Memorandum

To: Washington State Department of Ecology
From: [Sender's name]
Re: Study of Proposed Marketing Strategy

Executive Summary

The trend of employees changing their commuting habits towards ecologically sound modes of commuting has been leveling off in Washington State. The Department of Ecology hopes to reverse this and is therefore considering a number of proposals combining advertisements and public education. The most widely supported strategy under consideration by the Department involves focusing efforts at public and non-profit sector employees. This strategy is based on assumptions concerning the area of residence and commuting times of these employees. Before committing scarce resources, however, the Department asked for an independent assessment of the proposed strategy. This study examines the validity of this strategy and its underlying assumptions.

An examination of 1990 Census data does not support the hypothesized dependence of ecological commuting method on employment sector. Of the 597 workers in the data set, 135 or 22.6% use an ecological mode of transportation to get to work. When looking at individual sectors of the work force the proportion does not vary significantly; 21.9% of the private sector, 29.0% of the public sector and 23.8% of the non-profit sector use ecological commuting methods.1

These findings should motivate the Department of Ecology to re-examine the proposed strategy. The Department may want to consider targeting individuals residing in the Puget Sound region and urban areas. Workers residing in these areas are more likely to use ecological commuting methods than workers residing in other areas. The agency may also want to consider performing additional studies on other potential explanatory variables such as income levels and distance traveled to work.

1 Based on a 95% confidence level.
Introduction

The Department of Ecology is currently developing a new marketing strategy combining its advertisements and public education efforts. These are to be aimed at increasing the use of ecological modes of transportation by individuals commuting to work. Non-ecological modes of commuting are a major source of air pollution in Washington State and therefore the department wants to produce change in the behavior of individuals by encouraging them to choose ecological methods of commuting. Due to limited resources, the Department wants to target its efforts at populations that appear to be receptive to changing their commuting behavior.

The most widely supported plan within the Department targets employees in the public and non-profit sector. The underlying belief being that these sectors are more receptive to changing commuting behavior than private sector employees. The strategy is based on the following assumptions:

- Public and non-profit employees are more knowledgeable and concerned with environmental issues than private sector employees.
- Most public sector workers (federal and state government employees) work in urban areas and therefore have greater access to public transportation, as an ecological mode of commuting.
- These same workers are more likely to live closer to work which allows for more commuting options e.g., public transportation, carpooling, bicycling and walking.
- Private sector employees are more likely to work a variety of shifts (such as 11:00 p.m. to 7:00 a.m.) when public transportation is reduced and it is often unsafe to use other ecological means such as walking.

Study Overview

This study was designed to explore the relationship between the use of ecological modes of transportation and the sector of the work force in which an individual works. Additionally, the validity of the assumptions upon which the strategy is based will also be discussed. The analysis is based on 1990 census data for Washington state households. This random sample includes working households which are the true focus of this study. Although there are limiting factors to this data set constraints imposed by the Department's
limited resources prohibited the development of a more thorough data set.

The overall work force uses a variety of methods for getting to work. By far the majority of workers (77.8%) travel to work alone in a car. Carpools are the next most frequently used method of commuting at 11.2%. Approximately 4% walk, while 3% work at home or ride the bus. Less than 1% ride a ferry, taxi, motorcycle or bicycle.

An important first step was to define the terms being utilized in the proposed strategy; to some extent these have been modified to match the categories used in the census data. Modes of transportation were divided into two broad categories; ecological and non-ecological. Ecological modes include walking, working at home, riding a bus, streetcar, subway, elevated train, railroad, ferryboat, motorcycle, bicycle, or carpool (defined as two or more people). The sector of the work force is divided broadly into public sector, non-profit sector and private sector. The public sector includes employees of local, state or federal government. The non-profit sector is defined as working for a not-for-profit, tax exempt, or charitable organization. The private sector includes self employed individuals and individuals working in for-profit firms.
Commuting Method

After completing an analysis of the census data with regard to work force sector and commuting method, it was found that an employee's sector of the work force does not significantly affect the tendency to use ecological transportation methods. Of the 597 workers in the data set, 135 or 22.6% use one of these ecological modes of transportation. When looking at individual sectors of the work force the proportion does not significantly vary; 21.9% of the private sector, 29.0% of the public sector and 23.8% of the non-profit sector use ecological commuting methods.

![Percent of Sector Using Ecologic Commuting Methods](image)

On this basis, the agency should re-evaluate the proposed marketing strategy. There is no evidence that public sector workers are more receptive to ecological modes of transportation, therefore the strategy of targeting the department's advertising and educational efforts at the public and non-profit sector may not have the intended result. It would be more effective if the agency focused across work force sectors but incorporated other variables.

Although the strategy was not significant, it does not necessarily indicate that the assumptions upon which the strategy was based were also insignificant. Next, the validity of these assumptions will

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2 Based upon a two-tailed t-test with a 5% significance. The true t-value for the private versus public sector was -0.92 with a p-value of 0.36. In the case of the private versus non-profit, the t-value was -0.42 with a p-value of 0.67.
be evaluated as potential indicators of ecological commuting practices.

Validity of Assumptions

The first assumption, that public and non-profit employees are more knowledgeable and concerned with environmental issues is beyond the scope of this data set and this study.

Effects of Residential Area Density on Transportation Mode

The second assumption stated that public sector employees are more likely to live in urban areas and therefore have access to more ecological commuting options. This is not correct; the area in which a person lives is unrelated to the sector of the work force in which that person is employed. In fact, 16.2% of private sector workers live in an urban environment versus only 14.3% of public sector workers.

The underlying idea of this assumption, however, is that persons in higher density areas are more likely to use ecological commuting methods. This was examined in two ways; first by looking at large urban areas in Washington State to determine if residing in these areas affected the mode of transportation. The data set was divided between those living in large urban areas, Seattle and Spokane, and the rest of the state. Second, the region in which an individual resided was examined in order to determine if residents of the more densely populated Puget Sound region are more likely to use ecological modes of transportation that residents in the rest of the state. In this study the Puget Sound region is defined as King, Kitsap, Pierce and Snohomish Counties.

Ecological commuting practices is dependent on whether or not the employee lives in these densely populated environments. Of the employees residing in Seattle and Spokane, 33.7% use ecological commuting methods versus 20.5% in the remainder of the state. This difference is significant with a 99% confidence level. This dependence can be shown on a regional level as well; ecological modes of commuting are dependent on regional residency with a 98% confidence. When looking at the Puget Sound region versus the rest

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3 Based on a 0.05 significance level.
4 Based on a 0.05 significance level, the t-value is -2.53 (two tailed) and a p-value of 0.01.
of Washington state, 26.0% of employees in the Puget Sound region use ecological modes of transportation while only 18.3% of employees in the remainder in the state use these methods.5

Effects of Work Shift on Commuting Method

This idea of work shift is not specifically addressed in the census data. Therefore this assessment is based on the departure time for work in an effort to determine if it affects the employees ability to use ecological modes of transportation. Departure time was divided between peak commuter hours (5:00 a.m. - 10:00 a.m. and 2:00 p.m.-7:00 p.m.) and off commuter hours (all other departure times). This assumption was not supported by the data. The use of ecological modes of transportation did not vary significantly between peak and off commuting hours.6 In this sample, 20.3% of peak commuters and 13.3% of off hours commuters use ecological modes of transportation.

Additional Descriptors

Similarly, the distance traveled to work may be a good indicator of commuting method. The data set examined for this study did not include this information. Instead this study looked travel time to work as an indication of distance traveled. Employees traveling over a half hour to work are more likely to use public transportation. In fact, in this sample 33.6% of workers traveling over 30 minutes to work use ecological modes of commuting versus 16.3% of workers traveling less than 30 minutes.7 Although this should be of interest to the Department, it is important to note that the actual use of these ecological methods tend to take longer and therefore can distort this information. However, the effect mileage traveled to work has on commuting methods is worth future examination.

Additionally, other variables may warrant further study. Income level and variability of hours worked per week may affect the method of transportation to work. Examining commuting method in respect to income level may give further insight into the reasons used in choosing a commuting method. This could demonstrate

5 Based on a two-tailed test, with a t-value of -2.26 and a p-value of 0.02.
6This is based on a two-tailed test with a 0.05 significance level. The t-value is 1.13 and the p-value is 0.26.
7Based on a 0.05 significance level, the t-value is -3.66 and the p-value approaches zero.
whether ecological commuting is a luxury or inferior good. If ecological commuting is an inferior good, meaning as an individual's income increases the individual buys less of it, the Department of Ecology would need to alter the current public education plans. It would need to work on changing the perception of ecological commuting so that people are encouraged to do it regardless of income level. Conversely, ecological commuting may be viewed as a luxury, meaning when an individual's income increases the individual buys more of it. In this instance, the Department may want to combine its efforts with those of other departments in order to provide low income people with the greater opportunity to commute ecologically.

Data Set Constraints

While the Census data allowed for many important comparisons, there are some limits to the data. The number of workers using various ecological transportation methods is very low. Therefore the information can not be broken out by individual commuting methods but rather must be viewed as a combined category. It would be useful to determine if reasons leading employees to make ecological commuting decisions varies by the method of commuting.

Additionally some of the assumptions expounded by the proposed marketing strategy can not be fully explored with this data set. As previously mentioned, for example, it would be useful to explore the use of ecological modes depending on the distance traveled to work.

Recommendations

It is recommended that the agency re-evaluate the proposed marketing strategy to target public and non-profit employees in order to alter the current trend of decreased use of ecological commuting. Instead of aiming advertisements and education efforts at employees in the public and non-profit sectors, the agency should consider targeting employees in the Puget Sound region or in urban areas. Workers residing in these areas are more likely to use ecological modes of commuting than those in the rest of the state.

The department may also consider looking at methods of transportation utilized in other circumstances such as running errands and recreating. An automobile consumes the most energy and releases the most air pollution within the first five minutes of its
use. Therefore cutting down on the number of short auto trips to run errands, as well as in traveling to work, could have an important impact on Washington State energy consumption pollution patterns.

Future Areas of Study

It is also recommended that the Department of Ecology consider future studies into the individual decision-making process behind ecological transportation usage. The cost incurred by various commuting methods is critical information that is currently unavailable. Having this information would give insight into possible rationales for utilizing a particular commuting method. Additionally, studying why certain variables are significant indicators of ecological commuting patterns is important. For example, are more people commuting ecologically in urban areas because there is better public transportation, because it's less expensive than parking in urban areas, or because they live closer to their jobs?

It would also be beneficial to obtain information on employee's perceptions of particular commuting method? Are employee's perceptions correct? And if not, is that a possible focus of future public education efforts? What is the current level of knowledge on the benefits of using ecological modes of transportation?

Incorporating this information with the information provided above would be beneficial in any attempt to set the agenda for the agency's future advertising and education efforts.
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<th>p-value</th>
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