemaundersøgelse vil blive brugt til at klarlægge transportmønste-ret for pendlere til Christianshavn. Ud fra resultaterne vil vi opstille anbefalinger til, hvordan din virksomhed og de to andre lokale virksomheder kan fremme miljøvenlige transportformer og imødekomme behovet for transport. Undersøgelsen foregår i samarbejde med hhv. Peter Kornum fra Unibank A/S, Gitte Buskbjerg fra Udenrigsministeriet og Søren Jensen fra Miljøstyrelsen.

Vedrørende spørgeskemaet, start blot fra en ende af og følg vejledningen undervejs. Det vil tage dig ca. 15 minutter at udfylde skemaet. Undersøgelsen indeholder bl.a. spørgsmål om, hvordan du kom til og fra arbejdspladsen i går, tirsdag den 24. april 2001. Det er derfor vigtigt, at du udfylder skemaet allerhelst i dag. Vi indsamler skemaerne igen torsdag den 26. april 2001.

Når spørgeskemaundersøgelsen er blevet analyseret, vil vi dele en folder ud med de vigtigste resultater og forslag til fremme af miljøvenlige transportformer. Desuden vil vi fremlægge resultaterne på engelsk ved en præsentation den 7. maj 2001 kl. 9 i Miljøstyrelsens kantine, Strandgade 29. Du inviteres hermed til denne præsentation, hvor vi også vil byde på økologisk morgenbrød.

Blandt de udfyldte spørgeskemaer trækker vi lod om økologiske gaver. Vil du deltage i denne lodtrækning, så skriv dit navn på skemaets sidste side. Selve spørgeskemaerne forbliver anonyme, oplysningen om dit navn vil således ikke blive brugt i undersøgelsen. Lodtrækningen vil blive offentliggjort ved præsentationen den 7. maj.

Mange tak for din hjælp. Vi håber, at vi ses til præsentationen den 7. maj 2001.

Med venlig hilsen

Sarah Lovell Sam Popinchalk og Lauren Wojtkun

Appendix M: English Translation of Cover Letter

To the employees of MST, Foreign Ministry and Unibank:

We are a group of three students from the U.S. which are doing a project in cooperation with Christianshavn's Green Guide, Anja Puggaard and Bente Hesselhund Andersen from the Local Agenda 21 Network in Christianshavn. The questionnaire will be used to make discover the transportation patterns for commuters to Chritianshavn. From the results we will make recommendations on how local companies can promote environmentally friendly transportation and meet the need for transportation. The survey was done in cooperation with Peter Kornum from Unibank, Gitte Buskbjerg from the Foreign Ministry and Soren Jensen from MST.

Concerning the questionnaire, just start at the beginning and follow the directions. It should take about 15 minutes to complete. The survey will include questions on how you come to and from your workplace yesterday, Tuesday April 24, 2001. Therefore it is important that you fill out the questionnaire today, rather than tomorrow. The questionnaires will be collected on Thursday April 26, 2001.

When the questionnaire is analyzed we will hand out pamphlets reporting the important results and suggestions on how to promote sustainable transportation. In addition we will present the results in English at a presentation on May 7, 2001 at 9:00 in the canteen of MST, Strandgade 29. You are hereby invited where we will offer organic coffee and rolls.

From the incoming surveys we will be doing a raffle for organic gifts. If you want to participate in the raffle, write down your name on the last page of the questionnaire. The questionnaire itself will stay anonymous, your name will not be a part of the survey. The results of the raffle will be announced at the presentation.

Thank you very much for your help. We hope to see you at the presentation on May 7, 2001.

Best regards,

Sarah Lovell
Sam Popinchalk
Lauren Wojtkun

Appendix L: Employee Questionnaire in Danish

Baggrundsspørgsmål

1. Hvor er du ansat?
☐ 1. UNIBANK
☐ 2. UDENRIGSMINISTERIET
☐ 3. DEP (Miljø og Energiministeriet, Departementet)
☐ 4. DMU (Danmarks Miljøundersøgelser)
☐ 5. ENT (Energistyrelsen)
☐ 6. FSL (Forskning Center for Skov & Landbrug)
☐ 7. GEOS (Danmarks og Grønlands Geologiske Undersøgelser)
☐ 8. MST (Miljøstyrelsen)
☐ 9. NKN (Naturklagenævnet)
☐ 10. SNS (Skov & Naturstyrelsen)

2. Hvor bor du? a. Gadenavn:_____
b. Postnummer:_____

3. Hvor gammel er du?
☐ 1. Under 31 år
☐ 2. 31-40 år
☐ 3. 41-50 år
☐ 4. 51 år og derover.

4. Hvilket køn er du? ☐1. Kvinde ☐ 2. Mand

Første del: Til og fra arbejdspladsen tirsdag den 17. april 2001

5. Var du på arbejdspladsen tirsdag den 17. april 2001? ☐$_1$ Ja ☐$_2$ Nej
- Hvis nej, spring til anden del af spørgeskemaet som starter med spørgsmål 14.

Turen *til* arbejde:

6. Hvilken adresse kom du fra? a.☐ Hvis du kom fra din bopæl så afkryds blot feltet her, ellers skal du udfylde alle felter.
b. Evt. gadenavn og
nummer:_____
c. Postnummer:_____

7. Havde du ærinder undervejs? ☐1 Ja ☐2 Nej
Ærinder kan være indkøb, aflevere børn, møder og lign.

8. Hvad var turens varighed (ca. minutter)?_____

9. Hvilket transportmiddel - eller kombinationer heraf - brugte du, og hvor lang var turen/de enkelte strækninger i km?
Sæt kryds, evt. flere krydser og noter distancen

☐ a. Gang, _____km
☐ b. Cykel, _____km
☐ c. Knallert/motorcykel, _____km
☐ d. Bil som chauffør, _____km
☐ e. Bil som passager, _____km
☐ f. Bus, _____km
☐ g. S-tog, _____km
☐ h. Regional/IC-tog, _____km
☐ i. Taxa, _____km
☐ j. Havnebussen, _____km
☐ k. Hvis 'Andet, skriv: _____,
_____km

Turen *fra* arbejde:

10. Hvilken adresse tog du til?

a. ☐ Sæt kryds hvis du tog til din bopæl, ellers udfyldes alle felter.
b. Gadenavn:_____
c. Postnummer:_____

11. Havde du ærinder undervejs? ☐1 Ja ☐2 Nej
Ærinder kan være indkøb, aflevere børn, møder og lign.

12. Turens varighed, eksklusive ærinder undervejs (ca. minutter)?_____

13. Hvilket transportmiddel - eller kombinationer heraf - brugte du, og hvor lang var turen/de
enkelte strækninger i km?
Sæt kryds, evt. flere krydser og noter distancen

☐ a. Gang, _____km
☐ b. Cykel, _____km
☐ c. Knallert/motorcykel, _____km
☐ d. Bil som chauffør, _____km
☐ e. Bil som passager, _____km
☐ f. Bus, _____km
☐ g. S-tog, _____km
☐ h. Regional/IC-tog, _____km
☐ i. Taxa, _____km
☐ j. Havnebussen, _____km
☐ k. Hvis 'Andet, skriv: _____,
_____km

Anden del: Om dine rejsevaner og rejsemuligheder

Denne del drejer sig om dine daglige rejsevaner generelt, samt dine synspunkter vedrørende rejsen til og fra arbejde.

14. Har din husstand bil?
☐ 1. Nej
☐ 2. Ja, 1 bil
☐ 3. Ja, 2 eller flere

15. Har du adgang til bil hver dag eller næsten hver dag? ☐$_1$Ja ☐$_2$ Nej

16. Kommer og går du normalt samme tid hver dag?
☐$_1$Ja (gå til 16.A) ☐$_2$ Nej (gå til 16.B)

16.A. Hvornår møder du? kl ca._____
Hvornår tager du hjem? kl ca._____

16.B.Hvornår møder du hhv. går du hjem?
Jeg møder normalt mellem kl_____ og _____
Jeg tager normalt hjem mellem kl._____ og _____

17. Hvor mange *dage om ugen* har du normalt ærinder undervejs til/fra arbejdspladsen?
Ærinder kan være indkøb, aflevere børn, møder, mm.
☐$_1$. 0 dage ☐$_2$. 1-2 dage om ugen ☐$_3$. 3-5 dage om ugen

Normale transportmiddel

18. Hvad er dit normale hovedtransportmiddel til og fra arbejdspladsen?
Kun 1 kryds

☐ 1. Bil *{gå til spørgsmål 19}*
☐ 2. Kollektiv transport *{gå til spørgsmål 22}*
☐ 3. Cykel *{gå til spørgsmål 24}*
☐ 4. Knallert/motorcykel *{gå til spørgsmål 22}*
☐ 5. Gang {gå til spørgsmål 22}
☐ 6. Hvis 'Andet, skriv: _____ *{gå til spørgsmål 25}*

Hvis du kørte i bil besvar venligst spørgsmål 19-21

19. Hvad er de vigtigste årsager til at du kører i bil til arbejdspladsen?
Max 3 krydser

☐ a. Det er det hurtigste
☐ b. Det er det billigste
☐ c. Det er det mest fleksible
☐ d. Det er nødvendigt for at kombinere arbejdsturen med andre ærinder
☐ e. Jeg har dårlige kollektive trafikforbindelser fra bopælen
☐ f. Jeg holder af at køre i bil
☐ g. Gammel vane
☐ h. Jeg har dårlig cykelvej (risici, gener)
☐ i. Hvis 'Andet', skriv: _____

20. Er du normalt alene i bilen ved ankomsten til arbejdspladsen?

☐ 1. Ja *{gå til spørgsmål 21}*
☐ 2. Nej

Hvor ofte kører du sammen med kolleger på arbejde til arbejdspladsen?

Skriv antal gange om måneden: _ *{gå til spørgsmål. 29}*

21. Hvad er de væsentligste grunde til, at du ikke samkører med andre ansatte til arbejdspladsen?
Max 3 krydser

☐ a. Kender ingen i nærheden
☐ b. Har meget skiftende arbejdstider
☐ c. Dem jeg kunne køre sammen tager af sted/hjem på andre tidspunkter end jeg selv
☐ d. Ærinder på vej til eller fra arbejde
☐ e. Sætter pris på at være alene i bilen
☐ f. Har ikke overvejet samkørsel
☐ g. Samkører med ansatte ved en anden arbejdsplads
☐ h. Hvis 'Andet, skriv:_____ *{gå til spørgsmål 29}*

Hvis du brugte kollektiv transport besvar venligst spørgsmål 22 og 23

22. Hvilken form for kollektiv transport bruger du?
Kun 1 kryds

☐ 1. Tog
☐ 2. Tog og bus
☐ 3. Bus
☐ 4. Havnebussen
☐ 5. Hvis 'Andet', skriv:_____

23. Hvad er de vigtigste grunde til at du kører kollektivt til arbejdspladsen?
Max 3 krydser

☐ a. Det er det hurtigste
☐ b. Det er det billigste
☐ c. Jeg har ikke bil
☐ d. Ingen at køre sammen med i bil
☐ e. Det er for stressende at køre i bil så langt hver dag
☐ f. Jeg har dårlig cykelvej
☐ g. Det er det mest miljøvenlige
☐ h. Mulighed for at arbejde/læse under transporten
☐ i. Gammel vane
☐ j. Det er det mest fleksible
☐ k. Det er svært at finde parkeringsplads til bilen ved arbejdspladsen
☐ l. Hvis 'Andet', skriv_____ *{gå til spørgsmål 25}*

Hvis du cyklede besvar venligst spørgsmål 24

24. Hvad er de vigtigste grunde til at du kører på cykel til arbejdspladsen?
Max 3 krydser

☐ a. Det er det hurtigste
☐ b. Det er det billigste
☐ c. Jeg har ikke bil
☐ d. Ingen at køre sammen med i bil
☐ e. Det giver motion og frisk luft at cykle
☐ f. Det er det mest miljøvenlige
☐ g. Jeg har indrettet min tilværelse på cykling
☐ h. Det er det mest fleksible
☐ i. Det er svært at finde parkeringsplads til bilen ved arbejdspladsen
☐ j. Hvis 'Andet',
skriv_____

De næste spørgsmål besvares af alle uanset normalt transportmiddel

Man kunne forestille sig, at arbejdspladsen tog initiativ til at organisere samkørsel for medarbejderne, således at samkørsel kunne arrangeres enten fast eller fra gang til gang ved at kontakte en person eller en særlig hjemmeside for arbejdspladsen.

25. Vil organiseret samkørsel i en eller anden form være af interesse for dig *(evt. som beskrevet ovenfor)*?

☐ 1. Ja, muligvis *{gå til spørgsmål 26}*
☐ 2. Nej *{gå til spørgsmål 29}*
☐ 3. Ved ikke *{gå til spørgsmål 29}*

Hvis ja, besvar venligst spørgsmål 26-28

26. Hvad mener du, der skulle til for at du (oftere) ville køre sammen med andre (samkørsel)?

Max 3 krydser

☐ a. Hjælp til at finde faste samkørselspartnere
☐ b. Hjælp til koordinering/planlægning fra dag til dag
☐ c. Særlige pendler-biler/minibusser stillet til rådighed af arbejdspladsen
☐ d. At jeg kunne finde en samkørselspartner der ligger tæt på min bopæl
☐ e. Hvis 'Andet',
skriv_____
☐ f. Ved ikke

27. Vil du være interesseret i at køre samme med ansatte samkørsel fra andre lokale virksomheder?

Ja ☐ Nej ☐

28. Vil du være mere interesseret i samkørsel hvis...

...der er reserveret p-pladser til samkørere?
Ja ☐ Nej ☐

...du er garanteret hjemturen (med taxa) hvis der opstår problemer?
Ja ☐ Nej ☐

De resterende spørgsmål besvares af alle uanset normalt transportmiddel.

29. Hvad oplever du som de største ulemper ved at skulle tage med kollektiv transport til arbejdspladsen?

Max 3 krydser

☐ a. Prisen
☐ b. Tidsforbruget
☐ c. Upålidelighed
☐ d. For dårlige togforbindelser til nærmeste station
☐ e. For dårlige busforbindelser
☐ f. Nødvendigt at skifte undervejs
☐ g. For dårlig koordinering af bus og tog, angiv evt. ved hvilke skift?
_____.
☐ h. For dårlig koordinering mellem busser, angiv evt. ved hvilke skift? _____.
☐ i. For lang afstand mellem busstoppested og arbejdspladsen.
☐ j. For lav komfort med trængsel i bussen, dårlige ventefaciliteter mv.

☐ k. For lav komfort med trængsel i toget, dårlige ventefaciliteter mv.
☐ l. Andet, skriv: _____
☐ m. Jeg oplever ingen særlige ulemper
☐ n Ved ikke/kan ikke vurdere

30. Hvad oplever du som de største ulemper ved at skulle cykle hele vejen til arbejdspladsen?
Max 3 krydser
☐ a. For langt
☐ b. Tidsforbruget
☐ c. Dårlig cykelvej
☐ d. Trafikken (risiko, gener)
☐ e. Utilstrækkelige omklædningsfaciliteter i arbejdspladsen
☐ f. Andet, skriv: _____
☐ g. Jeg oplever ingen særlige ulemper
☐ h. Ved ikke/kan ikke vurdere

31. Vil du tage toget hvis…

...der kører bus direkte fra stationen til arbejdspladsen?
Ja ☐ Nej ☐

…virksomheden stiller pendlercykler til rådighed (station-arbejdsplads)?
Ja ☐ Nej ☐

32. Forventer du at ville bruge Metroen i fremtiden?
Ja ☐ Nej ☐ Ved ikke ☐

Tiltag

Hvis du normalt ***benytter bil, knallert, motorcykel eller andet til arbejde*** *besvar venligst spørgsmål 33. Nedenfor er nævnt en række mulige tiltag vedrørende transporten til og fra arbejdspladsen. For hvert spørgsmål bedes du vurdere i hvilken grad det enkelte tiltag vil medvirke til at gøre cykling eller kollektiv transport så attraktivt, at du vil skifte transportform.*

Hvis du normalt ***benytter kollektiv transport eller cykel*** *besvar venligst spørgsmål 33. Nedenfor er nævnt en række mulige tiltag vedrørende transporten til og fra arbejdspladsen. For hvert spørgsmål bedes du vurdere hvor stor betydning det enkelte tiltag vil have for at forbedre forholdene for din daglige cykeltur eller kollektivrejse til arbejdspladsen.*

Hvis du mormalt ***går til arbejde*** *spring da til spørgsmål 35.*

33. Hvor stor betydning ville . . . . have for dit valg af transportmiddel?

. . . øget hyppighed for eksisterende busforbindelser . . .
1. Meget stor betydning ☐ 2. Stor betydning ☐ 3. Mindre betydning ☐ 4. Ingen betydning ☐ 5. Ved ikke ☐

. . . øget hyppighed for eksisterende togforbindelser . . .
1. Meget stor betydning ☐ 2. Stor betydning ☐ 3. Mindre betydning ☐ 4. Ingen betydning ☐ 5. Ved ikke ☐

. . . bedre koordinering mellem de kollektive forbindelser . .
1. Meget stor betydning ☐ 2. Stor betydning ☐ 3. Mindre betydning ☐ 4. Ingen betydning ☐ 5. Ved ikke ☐

. . . bedre information om kollektive forbindelser . . .
1. Meget stor betydning ☐ 2. Stor betydning ☐ 3. Mindre betydning ☐ 4. Ingen betydning ☐ 5. Ved ikke ☐

. . . bedre komfort som kollektiv bruger (bedre venteforhold, plads i bussen, mv.) . . .
1. Meget stor betydning ☐ 2. Stor betydning ☐ 3. Mindre betydning ☐ 4. Ingen betydning ☐ 5. Ved ikke ☐

. . . markant billigere kollektiv transport . . .
1. Meget stor betydning ☐ 2. Stor betydning ☐ 3. Mindre betydning ☐ 4. Ingen betydning ☐ 5. Ved ikke ☐

. . . bedre faciliteter for cyklister (omklædning, parkering) . . .
1. Meget stor betydning ☐ 2. Stor betydning ☐ 3. Mindre betydning ☐ 4. Ingen betydning ☐ 5. Ved ikke ☐

. . . bedre cykelvej for cyklister . . .
1. Meget stor betydning ☐ 2. Stor betydning ☐ 3. Mindre betydning ☐ 4. Ingen betydning ☐ 5. Ved ikke ☐

. . .indførsel af P-afgifter (ex. 100 kr. pr. måned) for benyttelse af arbejdspladsen P-pladser. Det deraf følgende provenu anvendes til at forbedre forholdene for samkørere, for dem der bruger kollektiv transport og for cyklister.
1. Meget stor betydning ☐ 2. Stor betydning ☐ 3. Mindre betydning ☐ 4. Ingen betydning ☐ 5. Ved ikke ☐

Hvis du normalt kører alene i bil til arbejde besvar venligst besvar venligst spørgsmål 34.

34. Anser du det for realistisk, at kollektiv transport, cykel eller samkørsel kan forbedres i en grad der vil få dig til at ændre transportform?
Ja ☐1 Nej ☐2

De resterende spørgsmål besvares af alle uanset normalt transportmiddel.

35. Tror du, at bedre mulighed for at arbejde hjemme via PC med fast opkobling til arbejdspladsen ville påvirke hvor ofte du rejser frem og tilbage til arbejdspladsen?
Ja ☐ Nej ☐

36. Tror du at en sådan mulighed for hjemmearbejde ville påvirke dit valg af transportmiddel?
Ja ☐ Nej ☐

37.A Mener du, at arbejdspladsen bør påvirke medarbejderne til andre transportformer såsom samkørsel, bus, tog, cykel og gang?
☐ 1. Ja *{gå til spørgsmål 37.B}*
☐ 2. Nej
☐ 3. Ved ikke

37.B Har du forslag til konkrete tiltag der kunne sættes i værk?
Skriv: _____
_____

Uge 38 er miliøtrafikuge i Danmark, hvor der over hele landset sættes fokus på trafik og miljø. Det overordnede formål med miljøtrafikugen er, at fremme miljøvenlig trafikadfærd og synliggøre miljørigtige transportløsninger – ikke mindst for at skabe mere attraktive byer med renere luft, mere ro og bedre plads.

Miljøtrafikugen er det danske bidrag til det fælleseuropæiske trafikinitiativ den 22. september 2001, som gennemføres i ca. 700 byer i Europa under overskriften "In town without my car".

38. Har du forslag til konkrete tiltag der kunne prøves af under Miljøtrafikugen i efteråret?
Skriv: _____
_____

Trykt med støtte fra Den Grønne Fond

*Vil du deltage i lodtrækningen så skriv dit navn her:*_____

Dette ark vil ikke indgå i undersøgelsen.

Appendix M : Employee Questionnaire in English

Background Information

1. What company do you work for?
☐ 1. Unibank
☐ 2. FM
☐ 3. DEP
☐ 4. DMU
☐ 5. ENT
☐ 6. FSL
☐ 7. GEUS
☐ 8. MST
☐ 9. NKN
☐ 10. SNS

(2). Where do you live? a. Street and Number_____
b. Zip Code_____

(3). How old are you?
☐ 1. Under 31 years
☐ 2. 31-40 years
☐ 3. 41-50 years
☐ 4. 51 years and over

(4) What gender are you? ☐1. Female ☐ 2. Male

Travel to and from your company on April 17, 2001

(5) Did you go to work on Tuesday, April 17, 2001? ☐$_1$ Yes ☐$_2$ No
- If no, skip to question 14.

Travel to work:

(6) What address did you come from? a. ☐ If you're coming from your home address, check here.
b. Street:_____
c. Zip Code:_____

(7) Did you have errands to do on the way home? ☐$_1$ Yes ☐$_2$ No

(8) How long did the trip take (approximately in minutes)?_____

(9) What kinds of transportation, or combinations, did you use?
Check all that apply.

- ☐ a. Walk over 300 meters
- ☐ b. Bicycle
- ☐ c. Moped/Motorcycle
- ☐ d. Drive in a car
- ☐ e. Passenger in a car
- ☐ f. Bus
- ☐ g. S-train
- ☐ h. Regional/IC-train
- ☐ i. Taxi
- ☐ j. Harbor bus
- ☐ k. Other

Travel from work:

(10). What address are you traveling to?

a. ☐ If you are traveling to your home address, check here.
b. Street:_____
c. Zip Code:_____

(11) Did you have errands to do on the way? ☐$_1$ Yes ☐$_2$ No

(12) How long did you travel (approximately in minutes)?_____

(13) What kind of transportation, or combinations, did you take?
Check all that apply.

- ☐ a. Walk over 300 meters
- ☐ b. Bicycle
- ☐ c. Moped/Motorcycle
- ☐ d. Driver in a car
- ☐ e. Passenger in a car
- ☐ f. Bus
- ☐ g. S-train
- ☐ h. Regional/IC-train
- ☐ i. Taxi
- ☐ j. Harbor bus
- ☐ k. Other

About your Commuting Habits and Possibilities?

Daily transport habits in general, usual trips to and from work

(14). Does your household have a car?
☐ 1. No
☐ 2. Yes, 1 car
☐ 3. Yes, 2 or more

(15). Do you have access to a car every day or almost every day? ☐$_1$ Yes ☐$_2$ No

(16). Do you come and go at the same time every day?
☐$_1$ Yes (=>(16.A)) ☐$_2$ No (=>(16.B))

(16A). What time do you arrive at work? Approx._____
What time do you leave to go home? Approx._____

What time do you go to and from home?
(16B). I usually leave between the hours of_____ [(16Ba)] and _____[(16Bb)]
(16B). I usually go home between hours of_____[(16Bc)] and_____ *[(16Bd)]*

(17). How many days a week do your normally run errands to/from work?
☐$_1$. 0 days ☐$_2$. 1-2 days a week ☐$_3$. 3-5 days a week

Normal transportation
(18). What is your normal transportation to and from work?
Check only one
☐ 1. Car *{=> question (20)}*
☐ 2. Collective Transportation *{=> question (25)}*
☐ 3. Bicycle *{=> question (27)}*
☐ 4. Moped/Motorcycle *{=> question 25}*
☐ 5. Walk (=>*question* 25)
☐ 6. Other *{=> question (28)}*
If other, describe: _____.

(19). What are your reasons for driving a car to work?
Check a maximum of 3
☐ a. It is the fastest way
☐ b. It is the cheapest way
☐ c. It is the most flexible way
☐ d. It is necessary for combining the trip with other errands
☐ e. I do not have good opportunities to use public transportation
☐ f. I like driving a car
☐ g. Old habits
☐ h. I think the bike path is risky or inconvenient

☐ i. Other
If other, describe: _____.

(20). Are you normally alone when you arrive to work in your car?
☐ 1. Yes (=>*question* (21))
☐ 2. No
How often do you drive together with colleagues?
Approximately in days per month: _____(=>*question* (30)27)

(21). What are your main reasons for not carpooling?
Check a maximum of 3
☐ a. I don't know anyone nearby
☐ b. I have an odd schedule
☐ c. People I could drive with have different hours than I do
☐ d. I have to complete errands on the way
☐ e. I like being alone in the car
☐ f. It didn't occur to me
☐ g. I carpool with employees from other companies
☐ h. Other
If other, describe:

_____
{=> *question* (29)}

{For those who answered"2" in question (19)}
(22). What kind of public transport do you use?
Check only 1
☐ 1. Train
☐ 2. Train or bus
☐ 3. Bus
☐ 4. Harbor Bus
☐ 5. Other
If other, describe:_____

(23). What are your main reasons for using public transportation to get to work?
Check a maximum of 3
☐ a. It is the fastest
☐ b. It is the cheapest
☐ c. I don't own a car
☐ d. I have no one to ride with in the car
☐ e. It is too stressful to drive every day
☐ f. I have an inconvenient bike route
☐ g. It is the most environmentally friendly
☐ h. I work while transporting
☐ i. Old habit
☐ j. It is the most flexible
☐ k. There are no parking spaces at work
☐ l. Other

If other, describe_____
{go to question (25)}

(24). What are your main reasons for riding a bicycle to work?
Check a maximum of 3

☐ a. It is the fastest
☐ b. It is the cheapest
☐ c. I don't own a car
☐ d. I have no one to ride with in the car
☐ e. I like the exercise and fresh air of riding a bike
☐ f. It is the most environmentally friendly
☐ g. I planned my way of living around biking
☐ h. It is the most flexible
☐ i. There are no parking spaces at work
☐ j. Other

If other, describe _____

The next questions are answered by everyone, regardless of mode of transportation.

(25). Would organized carpooling interest you?

☐ 1. Yes, maybe (drivers => question 26)
☐ 2. No (=> question (29))
☐ 3. I don't know (drivers => question (29))

(26). What do you think it should take for you to carpool with some of your colleagues?
Check a maximum of 3

☐ a. Help to find someone regularly
☐ b. Help with coordination/planning from day to day
☐ c. Special cars or minibuses provided by the company
☐ d. If I could find a partner who lives by my house
☐ e. Other

If other, describe_____

☐ f. I don't know

(27) Would you be interested in carpooling with employees from other companies close to your workplace?

☐ 1. Yes, maybe
☐ 2. No

(28) Would you be more interested in carpooling if...

... there were parking spots specifically for carpoolers?

☐ 1. Yes, maybe
☐ 2. No

... you were guaranteed a ride home in case of a problem? (taxi, bus, etc)

☐ 1. Yes, maybe
☐ 2. No

(29). What do you see as the disadvantages of using public transport to get to work?
Check a maximum of 3

☐ a. Cost
☐ b. Time consuming
☐ c. Unreliable
☐ d. Bad connection to the next station
☐ e. Bad bus connections
☐ f. Need to switch on the way
☐ g. Bad coordination between bus and train
If bad coordination between bus and train, at what station?_____
☐ h. Bad coordination between buses
If bad coordination between buses, at what stop?_____
☐ i. Too long between bus stop and company
☐ j. Too little comfort on buses because of crowds
☐ k. Too little comfort on trains because of crowds
☐ l. Other
If other, describe: _____
☐ m. There are no special inconveniences
☐ n I don't know

(30). What are the disadvantages of riding a bicycle all the way to work?
Check a maximum of 3

☐ a. Too long a distance
☐ b. Too time consuming
☐ c. Bicycle road is bad
☐ d. Traffic is risky
☐ e. Bad facilities for cyclists at work
☐ f. Other
If other, describe: _____
☐ g. I don't experience any disadvantages
☐ h. I don't know

(31) Would you use the train if there was a direct bus from the station to your workplace?

☐ 1. Yes, maybe
☐ 2. No

Would you use the train if there were commuter bikes available to you?

☐ 1. Yes, maybe
☐ 2. No

(32) Do you anticipate using the Metro when it opens?

☐ 1. Yes, maybe
☐ 2. No
☐ 3. I don't know.

Suggestions

(33). How much would. . . . . mean for your choice of transportation?

(32.a). . . . if buses left more frequently . . .
1. A great deal ☐ 2. Some ☐ 3. Less ☐ 4. No meaning ☐ 5. I don't know☐

(32.b) . . . if trains left more frequently . . .
1. A great deal ☐ 2. Some ☐ 3. Less ☐ 4. No meaning ☐ 5. I don't know☐

(32.c) . . .better coordination between public transport. .
1. A great deal ☐ 2. Some ☐ 3. Less ☐ 4. No meaning ☐ 5. I don't know☐

(32.d) . . . better information regarding public transportation . . .
1. A great deal ☐ 2. Some ☐ 3. Less ☐ 4. No meaning ☐ 5. I don't know☐

(32.e). . . more comfortable public transportation (waiting conditions, more room). . .
1. A great deal ☐ 2. Some ☐ 3. Less ☐ 4. No meaning ☐ 5. I don't know☐

(32.f) . . cheaper public transportation. . .
1. A great deal ☐ 2. Some ☐ 3. Less ☐ 4. No meaning ☐ 5. I don't know☐

(32.g). . . better facilities for cyclists (changing rooms, parking) . . .
1. A great deal ☐ 2. Some ☐ 3. Less ☐ 4. No meaning ☐ 5. I don't know☐

(32.h). . . better bike routes for cyclists . . .
1. A great deal ☐ 2. Some ☐ 3. Less ☐ 4. No meaning ☐ 5. I don't know☐

(32.j) . . .Increasing tax on parking for using company parking lots (money from taxes would be used for carpoolers, public transport users, and cyclists) . . .
1. A great deal ☐ 2. Some ☐ 3. Less ☐ 4. No meaning ☐ 5. I don't know☐

(34) Do you think it is realistic to improve public transportation, cycling, or carpooling to an extent that it would change your transportation habit?
Yes☐$_1$ No☐$_2$
If yes, under what conditions?_____

(35) If there were better conditions for working at home (on a PC), would that affect how often you would go to work?
Yes ☐ No ☐

(36) Would home working affect your choice of transport?
Yes ☐No ☐

(36A) Do you think it is a good idea for your company to take initiatives to promote public transportation, cycling, and other modes of alternative transportation at the workplace?

☐ 1. Yes => spm 36B.
☐ 2. No
☐ 3. I don't know

(36B) Do you have any suggestions for doing this?

Describe: _____

(37) Do you have any concrete suggestions for the week of 22 September (In Town, without my car!)?

Describe:_____

Appendix N: Raw Survey Data

Mode of Transportation by Gender

	Unibank		Foreign Ministry			MST	
	Female	Male	Female	Male		Men	Women
Car	9	2	3	1		6	25
Public Transportation	19	10	10	3		21	43
Bicycle	3	1	2	2		39	43
Moped/Motorcycle	0	0	0	0		1	0
Walk	0	0	0	1		3	3
Other	0	0	0	0		3	1
No Answer	0	0	2	1			

Mode of Transportation by Age Group (As percentage of transportation category)

	Unibank			
	Under 31	31-40	41-50	51 or over
Car	0.00%	53.85%	30.77%	15.38%
Public Transportation	10.71%	17.86%	57.14%	14.29%
Bicycle	25.00%	50.00%	25.00%	0.00%
Moped/Motorcycle	0.00%	0.00%	0.00%	0.00%
Walk	0.00%	0.00%	0.00%	0.00%
Other	0.00%	0.00%	0.00%	0.00%

	UM			
	Under 31	31-40	41-50	51 or over
Car	0.00%	75.00%	0.00%	25.00%
Public Transportation	0.00%	7.69%	38.46%	53.85%
Bicycle	75.00%	0.00%	0.00%	25.00%
Moped/Motorcycle	0.00%	0.00%	0.00%	0.00%
Walk	0.00%	0.00%	0.00%	100.00%
Other	0.00%	0.00%	33.33%	66.67%

	MST			
	Under 31	31-40	41-50	51 or over
Car	6.45%	29.03%	22.58%	41.94%
Public Transportation	18.75%	32.81%	21.88%	26.56%
Bicycle	29.27%	36.59%	19.51%	14.63%
Moped/Motorcycle	0.00%	100.00%	0.00%	0.00%
Walk	16.67%	16.67%	16.67%	50.00%
Other	0.00%	0.00%	50.00%	50.00%

Mode of Transportation and Number of Days per Week that Errands are Run

Unibank			
	0 Days	1-2 Days	3-5 Days
Car	1	3	8
Public Transportation	6	20	3
Bicycle	0	2	2
Moped/Motorcycle	0	0	0
Walk	0	0	0
Other	0	0	0
No Answer	0	0	0

Foreign Ministry			
	0 Days	1-2 Days	3-5 Days
Car	0	1	3
Public Transportation	3	4	6
Bicycle	0	3	1
Moped/Motorcycle	0	0	0
Walk	0	1	0
Other	0	0	0
No Answer	1	1	1

MST			
	0 Days	1-2 Days	3-5 Days
Car	1	8	22
Public Transportation	16	27	21
Bicycle	6	37	39
Moped/Motorcycle	0	1	0
Walk	3	1	2
Other	3	1	0

Mode of Transportation and Daily Access to a Car

Unibank			
	Yes	No	No Answer
Car	10	2	0
Public Transportation	16	11	2
Bicycle	2	2	0
Moped/Motorcycle	0	0	0
Walk	0	0	0
Other	0	0	0
No Answer	0	0	0

Foreign Ministry			
	Yes	No	No Answer
Car	4	0	0
Public Transportation	7	6	0
Bicycle	2	1	1
Moped/Motorcycle	0	0	0
Walk	0	1	0
Other	0	2	0
No Answer	0	0	0

MST		
	Yes	No
Car	30	1
Public Transportation	25	39
Bicycle	25	57
Moped/Motorcycle	0	1
Walk	3	3
Other	2	2

Mode of Transportation and Commuting at the Same Time Every Day

Unibank		
	Yes	No
Car	7	5
Public Transportation	16	13
Bicycle	1	3
Moped/Motorcycle	0	0
Walk	0	0
Other	0	0
No Answer	0	0

Foreign Ministry		
	Yes	No
Car	3	1
Public Transportation	6	7
Bicycle	3	1
Moped/Motorcycle	0	0
Walk	0	1
Other	0	0
No Answer	2	1

MST		
	Yes	No
Car	19	12
Public Transportation	44	20
Bicycle	47	35
Moped/Motorcycle	1	0
Walk	4	2
Other	3	1

Interest in Carpooling by Mode of Transportation

Unibank			
	Yes, Maybe	No	I don't know
Car	2	5	2
Public Transportation	7	16	6
Bicycle	0	3	0
Moped/Motorcycle	0	0	0
Walk	0	0	0
Other	0	0	0
No Answer	0	0	0

Foreign Ministry			
	Yes, Maybe	No	I don't know
Car	1	3	0
Public Transportation	2	9	1
Bicycle	0	4	0
Moped/Motorcycle	0	0	0
Walk	0	1	0
Other	0	0	0
No Answer	1	1	0

MST			
	Yes, Maybe	No	I don't know
Car	10	18	3
Public Transportation	16	46	2
Bicycle	2	76	4
Moped/Motorcycle	1	0	0
Walk	1	4	0
Other	2	2	0

Appendix O: Contact Information

For questions or further information please feel free to contact us.

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