THE COST OF THE CAR
TO THE CITY OF VANCOUVER

By

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We accept this thesis as conforming
to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

August 1993

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Date Sept 8, 1993
This thesis was undertaken to identify and determine the costs borne by the municipal level of government to provide and maintain the infrastructure required by the private automobile. Such government expenses are known as subsidies. In 1992, Transport 2021 commissioned a broad study to determine the complete cost of transporting people by all modes of transportation throughout the Lower Mainland. This thesis complements the study by investigating the costs shouldered by one level of government, in one municipality and for one mode of transportation in greater detail. This thesis sets a framework that can be followed by other municipalities aimed at determining their own spending on the private automobile.

The underlying assumption of this thesis is that the automobile is perceived as a user pay mode of transportation and, unlike public transit, is not subsidized. Subsidies to the automobile by all levels of government go unnoticed. This thesis demonstrates that cars actually benefit from subsidies.

A framework for examining costs of the automobile was developed through a review of existing literature on automobile costs. Both direct costs and hidden costs are discussed. Most of the direct cost dollar figures were derived by examining the 1992 Vancouver City Budget and isolating those funds devoted to car infrastructure and services. The land cost of car infrastructure was determined by estimating its total land area and calculating the usual 1992 tax revenue of a similar sized parcel of land. The hidden costs of the car are discussed but not translated into dollar values.
This thesis discovers that, in 1992, the automobile cost the City of Vancouver $185.6 million dollars in both direct expenditures and lost tax revenue. The discussion on hidden costs asserts that the true annual subsidy to the car by Vancouver is even higher. This thesis concludes with recommendations for mitigating city spending on the car. Elimination of free on-street parking is recommended as an equity fair method of cost mitigation that obliges car owners to be responsible for providing, or at least paying for, their own residential and work place parking facilities. This thesis recommends the introduction of an on-street permit parking system. Other user pay systems such as road tolls are discussed but not recommended at the municipal level alone.
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CHAPTER ONE

1.0 INTRODUCTION

North Americans love their automobiles. They depend on their automobiles to assist in many of their daily activities. Automobiles have become so dominant in the North American society, that governments and transportation planners spend much time and energy in providing the necessary automobile infrastructure (Pollution Probe, 1991). Who pays for the automobile’s dominance in society? Certainly the car owners pay for their individual automobiles. But do the car users pay for the infrastructure necessary to operate the automobile or the damage, such as air pollution, created by the automobile? This thesis suggests that the user does not pay for many of the automobile associated costs. It is governments and society that pay these costs.

North Americans understand that governments operate transit in cities to provide carless people with some form of mobility. However, transit has difficulty competing with the speed and convenience of automobiles. Costs to keep transit operating increase while ridership and transit service often decrease. From an energy efficiency point of view, transit is a better transportation alternative as it is able to move more people at a lower energy per person amount than a private automobile (City of Toronto & The Technical Workgroup on Traffic Calming and Vehicle Emission Reduction, 1991). Transit is often heavily subsidized to keep it operating.
North Americans now realize that the automobile has had negative impacts on urban society. The automobile has increased urban sprawl and air pollution. The car needs to be checked in society. Car users need to start paying the full cost of the automobiles they use. This thesis discusses some of the automobile costs and offers suggestions that could be implemented to reduce municipal spending on the car.

1.1 Problem Statement

Both transit and private automobiles are subsidized by the public and private sectors, but the subsidies enjoyed by automobiles are more subtle than those of transit. While it is well known that transit receives subsidies in the form of government lump sums, the subsidies enjoyed by automobiles, such as road infrastructure, are more subtle and are often not perceived as subsidies by the public.

1.2 Purpose

The intent of this thesis is to determine the cost of the car to the City of Vancouver.

Transport 2021, a project jointly funded by the B.C. Ministry of Transportation and Highways and the Greater Vancouver Regional District (GVRD), is a current two year study aimed at determining the true cost of the various transportation alternatives and recommending long range transportation action plans for the region. A recently completed study for Transport 2021, entitled *Determining the Cost of Transporting People in the British Columbia Lower Mainland* by Peat Marwick Stevenson & Kellogg, estimates the total costs of 12 different passenger
transport modes by analyzing 20 different cost categories. As the scope of the study is broad in both land area and transportation mode, the level of detail is nominal. This thesis uses the Peat Marwick study as a base and strives to attain greater detail for one mode of transport, the private automobile, in one municipality, Vancouver. This thesis attempts to determine the subsidies from only one level of government, rather than from all subsidy sources as did the Peat Marwick study. Figures 1 and 2 show the study area, Vancouver, in its regional GVRD context.

1.3 Methodology

The literature discussing the cost of the private automobile is still limited and tends to focus on determining a figure for dollar per mile or kilometre travelled. However, a literature review was undertaken of both automobile cost studies and City of Vancouver written material. Meetings with city councillors, planners, engineers and the city's finance director were conducted in order to obtain city data. The 1992 budgets for both the City of Vancouver and the GVRD were obtained for examination.
Figure 1: The City of Vancouver

Source: City of Vancouver Planning Department
1.4 Relevance of Thesis

Transportation is a critical issue of this time. The Lower Mainland cannot keep building roads to satisfy the needs of car drivers. Local examples, like the completion of the Lower Mainland’s Alex Fraser Bridge in 1986, demonstrate that a new road is only a band-aid solution to solving road congestion. In this example, the anticipation of the new bridge provided an incentive to develop nearby land. The new development resulted in a bridge that exceeded capacity on opening day. New roads are a catalyst for new development and the new roads quickly become congested. Transit is often not a viable option for commuters for a variety of reasons, including poor or no transit service in some areas.

In 1990, the GVRD (Greater Vancouver Regional District) underwent the Creating Our Future process that involved concerned citizens and groups from across the region and determined fundamental goals for the future of the region. Some of the goals include:

- improving air quality;
- protecting the open spaces and environmentally important areas that give Greater Vancouver its special quality;
- placing walking, cycling, public transit and goods movement before automobiles in development of the region’s transportation system;
- creating more complete communities that provide a balance of jobs, housing, community services and transportation closer to home; and
- ensuring that agriculture remains a vigorous part of the region’s economy (Source: Shaping Our Communities: Critical Choices, 1992, p. 7).

Achieving most of these goals requires a reduction of private automobile use. Had the North American society not become so automobile oriented, it is plausible that many of these goals would not need to be considered. For example, automobile exhaust contributes to a decline of
air quality. A decrease in automobile use in the Lower Mainland could lead to improved air quality. Creating more complete communities also would de-emphasize car use in society. Historically, communities were built around the distance a person could conveniently walk in a given amount of time. The automobile has quickly changed that concept.

Since the region is currently debating its choice for direction of growth, this thesis is timely because it will demonstrate the amount of money one municipality spends on subsidies to the private automobile. This will illustrate the cost to municipal taxpayers of automobile based development.

In 1990, the City of Vancouver Task Force on Atmospheric Change produced an important report entitled *Clouds of Change*. The Task Force studied the issue of atmospheric change and made several recommendations for improving the region's air quality. Many of the recommendations address car dependency and encourage alternate modes of transportation. Recommendation 15, "Annual Emissions and Transportation Subsidy Report," relates directly to this thesis. The purpose of the recommendation is "to monitor and evaluate progress in reorienting subsidies from private to public forms of transit" (*Clouds of Change*, 1990, p. 43). Section B of recommendation 15 advises that Council direct the Engineering Department to provide an annual report on "the amount of all direct and indirect subsidies to private automobile use in the City...compared with the amount of all subsidies to public forms of transit" (*Clouds of Change*, 1990, p. 43).
Clouds of Change was endorsed by Council but in the time that has passed few recommendations have been fulfilled (Margaret Munro, "Clouds of Change plans disappear into thin air," The Vancouver Sun, June 9, 1993, p. A1). In the fall of 1990, recommendation 15 was changed so that it merely asked the Engineering Department to report to Council the resources needed to undertake such a study. This thesis has fulfilled most of the original requirements of recommendation 15.

According to Vancouver’s "CityPlan," Vancouverites typically spend 15 percent of both their incomes and waking hours moving around. The report describes the automobile in the following manner:

The car has come to symbolize much of what we like and dislike about transportation in our city. On the one hand it allows for personal accessibility, convenience, and security, and as a society, we have come to depend on cars for many of our transportation needs.

On the other hand, as our use of cars increases, the resulting traffic congestion restricts our accessibility and reduces the safety of our neighbourhoods. The car also pollutes the air and uses non-renewable resources.

On one hand many people are concerned that more cars will make our city less livable. Yet some of us may feel that limiting automobile use encroaches on our lifestyles (City of Vancouver, CityPlan Tool Kit, chapter 6, part 1, p. 2).

The automobile presents North American cities with a difficult dilemma.
CHAPTER TWO

2.0 THE PROBLEM

Grants of money, known as direct financial subsidies, are often provided by levels of government to keep transit operating in the Vancouver region. As Peat Marwick identifies, the transit financial subsidies in the Lower Mainland come in the form of government lump sums as well as government funds raised through gas tax, a transit levy placed on hydro and now a newly introduced "green tax" on automobile insurance rates (Peat Marwick, 1993, p. 15). Automobiles are subsidized in indirect ways such as government provided infrastructure and road maintenance. These automobile subsidies are not obvious to the average person. The intent of this thesis is to determine what the operation of private automobiles costs the City of Vancouver.

Subsidies to transit finance approximately 70 percent of the total transit cost in B.C. (Peat Marwick, 1993, p.B9). Transit's direct financial subsidies are summarized in Table 1.

Despite the huge amount of spending towards public transit in the Vancouver region, the private automobile still accounts for over 90 percent of all trips made in motorized vehicles. In the suburban areas, over 95 percent of total trips were made in private automobiles. This statistic was apparently due to the lack of public transit in the suburban areas (Peat Marwick, 1993, p. 14).
Table 1: Breakdown of Financial Subsidy Sources for Public Transit in 1991

<table>
<thead>
<tr>
<th>Subsidy Source</th>
<th>Paid By</th>
<th>Total ($ million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline Tax</td>
<td>Auto Drivers</td>
<td>$47.4</td>
</tr>
<tr>
<td>Hydro Levy</td>
<td>Householders</td>
<td>$12.6</td>
</tr>
<tr>
<td>Commercial Property Tax</td>
<td>Businesses</td>
<td>$24.0</td>
</tr>
<tr>
<td>Residential Property Tax</td>
<td>Homeowners</td>
<td>$14.0</td>
</tr>
<tr>
<td>Provincial Government</td>
<td>Provincial Taxpayer</td>
<td>$196.8</td>
</tr>
<tr>
<td><strong>TOTAL SUBSIDY</strong></td>
<td>All subsidy sources</td>
<td><strong>$294.8</strong></td>
</tr>
<tr>
<td>Transit fares</td>
<td>Transit user</td>
<td>$124.0</td>
</tr>
<tr>
<td><strong>TOTAL TRANSIT COST</strong></td>
<td>Subsidies &amp; Transit users</td>
<td><strong>$418.8</strong></td>
</tr>
</tbody>
</table>


As depicted by Seelig and Artibise, the Vancouver region is characterized by low density development. For example, the GVRD has the low population density of 493 people per square kilometre. This can be compared with the high densities of 6355 people per square kilometre in Toronto, 4200 in London, U.K. and 9312 in New York City. If the City of Vancouver is taken alone, its population density is 3881 people per square kilometre (Seelig and Artibise, 1991, p. 35). The characteristic low density of the region creates a difficulty in providing an efficient and convenient transit system. Low density means buses must travel long distances to serve few people. In fact, the transit system of the Lower Mainland covers 1500 square kilometres, the most area covered by any single transit system operating in Canada (Seelig and Artibise, 1991, p. 64). The nature of the Vancouver region’s sprawl makes transit provision...
extremely expensive. Thus, despite the money spent on providing transit service throughout the region, many people feel their community is not adequately serviced. The lack of convenient transit service in the suburban areas only increases the automobile’s popularity. Similarly, the argument can be said in a reverse fashion. The automobile’s popularity has lead to low density development and a decrease in demand for transit.

A new residential development studied in Richmond (bounded by Highway 99, Cambie Road, No. 4 Road, Alderbridge Way and Shell Road) illustrates the problem. The development has been designed for cars. Pedestrians have been given little consideration. There is not even a pedestrian link through to the adjacent transit serviced arterial road (Cambie Road). Thus, many residents of the development face long walks of a kilometre or more to reach the nearest bus stop. As well as the long walk, the transit that services the development has a frequency of only 30 minutes and does not provide direct service to Vancouver (Bagh, Dehnel et al., unpublished UBC class report, 1992). Other examples of similar developments have been noted in the Vancouver region. It is no doubt why people living in the suburbs complain of poor transit service. However, much of the poor service is not the fault of the transit company but rather lies within the design of the communities themselves.
CHAPTER THREE

3.0 BACKGROUND

One method of assessing the cost of the car to society is to determine what city infrastructure would be eliminated if there were no automobiles at all. Reflection on this question revealed that car infrastructure has intertwined itself into society and has many uses. Very little automobile infrastructure could actually be removed from North American cities.

Historically people have yearned for mobility. The Romans built roads; early populations built boats; and bicycles, which preceded automobiles, were widely sought after vehicles at the time of their introduction. If cars had not been invented people would have devised some other means to travel. Thus roads, which are necessary for automobile use, would be required even if cars were not in use. The history of car use in British Columbia shows that bicycle riders were in fact the instigators of paved roads in B.C. which were needed to make cycling more enjoyable and efficient (Taylor, 1984).

In North America, the possibility of eliminating car-related infrastructure, and thus, city costs is limited. The provision of free on-street parking is one of the very few costs that could be abolished. When private automobiles are allowed to park on public streets, roads need to be constructed wider than really necessary and car drivers do not have to make provisions for parking their own automobiles.
Street lighting at major cloverleaf intersections is a second expense that appears to be the primary responsibility of private automobiles. As these intersections are not normally found in areas where people are likely to be walking, such as residential areas, the street lighting is not provided for the safety and security of pedestrians. It is provided for automobiles. In Vancouver, only one road, the provincially owned and operated Cassiar Connector, is not meant for pedestrian use. Thus, in Vancouver, virtually no street lighting could be said to benefit only automobiles.

Roads can be considered a subsidy to car drivers because they take land out of the city’s tax rolls. However, without roads property values may be lower as accessibility is one of the factors that gives land value. Roads or pathways are necessary for any type of vehicle movement including pedestrian walking. Thus, although roads are needed for automobile use and can be considered a subsidy to autos, automobiles are not the only road user. The portion of roads used by automobiles that can be called a subsidy to automobiles is only a proportion of the total road cost to the city.

Determining the cost of the car is a complex task. The car has become an intricate part of our society. As long as automobiles are relied upon, their required infrastructure cannot be eliminated. A conscious effort needs to be made by society to decrease its reliance on private automobiles. Such an effort combined with an understanding of the automobile’s true cost to society, may then lead to a reduction in the amount of city provided automobile infrastructure.
Projects like Transport 2021 can be argued to be in progress solely due to the region’s dependency on the automobile and thus, to be a cost attributable to the car. Transport 2021 is developing a long-range transportation component of the GVRD’s Livable Region Strategic Plan. Transportation Demand Management (TDM) strategies are being considered by the Transport 2021 team to address the region’s traffic problems. The strategies, which include incentives to encourage alternative transportation modes and measures to discourage the automobile such as road tolls, aim to change travel behaviour in the region. The ultimate goal of Transport 2021 is to reduce congestion, improve the quality of the air and delay or reduce expensive development of the region’s transportation system (GVRD News, Nov/Dec 1992, p. 5).

Higher densities have been found to reduce average trip distances, increase the practicality and efficiency of other modes of transportation and reduce automobile dependency (Peat Marwick, 1993). Since Vancouver is more densely populated than some of the surrounding municipalities, its car infrastructure costs are likely less than the newer less dense municipalities. Residents of inner city neighbourhoods such as the West End have greater opportunities to reduce their car dependencies than residents of other more sparsely populated neighbourhoods. Although this thesis will not compare the cost of the automobile among different municipalities, there is a belief that due to Vancouver’s compact urban nature and established automobile infrastructure, Vancouver tax payers subsidize the automobile less than do neighbouring municipalities.
CHAPTER FOUR

4.0 DIRECT COSTS OF THE AUTOMOBILE TO THE CITY OF VANCOUVER

The Peat Marwick study was divided into 20 transportation cost categories. As this thesis will only look at one mode of transportation and one source of funding; not all of the Peat Marwick cost categories are appropriate. *The Costs of the Car*, a 1991 study undertaken by Pollution Probe, is divided into seven classifications of cost with each classification being subdivided into direct and hidden costs. Such a format will be followed in this study.

4.1 Land Use Costs

In North American cities, a considerable portion of land is devoted to automobile infrastructure. Although the exact proportion of such land is unknown, if one considers land used for roads, lanes, parking, automobile manufacturing and maintenance, the proportion could conceivably be in the order of 30 percent. Consequently, land use costs represent a large proportion of the total cost of the car. Land used for roads is not taxable land so is not assessed for taxation purposes. At least two problems exist in trying to determine the land value of roads. Firstly, as the value

---

1 The cost categories used by Peat Marwick are divided into six general categories. The 20 cost categories under their general divisions are as follows: direct user or operating costs (1. fixed vehicle costs, 2. variable vehicle costs, 3. parking fees and fines); indirect parking costs (4. residential, 5. commercial, 6. government); transport infrastructure (7. road construction, 8. road maintenance, 9. roadway land value, 10. transit land value, 11. protection services); time (12. personal, 13. commercial delays); urban sprawl (14. infrastructure, 15. loss of open space, 16. future transport options) and; environmental and social impacts (17. unaccounted accident costs, 18. air pollution, 19. noise pollution, 20. water pollution).
of land varies greatly throughout the city then so must the road land value, and secondly, road access influences the value of the adjacent land.

4.1.1 Roads

In Vancouver, the total amount of land devoted to city owned right-of-ways, that is, streets, roads and lanes, is 3361 hectares or 28 percent of the city's total area (11,690 ha) (Vancouver A to Z, 1992, p. 7). Table 2 shows the city land use breakdown. If the amount of land devoted to car parking and servicing, both as a private and public responsibility (i.e., private driveways and public city-owned parking lots), is included, then the total amount of land in Vancouver devoted to cars would likely be in the order of 33 percent.

To be more accurate, the actual amount of land devoted to just the streets must be determined as well as the value of the neighbouring land on which the street is located. As discussed, road access influences the land value of the surrounding area so difficulties arise in assessing road land value. Apparently, if the street was not in existence, the surrounding land would be inaccessible and thus, would have a lower value. In fact, section 75 (1)(a) of the B.C. Land Title Act requires that land must have "necessary and reasonable access" in order to be eligible for subdivision (Land Title Act, chapter 219, part 7, division 2 "Subdivision of Land", section 75).

In the Peat Marwick study, the road land value was discounted 70 percent from the assessed value of city land (Peat Marwick, 1993, p. B27) to address the fact that roads add value to adjacent land through accessibility. Although it is agreed that the land devoted to roads does
not have the same value as the adjacent properties, a discount rate of 70 percent is questionable. In a city, a road does serve adjacent properties. If the properties did not exist, it seems likely the road would not exist either. Within a city, it seems likely that the land value of a road is not so different from the land it serves.

Peat Marwick acknowledges that their report made estimates with some level of uncertainty. To address the uncertainty of the discounted rate of roadway land values, a sensitivity analysis was undertaken. Using a new discounted rate of 30 percent, the sensitivity analysis showed that such a scenario did "not substantially change the total costs or level of subsidy for personal vehicles or transit" (Peat Marwick, 1993, p. 27). For example, using the 70 percent road land discount rate, the study found that the total cost of personal vehicles travelling in the Lower Mainland is $0.662 per passenger kilometre. The total subsidy to personal vehicles is found to be 22.6 percent of the total cost of operating personal vehicles. At a 30 percent road land discount rate, passenger vehicle travel becomes $0.707 per passenger kilometre and the total personal vehicle subsidy becomes 27.6 percent of its total operating cost.

Although it is recognized that the land value of the road is likely lower than the land it serves, this thesis does not discount the road value as the true discount rate is not known. As previously stated, property needs road access in order to be subdivided. It is believed that the land value of the road is only slightly lower than the land value of the adjacent property. Although a discount rate is not formally applied to the land value of the road, this thesis does naturally discount the value of the roads by applying the residential taxation rates to the majority of the area devoted to city roads as a method of determining the yearly cost of the roads to the city. In reality, some of the road area should have the much higher commercial or industrial
taxation rates applied as some roads serve such property types. This point will be discussed further.

Table 2: City of Vancouver Land Use

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Hectares</th>
<th>Percent of land</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>4,593</td>
<td>39</td>
</tr>
<tr>
<td>Streets</td>
<td>3,361</td>
<td>28</td>
</tr>
<tr>
<td>Parks/Recreation</td>
<td>1,443</td>
<td>12</td>
</tr>
<tr>
<td>Industry/Utilities</td>
<td>928</td>
<td>8</td>
</tr>
<tr>
<td>Institutional</td>
<td>463</td>
<td>4</td>
</tr>
<tr>
<td>Commercial</td>
<td>451</td>
<td>4</td>
</tr>
<tr>
<td>Open Space</td>
<td>435</td>
<td>4</td>
</tr>
<tr>
<td>Agriculture</td>
<td>16</td>
<td>1</td>
</tr>
<tr>
<td><strong>TOTAL AREA</strong></td>
<td><strong>11,690</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>


In 1990, the City of Vancouver Engineering Department reported 2140 kilometres of streets and lanes in the city. Table 3 shows the breakdown.

Table 3: Vancouver's Road Characteristics

<table>
<thead>
<tr>
<th>Road Type</th>
<th>concrete</th>
<th>asphalt</th>
<th>unimproved</th>
<th>TOTAL</th>
<th>approximate road surface width</th>
<th>TOTAL AREA (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial</td>
<td>8 km</td>
<td>341 km</td>
<td>24 km</td>
<td>373 km</td>
<td>15 m</td>
<td>559.5</td>
</tr>
<tr>
<td>Local</td>
<td>74 km</td>
<td>751 km</td>
<td>237 km</td>
<td>1062 km</td>
<td>10 m</td>
<td>1062.0</td>
</tr>
<tr>
<td>Lanes</td>
<td>2 km</td>
<td>474 km</td>
<td>229 km</td>
<td>705 km</td>
<td>6 m</td>
<td>423.0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>84 km</strong></td>
<td><strong>1566 km</strong></td>
<td><strong>490 km</strong></td>
<td><strong>2140 km</strong></td>
<td>-</td>
<td><strong>2044.5</strong></td>
</tr>
</tbody>
</table>

The British Columbia Assessment Authority advises that property tax is a major source of municipal revenue collected. In fact, "property tax provides approximately 40 percent of local government revenue in Canada" (B.C. Assessment Authority, 1992, p.1). In the case of Vancouver, property tax revenue in 1992 was budgeted to be $272,131,900 of the city's total revenue of $486,629,300 or 55.9 percent (City of Vancouver, 1992 Operating Budget, June 1992, p. 1). As Vancouver is a regional centre, it is made up of a higher proportion of commercial properties than other British Columbia municipalities. Since commercial properties are taxed at a much higher rate than residential properties, it is understandable that Vancouver receives a higher than average income from property taxes.

The actual value of roadway land has not been appraised by the B.C. Assessment Authority because it is exempt from property taxes. The 28 percent of Vancouver's land devoted to roads represents a sizeable amount of lost tax revenue which can be argued to be a direct cost of the road users. The automobile is a primary road user. The following equation shows how a very rough estimate can be made in determining the taxable revenue lost on account of streets.

If Tax Revenue of (Residential + Industry + Commercial) is 51% of land and generates a tax revenue of $272,131,900, then tax revenue of 28% of the land should be as follows:

\[
\frac{272,131,900}{0.51} \times 0.28 = 149,405,750.
\]

Although the above equation is simplified, it does give some indication of what sort of value roads are to the city. In actual fact, the 28 percent of the land devoted to streets is the city's right of way and includes sidewalks and boulevards, land that is not devoted entirely to the automobile.

---

2 Residential, industrial and commercial land uses are the primary land uses that generate tax revenue. In Vancouver, as depicted in Table 2, they respectively represent 39%, 8% and 4% of the land. The other land uses listed in Table 2 are generally not taxed or experience extremely low tax rates.
The Peat Marwick study has estimated the value of Vancouver's roadway at $18,692,289,000. This value is based on a municipal average assessed value of $6,237,000 per hectare (computed from Peat Marwick, 1993, p. B28b). The study acknowledges that assessed land value varies widely throughout the municipality. The average land value may not be representative of the neighbouring land values. In order to attempt a more accurate estimation of road land values, the city has been divided into three zones: Eastside, Westside and Downtown.

In calculating property taxes lost to the city, Table 4 assumes that Westside and Eastside are homogeneously residential and that the Downtown is homogeneously commercial. In fact, this is not the case. The residential areas are interspersed with commercial streets. Average Westside and Eastside commercial property values were calculated to be $20,600,000 per hectare and $8,690,000 per hectare respectively (see Appendix 1 - Compilation of B.C. Assessment Authority Figures). The roads servicing commercial properties located within residential communities would be valued and taxed at a much higher rate than roads servicing residential properties only. As commercial space makes up only 4 percent of Vancouver's area (see Table 2) and much of that would be located in the downtown area, it is felt that the omission of the non-downtown commercial strips does not detract severely from the estimation of tax revenue lost and in fact, as previously discussed, serves to naturally discount the value of road land in the city.

In Vancouver, according to Table 4, the tax revenue lost on account of roads is $100,558,322. This figure may be slightly exaggerated because it does not consider tax credits, such as the $10,000 credit given to businesses or the $1000 credit given to homeowners (BC Assessment Authority, 1993 Completed Roll Copy). Since the estimated amount of actual street area is 2044
hectares or 17 percent of the total Vancouver area, and since 51 percent of the land produced taxable income of $272 million, then if streets were taxable, the street taxable revenue would be $91 million. The $100 million figure will be used as the value of lost road land tax revenue in later calculations.

It is important to note that if the city could collect tax revenue for roads, the current rate of property tax would be reduced. Road land value expressed by lost tax revenue is unrealistic since the city would never receive tax revenue from the roads. In this thesis, road land value is expressed in terms of lost tax revenue because tax revenue is determined on an annual basis. The annual amount of lost tax revenue can be added to the annual expenditures in the city budget to determine a total annual automobile expense figure. The fictitious lost tax revenue value of $100 million for Vancouver roads is overwhelming. It demonstrates that if a system were devised to tax either road users or property owners adjacent to roads, then the property taxes on the currently taxed land parcels would decrease by roughly one-third ($272 million - $100 million).

As the Peat Marwick study describes, roads have many users including public transit vehicles, emergency vehicles, bicycles, and private automobiles so the computed lost tax revenue is not entirely attributable to the private automobile (Peat Marwick, 1993, p. B27). To determine the automobile's share, the other road users must be identified and the total cost discounted by the amount of their road use.

---

3 Based on the previous calculation this is derived as follows: $272 million/0.51 x 0.17 = $91 million.
Table 4: Vancouver Road Values

<table>
<thead>
<tr>
<th>Zone Within City</th>
<th>Land Area Excluding Streets &amp; Lanes (ha)</th>
<th>Percentage of Vancouver's Area (1)</th>
<th>Estimated area of Zone's Streets (ha) (2)</th>
<th>Approximate Land Value ($/ha) (3)</th>
<th>Value of Streets ($mill.)</th>
<th>1992 Tax Rate (4)</th>
<th>Approximate Tax Revenue Lost to City ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastside</td>
<td>3711.1</td>
<td>44.50%</td>
<td>909.80</td>
<td>$5,430,000</td>
<td>$4,940</td>
<td>0.33%</td>
<td>$16,484,551</td>
</tr>
<tr>
<td>Westside</td>
<td>3859.3</td>
<td>46.30%</td>
<td>946.60</td>
<td>$8,790,000</td>
<td>$8,321</td>
<td>0.33%</td>
<td>$27,764,327</td>
</tr>
<tr>
<td>Downtown</td>
<td>361.6</td>
<td>4.3% (9%)</td>
<td>184.01</td>
<td>$19,590,000</td>
<td>$3,605</td>
<td>1.56%</td>
<td>$56,309,443</td>
</tr>
<tr>
<td>Stanley Park</td>
<td>37.9</td>
<td>4.9% (0.2%)</td>
<td>4.09</td>
<td>$6,237,000</td>
<td>$26</td>
<td>0.00%</td>
<td>$0</td>
</tr>
<tr>
<td>Vancouver Total</td>
<td>7969.9</td>
<td>100.00%</td>
<td>2,044.50</td>
<td>$6,237,000</td>
<td>$12,752</td>
<td>-</td>
<td>$100,558,322</td>
</tr>
</tbody>
</table>


Notes:

(1) As the downtown street network is more concentrated than the rest of the city, and since Stanley Park has very little area devoted to roads, the two zones were combined and the percentage in brackets was used to estimate the area of land devoted to streets in these two zones.

(2) The zone’s street area is determined by multiplying the zone’s percentage of total city area by 2044.5 ha, the total area of Vancouver’s streets.

(3) Approximate land values for Eastside, Westside and Downtown are calculated in Appendix 1. The approximate land value of $6,237,000 used for Stanley Park and Vancouver Total is the Vancouver figure calculated and used by Peat Marwick (1993, p. B28b).

(4) The City of Vancouver 1992 Operating Budget lists the general residential tax levy and tax rate as $3.3368 per $1000 of taxable value and the business tax levy and rate as $15.6213 per $1000 of taxable value. As the roads within Stanley Park are within non-taxable parkland, these roads do have a land value but do not represent lost taxable income to the city.

(5) The estimated street area (column 4) of "Vancouver Total" does not equal the street area listed in Table 2 because in this case, only roadway is being considered, not the entire right-of-way.
One method of doing this is to identify what is truly excess road provided solely for the automobile. According to Bob Ross of the City Engineering Department, average city road lane widths are 3.0 to 3.35 metres wide (conversation with Bob Ross, Streets Engineering Department, City of Vancouver, Streets Engineer, February 1, 1993). The Lions' Gate Bridge has lanes that are 2.96 metres wide, a width reported to be dangerously narrow (British Columbia Transportation & Highways, 1992, p. 5). Personal observation verifies this. It has been proposed to widen the lanes to 3.55 metres (British Columbia Transportation & Highways, 1992, p. 5). For the purpose of this report, an average safe arterial lane width is identified as 3.25 metres and local road lane width as 3.0 metres.

If the number of automobiles used on city streets were decreased, the number of alternate transportation mode vehicles would presumably increase. The number and width of road lanes would probably remain constant. An arterial road in Vancouver tends to be 4 to 6 lanes wide. Those that are 6 lanes wide, allow one lane per direction to be used for parking during certain time periods. These "parking lanes" can be considered solely an automobile cost, as they are primarily used by moving automobiles during peak hours and by parked automobiles in the non-peak hours. A base arterial road system is thus calculated to be 4 lanes at 3.25 metres or 13 metres wide. Table 3 shows that Vancouver's arterial roads are 15 metres wide, or 2 metres wider than necessary.

Local roads currently allow two lanes of parking and one lane in the centre for vehicle movement. Two lanes are required for service and emergency vehicles. It is believed that an adequate local base service road would be 6.0 metres wide, that is, 2 lanes of 3.0 metre widths. Vancouver's local road system is 4.0 metres wider than necessary.
The Peat Marwick study suggests that a road of 7.0 metres is adequate to provide basic access (Peat Marwick, 1993, p. 28). This seems reasonable for local roads but not for arterial roads since, as discussed, a decrease in car use would provide a need for an increase in service and transit vehicles.

In North America, back lanes are a characteristic of newer Western cities. Calgary, Vancouver and Edmonton have them; Halifax, Ottawa and Montreal do not. Thus, it can be argued that back lanes are unnecessary. They act as service entrances for properties, a use that can certainly be managed by the front street. The city lane area of 423 hectares is a cost to the car. The excess road land devoted to the automobile is calculated as follows:

- Arterial roads: $2 \times 373 \text{ km} = 74.6 \text{ ha}$
- Local roads: $4 \times 1062 \text{ km} = 424.8 \text{ ha}$
- Lanes: $6 \times 705 \text{ km} = 423.0 \text{ ha}$

Total area of excess roads: $922.4 \text{ ha}$

As 922.4 hectares or 45 percent of Vancouver's existing roads can be attributed to the automobile, the cost of the car to Vancouver in lost taxable revenue of excess road land is $45,264,600. Cars also contribute to some of the costs of the remaining base service roads. This cost can only be determined by factoring out the car's proportion of road use from all road users.

The literature does not differentiate between types of vehicle traffic. It either attributes all road costs to the automobile (Hanson, 1992, p. 65) or sums the total cost of the maintenance,
construction and land value of the road to calculate the cost per vehicle kilometre which includes trucks (Peat Marwick, 1993, p. 25). It is novel to determine the car’s share of road costs.

Conversations with city and transit staff revealed information helpful in calculating the car’s share of road land costs. An average of 6 percent of vehicular traffic on Vancouver’s arterial roads is trucks and 2-3 percent is buses (conversation with Rob Hodgins, Vancouver Engineering Department, February 25, 1993). A BC Transit bus is 12 metres long (conversation with Robin Bjorge, BC Transit, Engineering Department, February 25, 1993) and an average personal automobile is estimated to be 4.8 metres long.

To simplify the calculations, it is assumed that buses and trucks are similar in length and have the length equivalent of 2.5 automobiles. For every 100 vehicles on the road, the 9 that are bus and truck traffic on arterial roads are comparable in length to 23 automobiles while 91 are automobiles. So, virtually, the equivalent of one-quarter of the vehicles on arterial roads is non-automobile traffic. Automobiles are thus assumed to use three-quarters of arterial road space.

Of the 560 hectares of arterial road in Vancouver, 74.6 hectares have been already assumed to be attributable to automobiles. Of the roughly 485 hectares of arterial road that is shared between cars and other vehicles, cars use 75 percent of the area. Thus, 364 hectares (75% x 485 ha) of the base arterial road service is used by automobiles. To determine the cost to Vancouver of the 364 hectares, or 18 percent of total Vancouver road area, the total $100 million (see Table 4) of lost tax revenue is multiplied by 18 percent. The automobile land cost of Vancouver’s basic arterial road service is $18,100,000.
To determine the car's portion of local road use, assumptions must be made. In the residential areas of Vancouver one block may contain twenty houses and each household may make an average of two car trips per day. Thus, the block experiences 280 automobile trips per week. As residences are serviced by garbage trucks, moving vans, delivery trucks, school buses and emergency vehicles, local roads are used to a minor extent by non automobile traffic. If a residential block is visited by four service vehicles per week, the car-length equivalent is 10 trips per week. Thus, 96 percent (280/290) of the vehicle trips on the block are made by automobiles. Of the 637 hectares that are considered basic local service (1062 ha - 425 ha), the automobile's portion is 611 hectares (96% x 637 ha) or 30 percent of total Vancouver road area. The automobile cost of Vancouver's local road service is $30,167,000.

In Vancouver, the cost of road land, in terms of lost tax revenue, that is attributable to the automobile is calculated to be $93,531,600. Just over half of this cost ($48 million) is devoted to the car's share of a basic access road system. The remainder is an excess automobile-only attributable cost.

4.1.2 Parking

Parking is a lucrative business for the City of Vancouver. Not only does it receive revenue from parking meters and parking fines but, on private property, if private individual parking garages are added or improved, the assessed value of the property increases and the city can collect more property taxes. Parking, however does have opportunity costs and severe societal implications associated with it. Parking is described by Martin Wachs as a transportation "cost item which
is priced so as to encourage rather than discourage auto use" (Wachs, 1981, p. 246). In this section the cost of parking to the city will be determined.

Parking is a mixed blessing to the city. The revenue generated by parking meters and parking fines is important, but the costs, which are often hidden, are great. Parking is either a public or private cost. The private costs of parking refer to the cost to car owners of parking their vehicles at home (i.e., maintaining the driveway), work (i.e., monthly parking fees) and play (i.e. parking fees at entertainment, recreation or shopping facilities) and the cost to businesses providing "free" or revenue parking facilities. North Americans are accustomed to "free parking" at non-downtown commercial and industrial facilities. "Free parking" is a misnomer. The actual cost of the parking, which includes land value and parking stall construction and maintenance, is passed to customers through hidden means like higher consumer good prices. The public cost of parking includes not only the land value, construction and maintenance of city owned parking lots but also decrease in the city's environmental quality as land becomes paved with parking which in turn encourages more car use.

The amount of money collected by Vancouver parking meters in 1992 was $4.2 million dollars. An additional $5.4 million dollars in parking fines was paid in 1992 by people who did not feed the parking meters (John Skinner, "Numbers," The Vancouver Sun, Saturday January 23, 1993, p. B1). The costs of parking to the city far outweigh these benefits.

In 1979, the City Engineering Department conducted a parking inventory study in the Vancouver Central Business District. In the Downtown Peninsula a grand total of 41,634 public and private sector owned parking spots were counted. This number includes 2659 curb side meter stalls and
1085 curb side free stalls. Of the remaining stalls, 16,320 were located in surface parking lots and the rest (31,824) were in parking structures. The inventory only includes employee and transient parking spaces. It does not include private residential parking lots and spaces (Downtown Parking Standards, 1979, p. 23). Although the study is old and the numbers have most likely increased and shifted to show a greater number of structure parking stalls, the point remains that parking spaces cumulatively have a huge space requirement of downtown land.

City of Vancouver owned parking spaces are found throughout the city. Parking is provided to staff and visitors of many city operations, including police, fire and municipal hall. The city operates parkades in the downtown that are leased to the Downtown Parking Corporation but are owned by the city. Tax exempt property in the City of Vancouver that is used for parks and recreation or non-market housing is also a source of city owned parking spots that have opportunity costs associated with them.

The Peat Marwick study defines Government subsidized parking as "the opportunity cost of land used by government facilities to provide free parking to employees and visitors, and the costs involved with financing and maintaining a parking lot" (Peat Marwick, 1993, p. B19). The study estimates that all parking provided by governments is likely to be on surface lots as the capital costs for such lots are considerably cheaper than other lots. Peat Marwick estimates the capital costs of building a parking stall at $1500 for surface level, $13,000 for above ground parkade and $30,000 for below ground parkade. The capital costs correlate to estimated annual depreciation, financing and maintenance costs of $360 per surface parking stall, $2,180 per above ground parkade and $4,830 per below ground parkade (Peat Marwick, 1993, p. B17).
Space for parking is a cost of the car in society. It is difficult to determine the line between city costs and society or individual cost. For example, if a family owns a single family home and chooses to convert the backyard into a four car parking garage, of what concern is that to the city? That family has expressed their priorities to the community. They would rather house their automobiles than have outdoor living space for themselves. But their choice does have an effect on the neighbouring environment. The neighbours have a lessened "green" view, the property has less natural ground for water absorption which may result in neighbourhood flooding problems and the greater provision for automobiles means more traffic in the area. On city owned property, the situation is magnified. If the city chooses to build parking lots over creating open space, the entire community is forced to live with that decision.

Schools and churches are tax exempt properties. It is common that these land uses devote some portion of the land to parking. The more parking spots on the land parcel, the less aesthetically pleasing the property becomes. More parking spots means less room for public amenities such as playgrounds or visually pleasing open space. The parking stalls on these properties can be linked to a decline in the neighbours' quality of life. Parking also has an environmental cost to society. Natural drainage is affected when land is sealed with asphalt.

According to staff at Guardian Angels Church in the West End, land used for religious purposes is tax exempt. The land on which the church sits is exempt from property taxes but the church owned land used for other purposes (parking, priest residence, etc.) is not. The church is able to pay reduced property taxes on some of the excess facilities if it can prove that the facility is used on occasion for religious purposes. Parking falls in that category as it is used by people parking to attend religious functions (conversation with church secretary, Guardian Angels
Church, February 17, 1993). In general, church parking is a cost to the church to install, maintain and pay city taxes.

In the case of schools, regardless of whether there are 100 parking spots on the property or just one, the entire property is tax exempt. Schools are under provincial domain and any cost of providing parking on school property is a provincial responsibility. There are no direct municipal costs associated with school property; there are, however, hidden costs such as environmental degradation which will be discussed in Chapter 5. The land value of the school parking stalls cannot really be considered because the land would be exempt from taxes regardless of what land use the school devoted it to. The same argument can be used for the churches. Church parking land, if devoted to another use, could still be considered land used for religious purposes and thus, still have reduction in taxes.

The cost of parking on both school and church properties could be described in terms of decline in quality of life because it encourages more traffic in the areas and is not as visually pleasing as other land uses. As it is impossible to put a price tag on such costs, the number of parking stalls located on school and church properties in Vancouver was not determined.

The remainder of this section will determine the cost of city provided parking.

4.1.2.1 City Housing

Parking associated with social housing is considered a cost to the city attributable to the automobile. Because North American society is hooked on the automobile, even people who
cannot afford market housing feel that automobiles are a necessity in their lives. If the automobile had less of an influence on society, the money spent towards parking in social housing could be devoted to other things like more units or other amenities for the residents.

According to Cameron Gray of the city’s Housing Group, there are 18,212 social housing units in the city in 323 housing projects. Of these, 27 percent are co-op units and 73 percent are non-profit seniors and family housing. Gray assumes that the split between seniors and family is half and half. Parking facilities in these projects assume the following parking stall to housing unit ratio:

<table>
<thead>
<tr>
<th>Type</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-op</td>
<td>1:1</td>
</tr>
<tr>
<td>Senior</td>
<td>1:6</td>
</tr>
<tr>
<td>Family</td>
<td>1:2</td>
</tr>
</tbody>
</table>

From the ratios it is calculated there are about 9349 parking stalls contained within the social housing projects. The average number of stalls per housing project is 29. Gray believes that 40 percent of the stalls are surface parking and the rest are underground parking stalls (conversation with Cameron Gray, City Housing Department, January 28, 1993).

Surface parking calculation:
40% of 323 projects = 129 projects @ 29 stalls each = 3747 parking stalls

Underground parking calculation:
60% of 323 projects = 194 projects @ 29 stalls each = 5620 parking stalls

According to personal calculations and information confirmed by Bob Ross of the City Engineering Department, right angle city parking stalls are 18 feet by 8 feet in area. Their access aisle is 22 feet wide (conversation with Bob Ross, Streets Engineering Department, City
of Vancouver, February 1, 1993). A parking spot is calculated to be 21.6 square metres. The Peat Marwick study uses a figure of 38.6 square metres as the area of parking spaces (Peat Marwick, 1993, p. B18). Although it is recognized that the parking entrance driveway has not been accounted for, the Peat Marwick figure still appears to be exaggerated. For ease of calculation purposes and to attempt to account for the entrance driveway, 25.0 square metres will be used as the area of one city parking stall.

Area used for parking in housing projects:

\[
\text{Surface} = 3741 \times 25 \text{ m}^2 = 93,525 \text{ m}^2 = 9.4 \text{ ha} \\
\text{Underground} = 5620 \times 25 \text{ m}^2 = 140,500 \text{ m}^2 = 14.0 \text{ ha}
\]

For surface lots, the capital costs of building each stall is $1500. This is translated to an annual depreciation, finance and maintenance cost of $360 per stall (Peat Marwick, 1993, p. B17). The residential tax rate is 0.33 percent (1992 Operating Budget, p. 1).

Cost of surface stalls:

\[
\text{Finance and maintenance: } 3741 \times $360 = $1,346,760 \\
\text{Land Value: } 9.4 \text{ ha} \times $6,237,000/\text{ha} = $58.6 \text{ million} \\
\text{Lost city tax revenue: } $58.6 \text{ million} \times 0.33\% = $193,472
\]

Again it must be noted that the calculation for lost tax revenue is used only as a method of assigning a dollar value to the city opportunity cost of parking. The social housing properties will not generate tax revenues as long as the properties remain social housing. So, if the parking

---

4 (18 ft x 8 ft) + (22 ft/2 x 8 ft) = 232 ft²;
1 ft² = 0.093 m²; 232 ft²/ ft² x 0.093 m² = 21.6 m²

5 This is the figure used by Peat Marwick (1993, p. B28b) as Vancouver's average assessed land value.
areas had another land use such as other dwelling units or open space for property residents, the property would remain tax exempt.

The costs of underground parking are calculated in the same manner as those for surface parking. Underground parking stalls are said to cost $30,000 to build. If the finance and maintenance costs of a surface stall is said to be $360 per year at a 10 percent interest rate, then the same costs for an underground stall are understood to be in the order of $3,200. The Peat Marwick study uses a figure of $4,830 which seems inflated (Peat Marwick, 1993, p. B17).

The cost of Vancouver's non-market housing underground parking is estimated to be as follows:

Finance & maintenance: 5620 stalls x $3200 = $17,984,000  
Land value: 14.0 ha x 0 = 0  

Other factors to consider when calculating city housing parking costs were found in the City Budget. Barclay Heritage Park, a co-op housing project, receives parking revenue of $45,000 (Statement of Revenues, Expenditures and Encumbrances, 1992, p. 64, hereafter referred to as "Statement of Revenues") and employee parking in non-market housing projects is given a budget of $800 (Statement of Revenues, 1992, p. 71). This parking net revenue of $44,200 must be subtracted from the calculated costs.

---

Assessed value of land is based on surface land. Anything built underground adds value to the land improvements but not to the land itself. Since, in the case of underground parking, the underground cannot be used for anything but parking there are no lost opportunity costs. That is, if the parking was not there, there would be nothing there. More housing units or public park land could not be built in the place of underground parking. The greater assessed value associated with underground parking could be argued to cost the city lost tax revenue. However, the city could only cash in on the improvements if the social housing became market housing and was no longer tax exempt. This is unlikely.
4.1.2.2 City Hall Employee and Visitor Parking

Clyde Hosein of the city’s Facilities Development Department provided information on the number of city owned parking stalls associated with City Hall (conversation with Clyde Hosein, January 27, 1993).

<table>
<thead>
<tr>
<th>Location</th>
<th>Stalls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambie Street Garage</td>
<td>230</td>
</tr>
<tr>
<td>10th Avenue</td>
<td>172</td>
</tr>
<tr>
<td>City Hall</td>
<td>179</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>581</strong></td>
</tr>
</tbody>
</table>

The Cambie Street Garage is located in an area with 0 FSR (floor space ratio). The garage is located underground and is able to maintain open space above it. As with the social housing, land value is considered to be $0 because nothing else can be located in its place. The annual cost to the city of the 230 underground city stalls is 230 x $3200 = $736,000 for financing and maintenance.

The remaining 351 parking stalls are in the form of surface parking. The 1992 City Budget lists an expense of $4800 for City Hall parking lot maintenance. In August, that budget had already been exceeded by $6953 (Statement of Revenue, 1992, p. 50). Using the business tax rate of 1.56 percent and the maintenance budget of $4800 already considered in the city budget, their cost is determined as follows:

\[ 351 \times 25 \text{ m}^2 = 8775 \text{ m}^2 = 0.88 \text{ ha} \]
\[ \text{Finance and maintenance:} \ (351 \times $360) - $4,800 = $121,560 \]
\[ \text{Land Value:} \ 0.88 \text{ ha} \times $6,237,000/\text{ha} = $5.49 \text{ million} \]
\[ \text{Lost city tax revenue:} \ $5.49 \text{ million} \times 1.56\% = $85,622 \]
4.1.2.3 Police Department

Parking provision for the police department is as follows (source: conversation with Clyde Hosein, Facilities Development, January 27, 1993):

<table>
<thead>
<tr>
<th>Type</th>
<th>Stalls</th>
</tr>
</thead>
<tbody>
<tr>
<td>official police vehicles</td>
<td>254</td>
</tr>
<tr>
<td>police member parking</td>
<td>351</td>
</tr>
<tr>
<td>visitor parking</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>617</strong></td>
</tr>
</tbody>
</table>

In determining the police parking cost, an amount of $1800 is subtracted from the maintenance calculation as this figure is included in the police budget under "maintenance of parking lot - Detention & Services Section" (Statement of Revenues, 1992, p. 120). If it is assumed that all police parking is in surface lots, then the cost calculations are as follows:

- \[617 \times 25 \text{ m}^2 = 15,425 \text{ m}^2 = 1.54 \text{ ha}\]
- Finance and maintenance: \((617 \times 360) - 1800 = 220,320\)
- Land Value: \(1.54 \text{ ha} \times 6,237,000/\text{ha} = 9.6 \text{ million}\)
- Lost City Tax Revenue: \(1.56\% \times 9.6 \text{ million} = 149,838\)

The "official police vehicle" stalls cause concern as to whether or not they really are an automobile cost. The question has been resolved with "yes." As has been previously stated, Vancouver's design has created the need for city services to use automobiles. The police force has just reverted to using a bicycle squad as it did at the turn of the century before cars had been introduced to Vancouver (Taylor, 1984). Thus, it is and was possible to patrol a densely populated city with minimal vehicle usage. Therefore, the total number of police parking stalls contributing to the cost of the automobile is left at 617.
Abandoned vehicles is another police parking cost. According to the police department there are now approximately 175 parking stalls in the abandoned vehicle lot (conversation with Abandoned Auto police department staff, February 4, 1993). Abandoned automobiles are towed away from city streets at a cost to the city. These costs will be considered under the social cost of policing the automobile. The police department accounts for $400 in their 1992 budget to maintain the abandoned vehicle parking lot (Statement of Revenues, 1992, p. 119). This value does not consider any financing or initial capital costs of the lot. The actual 1992 cost to the city for the parking consideration of abandoned vehicles are calculated as follows:

\[
175 \times 25 \text{ m}^2 = 4,375 \text{ m}^2 = 0.44 \text{ ha}
\]

Finance and maintenance: \((175 \times \$360) - \$400 = \$62,600\)

Land Value: \(0.44 \text{ ha} \times \$6,237,000/\text{ha} = \$2.7 \text{ million}\)

Lost City Tax Revenue: \(1.56\% \times \$2.7 \text{ million} = \$42,811\)

The Police Department budget also accounts for costs of $22,700 for Vancouver Municipality Regional Employee's Union (VMREU) parking and $189,900 for police employee parking; and revenues of $11,200 for police parking and $13,400 for VMREU parking (Statement of Revenues, 1992, p. 95). The shortfall is $188,000, another cost to the city on account of automobile parking.

4.1.2.4 Fire Department

Parking information for the city fire departments was not readily available. From personal observations, in Vancouver it appears that most firefighters park their personal vehicles on the streets adjacent to the firehall. This on-street parking has already been considered in street land values.
As firefighting vehicles are emergency vehicles that would most likely be in existence had the city been designed differently (i.e., not dependent on the automobile), the storage of these vehicles is not considered a cost associated with the private automobile. Firefighting vehicles differ from police vehicles in that firefighters are responding to emergencies while patrolling police officers are playing more of a "preventative" role in keeping the community safe. If police are responding to an emergency, it is often with the accompaniment of an ambulance or fire vehicle.

Cases, such as the West End Firehall, are noted where the firehall has a few on-site parking spaces. These spots rarely are occupied by cars. The firefighters prefer to use the land for recreation. Since the land has a more frequent alternate use, it has not been deemed as land allotted to the automobile.

Thus, on account of lack of data as well as justification not to consider firehall parking costs, these costs have been omitted.

4.1.2.5 Downtown Parking

In downtown Vancouver, the city controls eight parking lots which are operated by the Downtown Parking Corporation (DPC). Of these lots, six are owned by the city. These city-owned lots represent a total of 2017 parking stalls (City Engineering Report to Council, November 28, 1991). According to the Engineering Department, the DPC is operated like a private company and is required to pay city taxes (amounts to $737,600 per year Statement of
This operation makes money for the city (conversation with Bob MacDonald, Parking Engineer, City of Vancouver, January 11, 1993).

Table 5: Summary of Downtown Parking Corporation Facilities

<table>
<thead>
<tr>
<th>Address of DPC Property</th>
<th>Property Area (sq m)</th>
<th>Land Value ($1000's)</th>
<th>Improvements' Value ($1000's)</th>
<th>Number of Parking Stalls</th>
<th>Average land value ($/sq m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>535 Hornby</td>
<td>1,952</td>
<td>$9,943</td>
<td>$172</td>
<td>373</td>
<td>$5,094</td>
</tr>
<tr>
<td>523-535 Richards</td>
<td>1,673</td>
<td>$2,700</td>
<td>$2,900</td>
<td>347</td>
<td>$1,614</td>
</tr>
<tr>
<td>65-69 W Cordova</td>
<td>1,661</td>
<td>$1,161</td>
<td>$9</td>
<td>60</td>
<td>$699</td>
</tr>
<tr>
<td>101-107 E Cordova</td>
<td>1,417</td>
<td>$961</td>
<td>$1,144</td>
<td>376</td>
<td>$678</td>
</tr>
<tr>
<td>505 Beatty</td>
<td>4,802</td>
<td>$7,659</td>
<td>$244</td>
<td>524</td>
<td>$1,595</td>
</tr>
<tr>
<td>520 W Georgia</td>
<td>2,509</td>
<td>$5,400</td>
<td>$97</td>
<td>337</td>
<td>$2,152</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>14,014</strong></td>
<td><strong>$27,824</strong></td>
<td><strong>$4,566</strong></td>
<td><strong>2,017</strong></td>
<td><strong>$1,972</strong></td>
</tr>
</tbody>
</table>

Source: BC Assessment Authority, 1993 Completed Roll Copy

The B.C. Assessment Authority was able to provide data on the six city-owned downtown lots. The total land area of the lots is 14,014 square metres or 1.4 hectares. The total land value is assessed by the Authority to be $27,824,000. This value confirms the accuracy of the previously determined approximate downtown land value of $19.59 million per hectare since multiplying 1.4 hectares by $19.59 million yields $27.4 million. Table 5 summarizes the DPC information.

The majority of DPC parking stalls are located in above ground parkades. Only the 60 stalls in the 65-69 W. Cordova Street lot are located at surface level. Incidentally, average parking stall area can be calculated, using the Cordova Street lot particulars, to be 1661 square metres divided
by 60 stalls or 27.68 square metres per stall. This shows the previously used figure of 25.0 square metres per parking stall to be underestimated but reasonably accurate.

The capital costs of building an above ground parkade are estimated at $13,000 per parking stall (Peat Marwick, 1993, p. B17). Yearly financing at 10 percent and maintenance are estimated to be $1500 per stall. Again, the surface stall yearly cost is $360.

\[
\begin{align*}
\text{Above ground parkade stalls:} \\
2017 \times \$1500 &= \$3,025,500 \\
\text{Surface stalls:} \\
60 \times \$360 &= \$21,600 \\
\text{TOTAL} &= \$3,047,100
\end{align*}
\]

These yearly maintenance costs are not a cost to the city since DPC is operating the parking as their business. DPC is collecting revenue for parking and must pay the costs of maintaining the facilities.

Much of the cost of downtown parking to the city is in the form of opportunity costs. That is, if the DPC land was being used for other purposes, the land may have a higher assessed value and could thus, collect more taxes. Availability of parking in the downtown also has associated hidden costs to the city. Because parking is available, people will choose to drive cars downtown. If parking were not available, people would be forced to choose another transportation alternative. It can be debated that downtown parking leads to greater road congestion which in turn leads to both more road maintenance being required and an incentive to provide more roads leading to the downtown area. Greater road congestion also leads to lost time for drivers and greater air pollution.
Besides the DPC taxation revenue received by the city, the budget anticipates another $155,900 in "other parking property revenue" (Statement of Revenues, 1992, p. 11) which will be considered in determining the total cost of parking to the city.

4.1.2.6 Parks and Recreation Parking

Parks and recreation represent a large area of land within the city. According to GVRD Development Services, Vancouver has 1443 hectares or 12 percent of its land devoted to parks and recreation (Vancouver A to Z, p. 7). Of this land some is devoted to roads and parking. As mentioned, parking encourages car use. If parking is not provided, people will be forced to explore other transportation alternatives. Also, parking takes land away from other land uses.

The Park Board operates Vancouver’s parks and community centres which are tax exempt properties (conversation with Terry Clark, Public Relations Officer, Park Board, February 3, 1993). If parking spaces were not provided, the land would most likely be used for more park so park board parking is a city loss in opportunity rather than a loss in property taxes.

There are 8618 parking stalls and 26 bus stalls in the entire park and recreation system. The figure includes parking space provided at the 22 community centres (conversation with Terry Clark, February 3, 1993). The car parking represents an area of \((8618 \times 25 \text{ m}^2)\) 21.5 hectares or 1.5 percent of the city’s park and recreation land. At an average land value of $6,237,000 per hectare, the Park Board provided parking represents a land value of $134,100,000.
These 8618 parking stalls are assumed to all be surface parking (personal observation). Some of the Stanley Park and Queen Elizabeth Park stalls are on-street parking which are assumed to have the same yearly maintenance costs as the other stalls. The 1992 Park Board has a budget of $527,800 for asphalt and drainage maintenance (Statement of Revenues, 1992, p. 270). Thus, the annual finance and maintenance cost to the city is:

\[(8618 \times \$360) - \$527,000 = \$2,575,480.\]

Note that this figure is exaggerated because the number of Park Board on-street parking stalls is unknown and the maintenance of these stalls will be considered again under road infrastructure costs.

Some of the Park Board stalls are revenue stalls. The 1992 expected Park Board parking meter revenue is $332,500 less some parking rental fees of $7300 for a total parking related revenue of $325,200 (Statement of Revenues, 1992, pp. 296-298).

Park Board parking represents a cost to the city of $2,575,480 less $325,200 for a total of $2,250,280. The land opportunity costs increase the figure. As parkland tends to be located in residential areas, the land opportunity costs are determined using the residential taxable rate of 0.33 percent.

One note of encouragement is that in 1993, the Park Board has decided to eliminate on a trial basis several Stanley Park on-street parking to devote the area to bicycle use (conversation with Terry Clark, February 3, 1993). This represents a step in the direction of discouraging car use in city parks.
4.1.2.7 Parking Meters

Parking meters are located on streets throughout the downtown and commercial areas of the city. The costs associated with parking meters as well as the revenue gained from them belong to the city. There are no land costs associated with Vancouver’s parking meter program because on-street parking land costs have been accounted for under the road cost section.

Table 6 shows that 4 million dollars of city funds are devoted to parking meters and the enforcement of city parking by-laws. However, revenue from parking is an important source of city funds. In 1992, the revenue from parking meters and parking permits was expected to be $4,453,200 (Statement of Revenues, p. 12). The parking meter program made the city a profit of $434,000 in 1992.

This thesis aims to determine the costs of the car and not the benefits as well. In this section, the benefits of the parking meters have been included because they are such important direct revenues of the car. Including the cost of the parking meter program without including the associated revenue would be misleading. If no monetary benefits were reaped from parking meters, the meter program would likely not be in force and there would be no parking meter costs.

The parking meter program and parking enforcement administration are under the jurisdiction of the city’s Engineering Department whereas parking revenues are listed in the revenue section of the city budget. Table 6 summarizes city parking meter budget information.
Table 6: Parking Meter Budget Information

<table>
<thead>
<tr>
<th>Budget Information</th>
<th>Budget 1992</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking meter program</td>
<td>$1,598,600</td>
<td>- includes revenue of $52,800 for parking decal fees</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- includes an employee auto allowance $800</td>
</tr>
<tr>
<td>Parking administration</td>
<td>$639,800</td>
<td>- includes an employee auto allowance of $400</td>
</tr>
<tr>
<td>Other parking enforcement</td>
<td>$1,780,800</td>
<td>Although, the operating budget is a credit of $270,700 (transfer from parking meter costs), the 1992 new and non-recurring costs for new installations and meter rate review was the same cost to the city, leaving a net of 0.</td>
</tr>
<tr>
<td>parking meters</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>$4,019,200</td>
<td>This budget represents 7.0% of the entire 1992 Engineering Department budget of $57,212,200.</td>
</tr>
<tr>
<td>Parking enforcement and administration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revenue from parking meters and parking permits was $4,453,200</td>
<td>($4,453,200)</td>
<td>- includes parking meter revenue ($4,336,200) and parking permit revenue ($117,000)</td>
</tr>
<tr>
<td>Net difference between costs and revenues</td>
<td>($434,000)</td>
<td>The city parking meter program made the city a small profit</td>
</tr>
</tbody>
</table>

Source: Statement of Revenues, Expenditures and Encumbrances, City of Vancouver, cycle 08, August 6, 1992.

4.1.2.8 Parking Cost Summary

In 1992, parking cost the City of Vancouver approximately $28 million dollars in terms of finance and maintenance, lost tax revenue and other costs. Parking revenues were $6 million dollars. The total cost of parking facilities to the City of Vancouver was $22.5 million. City controlled surface parking lots consume 35 hectares of land. Table 7 summarizes the cost findings and Table 8 summarizes the total city land area devoted to parking.
Table 7: City Parking Costs

<table>
<thead>
<tr>
<th>Division of Parking</th>
<th>Finance &amp; Maintenance of Surface Stalls</th>
<th>Land Value of Surface Stalls ($ million)</th>
<th>Lost Tax Revenue (Opportunity Cost)</th>
<th>Finance &amp; Maintenance of Underground Stalls</th>
<th>Other Costs less Revenue</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing</td>
<td>$1,346,760</td>
<td>$58.63</td>
<td>$193,472</td>
<td>$17,984,000</td>
<td>($44,200)</td>
<td>$19,480,032</td>
</tr>
<tr>
<td>City Hall</td>
<td>$121,560</td>
<td>$5.49</td>
<td>$85,622</td>
<td>$736,000</td>
<td></td>
<td>$943,182</td>
</tr>
<tr>
<td>Police</td>
<td>$220,320</td>
<td>$9.60</td>
<td>$149,838</td>
<td>$188,000</td>
<td></td>
<td>$558,158</td>
</tr>
<tr>
<td>Abandoned vehicles</td>
<td>$62,600</td>
<td>$2.74</td>
<td>$42,811</td>
<td></td>
<td></td>
<td>$105,411</td>
</tr>
<tr>
<td>Fire</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DPC</td>
<td></td>
<td>$27.82</td>
<td></td>
<td></td>
<td></td>
<td>($737,600)</td>
</tr>
<tr>
<td>Parks &amp; Recreation</td>
<td>$2,575,480</td>
<td>$134.10</td>
<td>$442,515</td>
<td></td>
<td></td>
<td>$2,692,295</td>
</tr>
<tr>
<td>Meters</td>
<td></td>
<td></td>
<td>($434,000)</td>
<td></td>
<td></td>
<td>($434,000)</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td>($155,900)</td>
<td></td>
<td></td>
<td>($155,900)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$4,326,720</td>
<td>$238.39</td>
<td>$914,257</td>
<td>$18,720,000</td>
<td>($1,508,900)</td>
<td>$22,452,077</td>
</tr>
</tbody>
</table>

Source: Compiled from thesis sections 4.1.2.1 through 4.1.2.7 and Statement of Revenues, Expenditures and Encumbrances, City of Vancouver, cycle 08, August 6, 1992.

Table 8: Parking Land Area

<table>
<thead>
<tr>
<th>Division of Parking</th>
<th>Total Land Area Devoted to Surface Parking (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Housing</td>
<td>9.40</td>
</tr>
<tr>
<td>City Hall</td>
<td>0.88</td>
</tr>
<tr>
<td>Police Department</td>
<td>1.54</td>
</tr>
<tr>
<td>Abandoned vehicles</td>
<td>0.44</td>
</tr>
<tr>
<td>Downtown Parking</td>
<td>1.40</td>
</tr>
<tr>
<td>Parks &amp; Recreation</td>
<td>21.55</td>
</tr>
<tr>
<td>TOTAL</td>
<td>35.21</td>
</tr>
</tbody>
</table>

Source: Compiled from thesis sections 4.1.2.1 through 4.1.2.7 and Statement of Revenues, Expenditures and Encumbrances, City of Vancouver, cycle 08, August 6, 1992.
4.2 Infrastructure Costs

Infrastructure costs are direct costs paid by the municipality to provide and maintain the facilities needed to operate automobiles in the city. Since most of Vancouver's roads have been in existence for some time, their cost of construction has been forgotten. However, if a disaster were to occur and the roads needed to be rebuilt, the City of Vancouver Engineering Department estimates the city's total replacement value of the road system (including bridges) at over $1.5 billion dollars (Capital Plan 1990-1993, Vancouver Engineering Department, p. B8).

4.2.1 Infrastructure Maintenance Costs

The Peat Marwick study surmises that new road construction is initiated in response to increased traffic volumes (Peat Marwick, 1993, p. B21). The same rationale can be applied to road maintenance costs. The vehicular traffic of local roads is limited to predominately automobiles and bicycles. Thus, it can be deduced that automobiles account for the bulk of local road maintenance. On arterial roads, commercial trucks and transit vehicles add to the usual traffic endured. As car usage increases then naturally so must the car infrastructure usage. Although cars are not entirely responsible for arterial road maintenance they do contribute to it.

Presently, a new bridge is being built in Richmond that will span the North Arm of the Fraser River. The four lane bridge is budgeted as a $39 million dollar project: $5 million being contributed by the province, the rest by the municipality of Richmond. The costs are broken down as $22 million for the bridge itself; $10 million for land acquisition, pedestrian ramp and engineering; and the remaining $7 million for roadwork. The bridge is novel in that it includes
two sidewalks for pedestrians and leisure cyclists to share as well as two paved shoulders for commuter cyclists (Keith Morgan, "Clearing Congestion: Building a Better Bridge," *The Province*, February 5, 1993, p. C4). Thus, the crossing has been designed for the automobile as well as for alternate forms of transportation. However, the notion of the bridge was conceived by automobile congestion and had it not been for a perceived need by automobiles, the bridge would not be built. In the case of this new bridge, the $39 million can be attributed as an automobile cost as it can be contended that the pedestrian and bicycle facilities would not be in place without the initial capital expenditure of the automobile infrastructure. This example indicates how great an expense new automobile infrastructure is on a municipality.

In order to determine the costs associated with Vancouver automobile infrastructure maintenance, the City's Public Works Department (engineering) budget was examined. Table 9 summarizes the organizations within the engineering budget that are believed to be automobile related.

Table 9 shows that automobile infrastructure cost Vancouver $13,031,300 in 1992. The Peat Marwick study lists Vancouver road maintenance cost in 1991/92 as $35,469,000 less municipality parking fines of $6,299,000. The study admits that the costs summarized may be overstated and include certain public works costs (Peat Marwick, 1993, p.B26b). As the study does not give a breakdown of the municipality maintenance costs it is difficult to compare the two results.
### Table 9: Automobile Infrastructure Costs

<table>
<thead>
<tr>
<th>City Budget Department</th>
<th>Budget 1992</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation division - administration</td>
<td>$1,608,700</td>
<td>- includes $6300 for auto allowance</td>
</tr>
<tr>
<td>Transportation engineering and planning</td>
<td>$32,800</td>
<td>- includes a small revenue of $400 for bicycle plan book sales which indicates that it is not entirely automobile oriented</td>
</tr>
<tr>
<td>Traffic management budget</td>
<td>$132,200</td>
<td>- approximately half of this budget is devoted to maintenance of computer mapping which is a traffic light management car cost</td>
</tr>
<tr>
<td>Traffic operations - administration budget</td>
<td>$418,300</td>
<td>- includes revenues for $12,000 for &quot;credit from MVA claims&quot; and $45,100 for &quot;supervision-outside work&quot;</td>
</tr>
<tr>
<td>Traffic signal maintenance</td>
<td>$996,100</td>
<td>- budget is transferred to electrical engineering and administered under &quot;Traffic Signal Budget&quot; (p. 149)</td>
</tr>
<tr>
<td>- includes maintenance damage repairs to signals and maintenance of the electronic traffic signal controls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road marking and traffic control device maintenance</td>
<td>$519,300</td>
<td>- road markings include barricades, railings, traffic islands, traffic lines and traffic counters</td>
</tr>
<tr>
<td>Traffic sign budget</td>
<td>$745,500</td>
<td>- includes overhead for new street signs in 1992 of $41,000.</td>
</tr>
<tr>
<td>- excludes non-automobile related costs: street name signs $97,600; transit system signing $15,600; and maintenance of bicycle routes $6,200.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- the total divisional budget as listed by city finance department is $864,900</td>
<td></td>
<td>- combining the above 7 noted budgets produces the entire engineering transportation division budget of $4,572,300</td>
</tr>
<tr>
<td>Automobile portion of Streets engineering budget</td>
<td>$4,984,500</td>
<td>- total budget for division is $12,037,300</td>
</tr>
<tr>
<td>- includes street ice and snow control ($416,300), maintenance of bridges and viaducts ($420,300), roads and lanes maintenance ($1,509,900), some variable maintenance for crack-filling and pavement patching ($2,638,000)</td>
<td></td>
<td>- excludes streets operation budget (see next row), maintenance of non-automobile related street features (such as bus stops and shelters $47,000, and remaining general maintenance $1,325,500), some variable maintenance for sidewalks, curbs, and drain tiles ($2,487,500)</td>
</tr>
<tr>
<td>Streets operation budget</td>
<td>$3,192,800</td>
<td>- includes $9,100 for auto allowance and $16,400 for automobile maintenance</td>
</tr>
<tr>
<td>Total Automobile allowance from all other engineering divisions</td>
<td>$83,800</td>
<td>- see discussion in text</td>
</tr>
<tr>
<td>Total automobile maintenance from all other engineering divisions</td>
<td>$317,300</td>
<td>- see discussion in text</td>
</tr>
<tr>
<td>TOTAL car related engineering budget</td>
<td>$13,031,300</td>
<td></td>
</tr>
<tr>
<td>TOTAL ENGINEERING DEPARTMENT BUDGET</td>
<td>$57,212,200</td>
<td>Thus, 22.7% of the city’s engineering budget is devoted to the maintenance and provision of car-related infrastructure</td>
</tr>
</tbody>
</table>

Source: Compiled from *Statement of Revenues, Expenditures and Encumbrances*, City of Vancouver, cycle 08, August 6 1992)
Table 9 demonstrates how considerable both the cost of the automobile is to the Engineering Department and also how important streets are to society in general. For example, approximately half of the street operation budget is devoted to non-automobile infrastructure. That is, maintenance required for sidewalks, curbs and tile drains as well as street furniture, walkways and transit stops and shelters.

Automobiles account for the majority of costs in the traffic sign division operating budget. Only 13.8 percent ($119,400) of the traffic sign budget is not attributable to the automobile. The obvious non-auto costs relate to transit system signing and maintaining bicycle routes. Another non-auto cost is street name signs. These are a societal cost of identifying the streets of the city. People, and not automobiles, need the signs in order to locate other people and services. Signage considered a cost attributable to the automobile is signage that is required to control and direct the movement of automobiles.

Within the Engineering Department there are several divisions that are not automobile related such as sewers engineering. However, within these non-auto related engineering budgets are often staff automobile allowance and automobile maintenance expenses. These expenses are direct automobile costs and clearly demonstrate the automobile’s powerful influence on Vancouver. The historical dependence on the automobile prompted the city’s spread into a large geographical area. Now in trying the manage and maintain the city, staff in all city departments need to travel some distance to carry out all of their job duties. Employees are compensated with an automobile allowance for out-of-pocket car expenses like gas and personal vehicle wear and tear. In other cases, the city owns vehicles that are used for city business. The maintenance of these vehicles is the city’s responsibility. These extra automobile expenses
indicate how acceptable the automobile has become as a means of assisting in work duties. Had the city not been designed for the automobile, city employees would possibly move around the region in a different manner like by foot or bicycle.

So as not to double count automobile allowance and automobile maintenance costs in Table 9, only such expenses reported in non-auto related engineering functions were included in the table. The same expenses found within auto related engineering budgets are included in those budgets with a note made in the "comment" column of the table.

One engineering budget that is considered partially attributable to the automobile is street lighting. The engineering street lighting maintenance and general expenses budgets total $3,955,400 (Statement of Revenues, 1992, p. 145). This budget has not been included in the Table 9 as it is believed that street lighting is not strictly an automobile expense. The assumption being that if society did not use automobiles, street lights would still be used for the safety and security of pedestrians and cyclists. There are some street lights possibly in existence because they are required to light areas prone to automobile accidents. It is believed that in Vancouver such lights are rare. Street lights used primarily by automobiles are generally located on freeways at major cloverleaf or other intersection areas. Since Vancouver has only one freeway, the Cassiar Connector, which is provincially owned, the number of automobile-only street lights is insignificant. Thus, the street light budget is discussed here for interest sake only and will not be included as a part of the automobile’s cost to the city.

In 1993, Vancouver experienced a harsh January in terms of cold temperatures and heavy snow fall. These conditions have done considerable damage to Vancouver’s roads. According to
Vancouver City Engineer Dave Rudberg, "Vancouver's aging and heavily travelled street system is susceptible to potholes during severe cold spells." Pothole damage on local residential streets is reported to be worse than on more heavily travelled routes because the local roads have not been upgraded since their original construction (Sean Magee, "Streets suffer under severe winter cold," The Vancouver Courier, January 13, 1993, p. 8). This damage may be a result of winter weather but it is compounded by automobile use on streets. As predicted earlier, local streets require less maintenance on account of lower amounts of vehicular traffic. At first glance Magee's article seems to contradict the prediction. However, upon further reflection, it is realized he actually confirms the prediction. Since local roads experience lower traffic counts, they have not required upgrading since their original construction. The result of 1993's severe winter is that Vancouver will likely exceed its budgets for both snow removal and street repairs.

The severity of this winter indicates that Table 9 records the minimum infrastructure cost of the automobile. It seems that emergencies and unexpected maintenance will force the costs to rise.

In 1992, automobile infrastructure costs for maintenance alone, as noted in Table 9, were in the order of $13 million dollars. This figure is not entirely fair because, as with road land costs, it assumes that automobiles are the sole vehicles using the infrastructure. The true automobile cost of the infrastructure is determined by factoring out the car's proportion of road use from all road users.

As previously discussed, the literature does not differentiate between types of vehicle traffic so all infrastructure maintenance costs are reported, not just the automobile's share. The calculations made to determine the car's share of costs in this thesis are original. As with
determining the car’s share of land costs, assumptions must be made to estimate the car’s share of road maintenance costs. Again conversations with city and transit staff were helpful in determining a method of calculation.

A BC Transit bus has a net weight of 11,370 kilograms, a gross weight of 16,485 kilograms and has a single axle (conversation with Robin Bjorge, BC Transit, Engineering Department, February, 25, 1993). An average personal automobile is estimated to weigh 1400 kilograms. A truck can weigh more than a loaded bus but generally is less damaging to road surfaces because its load is spread over more axels (conversation with Bob Ross, Streets Engineering Department, City of Vancouver, February 25, 1993).

It is the heavy buses and trucks that cause the most damage to road surfaces. Thus roads designed to regularly carry heavy vehicles must be constructed to be about four times thicker than local roads (conversation with Bob Ross, Streets Engineering Department, City of Vancouver, February 25, 1993). Also, to mitigate damage caused by heavy buses regularly waiting at the same road spot, concrete pads are placed in the asphalt at bus stops. The concrete, which is more expensive than asphalt, is an expense attributable to buses (conversation with Clive Rock, Manager of Engineering, City of Richmond, February 25, 1993). It is assumed from Table 9 that this cost has already been considered as the automobile portion of the streets engineering budget excludes maintenance of bus stops and shelters.

Other significant information is as follows:

- In the United States, local roads are considered under used as "they provide 80 percent of the lane miles of roadway nationally" but carry only 15 percent of vehicle mileage (Cervaro, 1989, cited in Hanson, 1992, p. 66).
In Vancouver, 73 percent of the road lane area is made up of local roads and back lanes.\(^7\)

Although maintenance costs of local roads may be presumed to be insignificant based on Magee’s information that most of Vancouver’s lightly travelled roads have not been upgraded since original construction (Magee, *The Vancouver Courier*, January 13, 1993), some maintenance must occur, like for example, road repair after a severe winter causes road pavement upheaval. The U.S. finding of local roads carrying 15 percent of vehicle mileage can be used to estimate local road maintenance costs. Of the $13 million dollars spent on infrastructure maintenance, 15 percent is assumed to occur on local roads which translates to $1.95 million. Since local roads are not constructed to accommodate heavy vehicles, and since the heavy vehicle use is minor, the total $1.95 million is considered attributable to automobiles.

To simplify the calculations of arterial road maintenance, it is assumed that buses and trucks are similar in weight and have a weight equivalent of 10 automobiles.\(^8\) The weight of the 9 percent of bus and truck traffic on arterial roads is comparable to the weight of 90 automobiles. So, non-automobile traffic weight is similar to the weight of the 91 percent of automobile traffic on arterial roads. Automobiles are thus assumed to contribute to one-half of arterial road maintenance.

\(^7\) Derived from Table 3 as follows: 1062.0 ha (local roads) + 423.0 ha (lanes) = 1485 ha. 1485 ha/2044.5 ha (total road area) = 72.6%.

\(^8\) This is based on the assumption that cars weigh 1400 kg and buses weigh 14,000 kg (i.e., between 11,370 kg and 16,485 kg).
If local road maintenance is $1.95 million, the remaining budget for arterial road maintenance is $11.05 million. Half of this budget, or $5.5 million can be attributed to cars. The total car attributable road maintenance cost is 7.45 million dollars.

### 4.2.2 Infrastructure Capital Costs

The true cost of infrastructure should also consider an amortized amount of the original capital costs of providing the infrastructure. For example, in 1984, city electors authorized a $35 million contribution for the construction of the Cambie Bridge. The contribution was made over a period of several years. Other funds from senior governments were also contributed (Financial Statements and Annual Report, 1991, p. 84).

The city considers recent acquisition expenses in its "debt charges" and "capital purpose" budgets. The 1992 budget for such expenses was approximately 80 million dollars (Statement of Revenues, 1992, pp. 376-378). The 1991 budget indicates that 25 percent of the capital expenditure budget was spent on streets, lanes, sidewalks and Cambie Bridge. The 1992 new infrastructure expenditures are thus estimated to be $20 million.

The Peat Marwick study similarly found the 1991/2 Vancouver municipal capital road construction costs to be $19,172,000 or 19.6 percent of all the regional municipality capital construction costs (Peat Marwick, 1993, p. B24b). The net municipal costs for the region, which combined interest expenses on historical capital costs and 1991/2 municipal capital costs; and deducted provincial subsidies, was determined to be $345.52 million (Peat Marwick, 1993,
Vancouver’s share (19.6 percent of $345.52 million) is calculated to be $67.8 million.

To determine the car’s share of capital construction costs of $67.8 million, facts and assumptions of road thickness and cost must be made. The City of Vancouver uses an eight inch standard asphalt thickness on arterial roads and a two inch asphalt thickness on local roads. Arterial roads that carry buses are asphalted to a nine inch thickness (conversation with Bob Ross, Streets Engineering Department, City of Vancouver, February 25, 1993). So, certainly one inch of asphalt is not attributable to automobiles on arterial roads. For ease of calculating road construction cost, it is assumed that all Vancouver arterial roads carry buses so all are made 9 inches thick. It is further assumed that each inch of road thickness has the same cost to build. That is, the average cost per inch of pavement thickness is assumed rather than the marginal costs of each inch of pavement thickness. Thus, each hectare of arterial road construction is expected to cost 4.5 times the comparable construction of a two inch thick local road.

If each hectare of arterial road is 4.5 times more expensive than each hectare of local road, then the cost of constructing 560 hectares (from Table 3) of arterial road is equivalent to the cost of constructing 2520 hectares (4.5 x 560 ha) of local road. There are 1485 hectares of real local road (including lanes) in Vancouver. So, 63 percent of the $68 million capital cost of roads is

---

Note: this figure does not consider "recoveries" as the Peat Marwick study did because the municipality of Vancouver did not report any.
spent on arterial roads. The figures work out to be $42.8 million for arterial roads and $25.2 million for local roads.\(^{10}\)

To accommodate heavy vehicles, arterial roads are constructed to be one inch thicker than needed for solely automobile use. One-ninth of the arterial road thickness is not attributable to cars. Once arterial road area has been converted to equivalent local road area cost, the cost of each hectare of road construction can be determined as follows:

\[
\begin{align*}
1485 \text{ ha} + 2520 \text{ ha} &= 4005 \text{ ha} \\
$68 \text{ million}/4005 \text{ ha} &= $0.017 \text{ million/ha}
\end{align*}
\]

**Arterial Roads:**
\[
2520 \text{ ha} \times $0.017 \text{ million/ha} = $42.8 \text{ million}
\]
The extra inch of asphalt attributed to transit has a cost of: $42.8 million/9 inches
\[
= $4.8 \text{ million/inch}
\]
Remaining arterial road cost: $42.8 million - $4.8 million = $38 million

**Local Roads:**
\[
1485 \text{ ha} \times $0.017 \text{ million/ha} = $25.2 \text{ million}
\]

Again, since other traffic uses the city roads, the car's share of road use must be determined. This share is determined by referring to the calculations made in section 4.1.1. Buses and trucks were calculated to use 25 percent of the 485 hectares of arterial road used by all traffic. This works out to be 121 hectares and 21.6 percent of the total (560 ha) amount of Vancouver arterial road.

**Arterial Roads:**
Other traffic accounts for: 21.6% x $38 million = $8.2 million
Car's share: $38 million - $8.2 million = $29.8 million

\(^{10}\) 1485 ha of real local roads and lanes + 2520 ha of equivalent-to-local arterial roads = 4005 ha.
2520 ha/ 4005 ha = 63% of costs spent on arterial roads.
Capital costs of arterial roads is 63% x $68 million = $42.8 million; and of local roads is 37% x $68 million = $25.2 million.
For local roads, automobiles were found to use 611 hectares as basic service, 425 hectares as excess service and all of the lane area (423 ha). The car uses 1459 hectares of the total 1485 hectares of local road in Vancouver or 98 percent.

Local Roads:
Cars account for: 98% x $25.2 million = $24.8 million

The total automobile share of road capital cost is calculated to be $54.6 million dollars.\(^{11}\)

### 4.3 Social Costs

Pollution Probe identified policing and court costs as direct social costs of the automobile (*Pollution Probe*, 1991, p. 44). The regulation of parking and driving infractions is both costly and time consuming to the court system and cannot be omitted in a comprehensive automobile cost study. Courts are, however, under provincial jurisdiction so their costs are not included in this study. Policing costs are a direct municipal responsibility and thus, Vancouver’s car-related police expenses are reported in Table 10.

As noted in Table 10, automobiles account for 5 percent of the entire Vancouver Police Department operation costs. The car does contribute some revenue to the city, often in the form of fines administered to car owners. These car-related revenues are included in the budgets. The 4.5 million dollar police cost represents the shortfall between car-related expenses and revenues.

\(^{11}\) Local road capital cost of $24.8 million + arterial road capital cost of $29.6 million.
Table 10: Automobile Related Police Costs

<table>
<thead>
<tr>
<th>Budget Information</th>
<th>1992 Budget</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abandoned Auto</td>
<td>$38,100</td>
<td>- includes revenues of $108,000 for fees and sale of vehicles</td>
</tr>
<tr>
<td>Sale of Other Impound Vehicles</td>
<td>$12,000</td>
<td>- this revenue is included in the &quot;Detention and Services Section&quot; budget</td>
</tr>
<tr>
<td>Automotive</td>
<td>$4,272,100</td>
<td></td>
</tr>
<tr>
<td>General Operating - Towing</td>
<td>$30,000</td>
<td></td>
</tr>
<tr>
<td>Staff Automobile Allowance</td>
<td>$19,200</td>
<td>- for a discussion of this automobile cost see section 4.2 - &quot;infrastructure costs&quot;</td>
</tr>
<tr>
<td>Traffic &amp; Auxiliary Division</td>
<td>$27,200</td>
<td>- as of August 6, 1992, the unencumbered balance was 47,747-</td>
</tr>
<tr>
<td>Traffic Section</td>
<td>$132,900</td>
<td>- as of August 6, 1992, the unencumbered balance is 2,342,759-</td>
</tr>
<tr>
<td><strong>Total police car related costs</strong></td>
<td><strong>$4,507,500</strong></td>
<td></td>
</tr>
<tr>
<td>Total police department budget</td>
<td>$90,363,100</td>
<td>- automobile related policing costs make up 5% of the Police Department’s budget</td>
</tr>
</tbody>
</table>


It has been questioned whether police vehicles should be considered a cost attributable to the automobile. After all, these vehicles are necessary to protect the citizens of Vancouver from crime and violence. Police vehicles are not only used to patrol the city as a preventative measure of crime but also are needed to reach accident scenes and emergencies quickly. It is felt that the police automobiles are made necessary by the fact that automobiles have influenced the city’s pattern of growth. For that reason, police vehicles are included as automobile costs to the city.
It is interesting to note that both the Traffic and Auxiliary Division and the Traffic Section of the Police Department well exceeded their allotted 1992 budget. In the case of the Traffic Section the 2.3 million dollar amount was considerable. This is an indication that the rising costs of policing the automobiles of Vancouver are becoming more significant.

The abandoned auto section of the Police Department is of interest. The Police Department must remove abandoned automobiles from city property but has no jurisdiction to penalize the owners of the abandoned automobiles. In 1991, more than 2800 abandoned cars were taken off city streets at a cost to the city. This number is likely to increase on account of higher automobile insurance rates and a newly introduced "AirCare" system, which requires vehicle owners to pass an annual vehicle emissions test before the vehicle can be insured. Owners of "junky" vehicles may feel their personal cost of operating the vehicle has become too high to be worthwhile (Sean Magee, "Skyrocketing insurance rates making owners jetison [sic] junkers", The Vancouver Courier, October 14, 1992, p. 5). An important note is that an increase of automobile owner's out of pocket automobile expenses can have a direct effect on also increasing the city's subsidy expenses as in the case of the city's responsibility to deal with abandoned automobiles.

4.4 Human Health Costs

Pollution Probe identifies expenditures on road safety and health care costs as direct government expenditures on the automobile. Both costs tend to be borne by federal and provincial governments rather than municipalities. For road safety, the annual 1990 federal government
spending on road safety, research and prevention of accidents testing was $15,161,000 (cited in Pollution Probe, p. 32). Based on population, B.C.'s share is approximately $1.8 million. However, municipal expenditures on road safety in Vancouver are in the form of maintenance and construction of road infrastructure. These costs are covered in section 4.2, "Infrastructure Costs". In fact, Vancouver electors approved a three year capital financing plan in November 1990, for streets and other public works that included the following proposals: "to improve the street system to reduce accidents" (Financial Statements and Annual Report, December 1991, p. 86).

Automobile accidents are a common occurrence in North America and have the effect of adding more patients to an already highly used hospital system. In 1991, Vancouver recorded 39,762 accidents resulting in 44 deaths and 7,953 injuries ("Vancouver's traffic police to crack down at intersections," The Vancouver Sun, November 14, 1992). Pollution Probe determined automobile related health costs in two manners. The first, through a breakdown of payments made to Ontario's medical insurance companies and the second by summing the costs as the path of an accident victim was traced through the hospital system. The conclusion of Pollution Probe study was that in 1987 the cost of automobile accidents to the Ontario health care system was in the order of $80 million dollars (Pollution Probe, p. 34). Presumably since B.C.'s population is one-third of Ontario's, the cost of automobile related accidents to the B.C. health care system would be in the $30 million dollar range.

An investigation into Vancouver's Health Department budget reveals that much of the $11,086,200 budget (the excess after provincial and other recoveries are considered) is related
to clinic and community care facilities. Only the $2,653,700 environmental health budget, can be partially considered a direct cost to the city by automobiles (Statement of Revenues, 1992, p. 206).

According to Doug Glenn of the Environmental Health Department, the department is divided into two sections: food inspection; and environmental health concerns of noise, water quality and air quality. The automobile related contributions to water and air quality health issues are primarily handled by GVRD, while automobile noise issues (i.e., cars without mufflers) are handled by the Vancouver Police department. The Environmental Health Department's principal health concerns relate to commercial, construction and nightclub noise, and indoor air quality issues such as smoking and sick building syndrome (conversation with Doug Glenn, Environmental Health Department, February 15, 1993).

Mr. Glenn indicated that one person of the thirty-five employed by the department has a liaison position with the GVRD air quality department providing input and looking out for Vancouver's concerns. This person also is involved with the Vancouver Engineering Department on projects such as developing alternate fuel sources for the city's vehicle fleet. It is estimated that the employee spends 50 percent of the job on automobile related air quality concerns (conversation with Doug Glenn, Environmental Health Department, February 15, 1993).

One irony is that $9,300 plus $29,100 are included in the environmental health budget for automobile allowance and automobile maintenance respectively (compiled from Statement of Revenues, August 1992, pp 201-247). The rest of the health department has budgeted $637,700
for automobile allowance and $350,000 for automobile maintenance and automobile leases. So, $1,026,100 is devoted by the City Health Department to staff automobile requirements.

As for the budget devoted to automobile related environmental health concerns, the remaining environmental health budget is $2,615,300 once automobile allowance and maintenance budgets ($38,400) are excluded. Since salaries are normally the bulk of budget expenses (and in the case of the Environmental Health Department, 64 percent) it seems reasonable that the budget be divided by the number of employees to get a sense of what the GVRD air quality liaison position costs the city. Thus, 50 percent (the amount of time devoted to automobile environmental concerns by the employee) multiplied by 1/35 of the remaining environmental health budget is $37,361.

The city’s Health Department expenditure on car related activities is minimal and primarily appertains to staff automobile usage. The Health Department’s automobile associated budget is calculated to be ($1,026,100 + $37,361 + $38,400) $1,101,861 or 9.9 percent of the Health Department’s budget.

As for health costs associated with the automobile, the city really only spends about $37,361, a minute proportion of both the city’s health budget and the amount expended by the provincial government on the care of automobile accident victims. The majority of car related health costs are borne by the provincial government or private insurance companies. Thus, for the most part it is provincial tax payers funding automobile related health costs and individuals funding their own medical insurance needs.
4.5 Environmental Costs

Pollution Probe describes direct automobile environmental costs as government spending on the environment. The federal and provincial governments annually spend billions of dollars attempting to control pollution by monitoring polluting industries, enforcing emission standards, and cleaning up after pollution damage has occurred (Pollution Probe, 1991, p. 14). Environmental studies made necessary by automobile pollution are also direct automobile costs borne by governments.

4.5.1 Air Quality

Air pollution caused by automobile emissions can lead to degradation of property and increased health ailments. These societal costs will be discussed in Chapter 5, "Hidden Costs of the Automobile." Air pollution and decline in air quality are under GVRD jurisdiction as they have serious effects on the entire region. Spending on air quality improvement by the GVRD will be discussed in this section. Since GVRD is primarily operated by transfer payments from its member municipalities and townships, a portion of GVRD's air quality budget is a direct cost to Vancouver.

The Vancouver region is plagued by ozone pollution found in many large mid-latitude coastal cities (Los Angeles, Tokyo and Athens). Although Vancouver has a smaller population than these cities, the mountains to the north of the city trap emissions in the valley, creating a large air pollution concern (Steyn, 1992, p. 268).
Stratospheric ozone in the lower atmosphere is created by chemical reactions involving solar ultraviolet radiation and volatile organic compounds and nitrogen oxide. The ozone is a highly corrosive gas that affects human, plant and animal health and corrodes many building materials prominent in the urban built form (Steyn, 1992, p. 268).

The federal government has established a series of broad range categories of air pollution for description and management purposes. According to these categories, the acceptable hourly average range of ozone is 50 to 80 ppb (parts per billions) and is intended to provide adequate protection for "personal comfort and well-being." The desirable range for long term environment protection is 0 to 50 ppb. The tolerable range of 80 to 150 ppb means that without further effort at reducing ozone production, the air quality "poses a substantial risk to public health" (Steyn, 1992, p. 269).

The Air Quality and Source Control Department of the GVRD, responsible for monitoring air quality in the region, operates 21 air monitoring stations in the region and receives data from a further four stations, located to the east of the GVRD’s jurisdiction, operated by the provincial Ministry of the Environment. The data collected from these stations indicate that the maximum tolerable hourly average concentration of 150 ppb was exceeded at an average of 4 times per year in the 1980’s. During the same time period, 80 ppb (the maximum acceptable hourly average concentration) was exceeded an average of 160 times per year. This information indicates only that the air Vancouverites breathe is significantly polluted (Steyn, 1992, p. 270). Much of the pollution is attributed to automobile emissions.
Emissions of volatile organic compounds from automobile fuels account for over two-thirds of the total emission amount. These automobile emissions are derived from partial combustion of fuels during automobile operation as well as during automobile servicing and refuelling (Steyn, 1992, p. 270). In order to control ozone pollution, GVRD initiated a vehicle emissions testing program known as "AirCare," now operated by the provincial Ministry of the Environment (Steyn, 1992, p. 272). User fees associated with AirCare are direct costs to the automobile owner.

An examination of the 1992 GVRD final budget revealed the following information:

- GVRD member municipalities and districts contributed $22,491,423 in the form of tax requisitions;
- total revenue for GVRD’s regional function was $26,952,206;
- Vancouver’s contribution was $8,569,515 or 31.8 percent of total GVRD revenue and 38.1 percent of all member contributions (source: Greater Vancouver Districts, Revenue and Expenditure Budgets, 1992, p. A1).

The 1992 budget of Air Quality expenditures was $4,566,030. This represents 17 percent of the final budget for GVRD’s regional function. Of the Air Quality budget, the members’ tax requisitions amount to $2,677,780 or 58.6 percent. Vancouver’s share is obtained by multiplying Vancouver’s share of 38.1 percent by the members’ contribution to the air quality budget. The result is $1,020,234.

This 1.02 million dollar fee paid by Vancouver to air quality is not entirely a result of Lower Mainland car use. Degradation of air quality is also produced by industry and private chimney use. In order to more accurately determine which air quality costs are directly attributed to the automobile, GVRD’s detailed air quality budget was examined.
Some of the 1992 costs within the air quality budget are consulting costs for two studies: carpooling and trip reduction; and the completion of a 1991 emission inventory study. The 1992 budget also describes plans to implement a Communications Plan that focuses on four priority programs, three of which can be considered car related. The programs are as follows: development of an Air Quality Patron Program; Air Quality Management Plan consultation; Trip Reduction and GO GREEN programs; and review of industrial emission permits through public hearings (GVRD Revenue and Expenditure Budgets, 1992, p. B1).

GO GREEN is a partnership program funded by GVRD and business to raise public awareness of pollution attributed to vehicles. GO GREEN promotes and encourages the use of alternate transportation like carpooling, transit and cycling. GO GREEN awards organizations within the GVRD that successfully contribute to a reduction of emissions caused by commuter traffic. The awards are based on the following two key criteria:

- training an employee as an Employee Transportation Administer; and

The fact that programs like GO GREEN and Transport 2021 have to be sponsored by the regional district is an indication of the serious negative impacts of the automobile, particularly the commuting function of the private automobile. If cars were not so widely used and accepted, programs such as GO GREEN would likely not be in existence. The mere fact that they are in existence is a cost attributable to the automobile.

Determining the cost of air quality expenditure resulting from automobiles alone is a difficult task. The majority of budget expenses are office operation and employee salaries and benefits.
How many of the jobs in the Air Quality Department are in existence solely on account of automobile air pollution? The answer is not simple as employees deal with air quality in general rather than individual pollution sources. As previously discussed automobiles account for two-thirds of volatile emissions, it is logical that two-thirds of the air quality budget is a direct result of automobiles. The only direct car related expenditure noted in the budget is $100,000 for the GO GREEN cooperative program (*GVRD Revenue and Expenditure Budgets*, 1992, p. B7). Car related air quality expenses are calculated as follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total air quality expenditure</td>
<td>$4,566,030</td>
</tr>
<tr>
<td>less GO GREEN expenditure</td>
<td>$100,000</td>
</tr>
<tr>
<td>Result</td>
<td>$4,466,030</td>
</tr>
<tr>
<td>Car-related expenses ($4,466,030 x 2/3)</td>
<td>$2,977,353</td>
</tr>
<tr>
<td>plus GO GREEN</td>
<td>$100,000</td>
</tr>
<tr>
<td>TOTAL CAR RELATED EXPENSES</td>
<td>$3,077,353</td>
</tr>
<tr>
<td>MEMBER'S SHARE (total car-related expenses x 58.6%)</td>
<td>$1,803,329</td>
</tr>
<tr>
<td>VANCOUVER'S SHARE (member's share x 38.1%)</td>
<td>$687,068</td>
</tr>
</tbody>
</table>

It is estimated that in 1992, the City of Vancouver contributed $687,068 to car related air quality expenses.

### 4.6 Other City Costs

As the entire Vancouver City Budget has been examined for direct automobile costs, most costs have been considered in the preceding sections. One remaining cost pertains to city staff on-the-job automobile usage.
Automobile allowance and automobile maintenance costs have already been considered in departments having other automobile spending such as health and public works. The remaining departments including, recreation and community services and general government also have staff automobile related costs which have not yet been considered. A review of the city budget reveals that the remaining departments had a 1992 budget of $682,900 for automobile allowance and $205,400 for automobile maintenance. An extra $6,900 was considered "other" automobile costs. These other costs are broken down into $700 for "executive parking Vancouver airport" (Statement of Revenues, 1992, p. 37) and $6200 in the housing and properties division for "rental vehicles (outside)" (Statement of Revenues, 1992, p. 44).

The total "other" automobile city costs are calculated to be $895,200, or 0.18 percent of the entire 1992 city budget.

4.7 Other GVRD Costs

Besides Air Quality, the GVRD regional function has jurisdiction in other capacities that have car related expenses. These expenses fall in the Development Services, General Government Services, and to some extent, the 9-1-1 Emergency Telephone Service divisions.

4.7.1 Transportation Planning

The Development Services branch of the GVRD has one expenditure that is a direct automobile expense. That is, the Transportation Planning Department. The 1992 budget allowed for $831,073 in transportation planning expenditures, $468,000 of which was devoted to Transport
2021. This is not a recurring cost, but surely given the severity of the car's contribution to urban congestion, other similar expenditures will happen in future years.

Using the same formula as used in section 4.5.1, Vancouver's share of GVRD's transportation planning is determined as follows (figures from Greater Vancouver Districts, Revenue and Expenditure Budgets, 1992, p. F7):

- Total Development Services expenditure: $3,005,478
- Transportation Planning expenditure: $831,073
- Members' tax requisitions: $2,352,989

Percentage of members' contribution to Development Services (Members' tax requisition/development services expenditure) 78.29%

Member's share of Transportation Planning:
(total Transportation Planning x 78.29%) $650,647

VANCOUVER'S SHARE
(member's share x 38.1%) $247,896

4.7.2 Staff Automobile Use and General Government Services

Each administration department of the General Government Services department of the GVRD, as well as most of the other GVRD regional function departments (air quality, hospital planning, labour relations, regional parks, and development services), includes a category usually entitled "mileage, travel & board vehicles" in its operating expenses budget. As discussed in section 4.2, staff automobile expenses are believed to be a direct cost of the automobile and its powerful influence on society. Historical dependence on the automobile has enabled the region to spread over a huge area. Staff is required to travel long distances in order to manage the area. If the
region were not car oriented, GVRD employees might not be reimbursed for driving their personal automobiles to perform work duties.

The sum of all staff automobile expenses in all regional function GVRD departments was totalled and found to be $986,419. Vancouver's share of the total was then determined.

The sum of staff automobile expenses includes $586,689 for the Regional Park expenditure "board and rented vehicles." This amount is to be excluded as it is assumed vehicle expenses in the park division would primarily be in the form of park service vehicles and not private automobiles. So, an estimated $381,739 is considered the GVRD employee automobile expense. This translates to 1.42 percent of the total GVRD regional budget. Vancouver's share of this cost is $121,393 (31.8% of the estimated $0.38 million cost) (compiled from Revenue and Expenditure Budgets, 1992).

4.7.3 Emergency 9-1-1 Service

The GVRD's emergency 9-1-1 telephone service is a life saving regional service that is used to aid people suffering from many life threatening situations. Calls made to the service for victims of motor vehicle accidents can be attributed as another cost of the automobile.

The budget for the 1992 9-1-1 service was $3,806,131, which is comprised of members' tax requisitions and surplus of the previous year (Revenue and Expenditure Budgets, 1992, p. G3).
Thus, the service is funded solely by the members. Vancouver’s share of the service is 38.1 percent of the budget or $1,450,136.

According to the 9-1-1 administration staff, the system serves a population of 1.6 million and 850,000 telephone lines. The system receives just under 1 million emergency calls annually (conversation with GVRD 9-1-1 administration staff, February 1, 1993). The 9-1-1 system does not keep records as to the nature of the calls.

Staff Sergeant Larry Smith of the Vancouver Police Department was able to provide 1992 data on the number of motor vehicle accidents reported in Vancouver in 1992. According to Smith, 24,688 motor vehicle accidents were reported in Vancouver in 1992. Any accident resulting in more than $500 worth of damage must be reported. Of the reported accidents, 9638 or 39 percent of them were considered serious enough to have a member of the Vancouver Police Department attend (conversation with Larry Smith, Vancouver Police Department, February 2, 1993). It is assumed that the serious accidents involved the 9-1-1 service.

So, roughly, in 1992, Vancouver used the 9-1-1 system 10,000 times to report automobile accidents. This represents 1 percent of the million calls 9-1-1 received. Vancouver’s share of the 9-1-1 budget of $3,806,131 devoted to Vancouver automobile accidents is (1% x $3,806,131) $38,061.
This figure could be more accurately determined if the total number of GVRD motor vehicle related 9-1-1 calls was known. Vancouver’s share of motor vehicle accidents could then be compared against Vancouver’s share of the 9-1-1 budget.

4.8 Direct Automobile Cost Summary

Table 11 summarizes the direct automobile costs found in this chapter. The total direct cost of the automobile to the City of Vancouver is calculated to be $185,632,656.

Table 11: Direct Automobile Cost Summary

<table>
<thead>
<tr>
<th>Direct Automobile Cost Category</th>
<th>Cost to the City of Vancouver, 1992</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roads</td>
<td>$93,531,600</td>
</tr>
<tr>
<td>Parking</td>
<td>$22,452,077</td>
</tr>
<tr>
<td>Infrastructure Maintenance</td>
<td>$7,450,000</td>
</tr>
<tr>
<td>Infrastructure Capital Costs</td>
<td>$54,600,000</td>
</tr>
<tr>
<td>Policing Costs</td>
<td>$4,507,500</td>
</tr>
<tr>
<td>Human Health</td>
<td>$1,101,861</td>
</tr>
<tr>
<td>Environmental</td>
<td>$687,068</td>
</tr>
<tr>
<td>City Staff Automobile Use</td>
<td>$895,200</td>
</tr>
<tr>
<td>GVRD Transportation Planning</td>
<td>$247,896</td>
</tr>
<tr>
<td>GVRD Staff Automobile Use</td>
<td>$121,393</td>
</tr>
<tr>
<td>9-1-1 Service</td>
<td>$38,061</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$185,632,656</strong></td>
</tr>
</tbody>
</table>
CHAPTER FIVE

5.0 HIDDEN COSTS OF THE AUTOMOBILE TO THE CITY OF VANCOUVER

A hidden cost is defined by Pollution Probe as a "cost which is not [explicitly] linked to a government expenditure" (Pollution Probe, 1991, p. 3). Since hidden costs are not associated with direct spending, it is very difficult to quantify the cost in dollar terms. Thus, this chapter will discuss the hidden costs that affect the city but will not price them.

5.1 Urban Sprawl

"Low density residential development increases the per capita municipal costs of roads, utilities, school transportation and storm water management" (Peat Marwick, 1993, p. B33). So the automobile's influence on spreading out cities has had an effect on increasing the cost of providing the services demanded by municipal residents. Increased municipal costs are considered hidden costs because the amount the costs rise on account of urban sprawl is unknown. Increased costs are not direct expenditures like, for example, the 1992 street maintenance budget.

Vancouver itself is not so affected by urban sprawl. Being an older city, it has a more compact development nature and tends not to be so automobile oriented as some of its neighbouring municipalities like Richmond and Surrey.
Included in urban sprawl is a cost identified by Pollution Probe as "destruction of agricultural land and urban green space" (Pollution Probe, 1991, p. 9). Vancouver is located just west of the Fraser Valley, one of the three most fertile agricultural land areas in Canada. As the Vancouver area grows to the east, it consumes the agricultural land. In the 1970's, the province created the Agricultural Land Reserves, intended to freeze development in agricultural lands.

As the region sprawls, more and more land must be paved to construct roads and parking facilities. This means greater direct costs of construction and road maintenance to governments. The pavement also has environmental cost of hindering drainage.

Urban sprawl is also costly in terms of increasing energy consumption. As people move further from their place of work, their tendency to drive to work increases as other transportation options decrease. Walking and cycling is unsatisfactory or even impossible for long distances and transit is often unavailable or inconvenient. The increase in traffic volumes leads to excessive fuel consumption, partially due to waiting in traffic congestion. Pollution Probe predicts that denser developments within city centres would reduce both fuel consumption and vehicle emissions (Pollution Probe, 1991, p. 11).

A well respected study by Newman and Kenworthy documents an inverse relationship between fuel consumption and urban density in many world cities. Hong Kong, a city with an urban density of over 275 persons per hectare has very low annual gasoline consumption (2500 MJ per capita). In contrast, Houston is reported to have an urban density of about 9 people per hectare yet consumes annually 75,000 MJ of fuel per capita (Newman and Kenworthy, 1989b).
The direct cost of city and GVRD employee automobile use reported in Chapter 4 is a cost that can be attributed to urban sprawl. The city devotion to maintain car oriented infrastructure has an added effect of discouraging alternate forms of transportation such as cycling and transit (Pollution Probe, 1991, p. 28).

5.2 Environmental and Human Health Costs

It is very difficult to separate automobile induced environmental costs from human health costs as they are so interlinked. Any degradation of environmental quality eventually leads to decline in human health. For example, a polluted water supply is an environmental concern that will certainly harm people. Thus, these hidden costs are described together.

5.2.1 Air Quality

As discussed in section 4.5, automobiles produce two-thirds of all volatile air pollutants. GVRD's publication "Let's clear the air" states that air pollution affects everyone by contributing to heart and lung diseases, asthma, and aggravating cardiovascular and respiratory illness. In the presence of air pollution, the heart and lungs are forced to work harder. This can create a chain of reactions in the body. Stress is added to the cardiovascular system, the lungs have a reduced capacity to exhale air and cells in the airways of the respiratory system, as well as the lungs themselves, can be damaged. Thus, air pollution contributes to bronchitis, emphysema and cancer (GVRD Air Quality & Source Control, 1992, p. 3).
Air pollution in Mexico City is described as so bad that residents are breathing in the toxins equivalent to smoking three packages of cigarettes per day. The biggest contributor to this air pollution is said to be the automobile. In Los Angeles, residents are breathing in the toxins of two packages of cigarettes per day (Sandra McKenzie, "Auto exhaust more offensive than smoke," *The Vancouver Courier*, January 13, 1993, p. 6). Consider the health effects of smoking so heavily. McKenzie, in her article, expresses that although she is unsure of the numbers of deaths and injuries that can be attributed to the automobile, she is willing to bet they far outnumber those attributed to smoking. And with respect to air pollution, she wonders how many more episodes of asthma and emphysema are induced by exhaust emissions as compared to those attacks induced by cigarette smoke (McKenzie, 1993, p. 6).

Vancouver currently does not suffer from levels of air pollution nearly as high as the above mentioned examples. But Vancouver’s population is also much lower than the examples. The experience of Mexico City and Los Angeles should be taken as severe warnings. As population and car usage increase, so might air pollution.

The car’s air pollution cost to the Municipality of Vancouver can be measured in terms of decreased quality of life as air pollution contributes to health problems and corrosion of materials. Decline in resident quality of life means that on account of air pollution residents cannot enjoy their life as they did before. For example, it is now common to see cyclists in downtown Vancouver wearing masks to prevent them from breathing in excessive amounts of harmful air pollutants. The wearing of a mask is not as comfortable as going without but is made necessary by air pollution. The mask is also strongly related to health. Without the mask, the cyclist’s health may suffer.
5.2.2 Water Quality

The municipal water quality of Vancouver's mountain watershed reserves is very high. The water in the Lower Fraser River has experienced significant degradation although the quality of the water is still above most rivers flowing through other large North American urban municipalities (Steyn, 1992, p. 272).

Pollutants enter the waterways by three major pathways. The first being the deposition of material directly from the lower atmosphere, either as dry suspended particles or in precipitation droplets known as "acid rain". Due to Vancouver's wind direction and other atmospheric conditions, acid rain has a minute impact on the area's water bodies (Steyn, 1992, p. 274). Acid rain causes devastating results in eastern Canada.

Runoff from urban and agricultural areas is the second source of water pollution (Steyn, 1992, p. 274). The numerous oil patches on city roads and driveways are washed off by rain water, and the pollution eventually becomes diluted in the city's water bodies. In early autumn after the first seasonal rain the city's streets are slick. The slickness is due to vehicle deposited particles being washed off the streets by the rain. This represents evidence of car related pollution that eventually finds itself degrading the water supply or degrading the natural beauty of the region.

The World Resources Institute reports the following shocking news:
Research shows that the water quality of urban run-off is often worse than that of treated sewage. Traffic emissions, construction, road de-icing, street refuse, organic residues from vegetation and animals, and atmospheric deposition are producing growing amounts of sulphuric and nitric acid, copper, zinc, vanadium, hydro carbons, phosphates, asbestos, particulates, lead, chlorides, chromates, complex cyanides, dirt, organics and untreated garbage. Further, the hydrologic changes resulting from urbanization are only now beginning to be understood in terms of surface and ground water pollution (cited in Peat Marwick, 1993, p. B48).

Substances, like salt on icy roads, used to maintain city streets have varied damaging impacts. Road salt is washed off roads by rain and easily enters runoff water. In a dissolved form, salt releases chlorine and sodium ions which lead to corrosion of roads, cars and buildings; destruction of vegetation; and possible contamination of drinking water (Pollution Probe, 1991, p. 28).

The third form of water pollution in the Lower Fraser River is discharged from industrial plants and municipal sewage treatment facilities (Steyn, 1992, p. 274). This represents the most damaging regional source of water pollution and is by no means the responsibility of automobiles being operated in the area. It may however be the responsibility of automobiles and their parts being manufactured in the region but that is not part of this thesis's scope.

5.2.3 Disposal

One automobile cost that seems to often be overlooked is the cost of disposing automobiles that are no longer useful to society. Abandoned and smashed cars litter the rural landscape worldwide.
According to Pollution Probe, 500,000 automobiles are discarded in Ontario each year (Pollution Probe, 1991, p. 28). Based on population, the number of vehicles disposed of in the Greater Vancouver region would be roughly 50,000. This number is no doubt exaggerated on account of factors relating to the Vancouver climate. Ontario experiences acid rain and heavy winter road salting which have the direct result of lowering the lifespan of vehicles. Vancouver experiences mild winters and minor acid rain and as a result, Vancouverites are able to keep vehicles for much longer periods. Regardless, some vehicles, due to accident or vehicle deterioration must be discarded into landfill sites that are fast approaching overcapacity. Cars that are salvaged as sources of scrap metal still have non-metallic portions that are presently landfilled as recycling facilities for these portions do not exist (Pollution Probe, 1991, p. 29).

Automobile tires also pose a serious disposal problem. Very few old tires are recycled, the majority end up in landfills or tire piles. In the 1990’s, tire fires have made news in both Ontario and the Vancouver area. Burning tires release toxins into the air and create an oil runoff, posing serious environmental threats to land and water tables. As the tires retain their heat, the fires are difficult to combat and in the recent cases, smouldered for some days after the fires were contained. Clean up costs for tire fires are considerable (Pollution Probe, 1991, p. 29).

5.2.4 Accidents

The accident costs in terms of lives lost and time at work lost is also not a direct cost to the City of Vancouver unless of course, the accident victim is a city employee. Generally speaking, work time lost due to cars accidents is considerable. Normally, employers have employee
benefit systems that pay workers who are absent from work on account of accidents or sickness. The recovery time from motor vehicle accidents can be lengthy as slow healing neck and back injuries are often involved. Time missed from work, and thus time payed by the employer through sickness benefits can be considerable.

In cases where automobile accidents result in the death of the family income earner, the family may be forced to turn to federal and provincial assistance programs to survive (Pollution Probe, 1991, p. 46). This is not only devastating to the family but also represents hidden costs to governments resulting from automobiles.

The majority of damage and loss to property resulting from motor vehicle accidents is covered by ICBC (Insurance Corporation of British Columbia), the province's automobile insurance corporation. The cost of insuring vehicles is considered an automobile operating cost and is the direct responsibility of the owner. ICBC reports that vehicle damage that is covered by the insurance company amounts to about $1.2 billion per year (Peat Marwick, 1993, p. B36). There is also considerable damage to vehicles and property that is not paid by ICBC for reasons such as, insufficient vehicle coverage, or unclaimed losses (Peat Marwick, 1993).

5.3 Social Costs

Pollution Probe identified important hidden social costs that are associated with automobile use. These costs are important to both the city and the residents of Vancouver.
5.3.1 Congestion and Lost Time

City street congestion has a direct relationship with the number of automobiles using the road. As more automobiles use city streets at any given time, road congestion increases. Pollution Probe mentions a study prepared for the Ontario Ministry of Transportation that suggests "the economic cost of congestion and the opportunity cost to individuals and businesses" in the Toronto region is in excess of $2 billion annually (Pollution Probe, 1991, p. 45).

In Vancouver, the growth of the region is creating greater congestion on all arterial roads, especially those leading to downtown. City employees that are late for work on account of traffic congestion or traffic accidents are costing the city in unproductive job time. Increased congestion has an impact on individuals too. As congestion increases, the individual gradually needs more time to reach the work destination. This results in less available time for other activities, representing an individual’s opportunity cost.

5.3.2 Stress and Decline in Quality of Life

Stress is related to congestion and lost time. Individuals stuck in traffic congestion experience frustration which can lead to stress if the frustration happens on a daily basis. As greater amounts of traffic increase the probability of accidents, another stress, the danger level of driving, increases.

Decline in quality of life is a common result of increased automobile dependence and has been mentioned previously in this report. Socially, the automobile’s contribution to an individual’s
"lost time" is a factor leading to decline in life quality. Automobiles affect the physical characteristics of neighbourhoods which lead to resident decline in quality of life. For example, parking lots detract from the neighbourhood's aesthetic qualities and busy roads that are difficult or unsafe to cross can present physical obstructions to neighbourhood facilities (Pollution Probe, 1991, p. 45).

These hidden costs may appear only to be individual costs but they do have indirect effects on the city. Some affected individuals may be city employees whose job performance is disrupted on account of personal stress or unhappiness. In the case of neighbourhoods declining on account of busy roads, the city may be pressured into building pedestrian bridges or other mitigating devices to assist citizens to reach facilities. These represent costs to the city that need not be if automobiles had been restrained during the city's growth period.

5.3.3 Transportation Disadvantaged

Although automobile ownership is increasing (see Table 14), there are people who are not able to use automobiles for personal mobility due to reasons of economics, health or circumstance (Straka, 1989). There are also people who choose not to use automobiles in favour of more environmentally sound transportation alternatives (personal observations). Increased automobile use disadvantages carless people (for reasons of choice or circumstance) even more. That is, the increased popularity of automobiles increases demand for automobile services like parking and road maintenance. Funds directed to accommodate the automobile are not available for improving other forms of transportation. Consequently, carless people become increasingly more disadvantaged.
5.4 Other Hidden Costs

The hidden costs of parking and noise have both social and environmental associated costs. Thus, it was decided to discuss them in a section of their own.

5.4.1 Parking

Parking has been discussed extensively in Chapter 4. However, it is worth repeating that parking has hidden costs as well as direct costs associated with it.

Parking spaces are normally asphalted which interferes with natural drainage of land. This could result in flooding of city or personal property. Paved parking means more money must be spent to properly drain the increased runoff.

Parking has an effect on quality of life as parking lots tend to be unattractive and tend to accumulate garbage. Neighbours would more enjoy their view if the parking were replaced by open space or an attractive building.

The most expensive hidden cost of parking lies in its actual existence. That is, if parking is available, automobiles are encouraged. The more automobile use experienced in the city, the greater the direct costs of, for example, maintaining the streets.

On-street parking does have a benefit that offsets its hidden costs. That is, the presence of parked cars and those trying to park provides a barrier between the moving vehicles and the
pedestrians on the sidewalk. The parked vehicles can have the effect of slowing down traffic on the street. This creates a safer environment for pedestrians. This is a minor benefit of parked cars because, it is other moving cars that create the need for this protection. Other traffic management techniques such as narrower lanes or more traffic lights could produce the same effect.

5.4.2 Noise

Peat Marwick defines noise as "the loss in property values resulting from noise generated by high vehicle traffic." Automobile noise is said to burden the municipal tax payer by reducing property values (Peat Marwick, 1993, p. B45). The municipality also bears a cost in that reduced property values reduce city tax revenue.

Peat Marwick reports that 50 decibels of noise is a tolerable level. Each decibel above 50 has the effect of reducing adjacent property values by 0.6 percent. If each excessive decibel has the ability to reduce property values, imagine what it must have on personal enjoyment of life. Research indicates that most urban arterial road noise well exceeds 50 decibels. Some spot samples taken by Roger Kemble in 1988 reveal non-rush hour decibel noise on Granville Street to be between 74 and 86 decibels. Other downtown streets exhibit the same range (Kemble, 1989, p. 200). Rush hour noise levels are presumably even higher.

The noise made by heavy traffic can decrease quality of life as the traffic noise can interfere with enjoyment of conversation, television, radio and sleep. It may even contribute to human
deafness which would result in increased individual health care costs (i.e., hearing aids and hearing tests).

If street traffic noise increases to an intolerable level, the city may face public pressure to "fix" the problem. The city may then find itself funding expensive traffic studies or installing more vegetation or sound barriers as noise mitigating devices.

5.5. Hidden Automobile Cost Summary

Table 12 summarizes the hidden costs discussed in this chapter. Decline in quality of life through increased levels of stress, increased health problems and decreased aesthetic quality are common consequences of the hidden costs of the automobile.
### Table 12: Hidden Automobile Cost Summary

<table>
<thead>
<tr>
<th>Hidden Automobile Cost Category</th>
<th>Description of Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban Sprawl</td>
<td>- increase in direct costs of providing infrastructure</td>
</tr>
<tr>
<td></td>
<td>- destruction of agricultural land and urban green space</td>
</tr>
<tr>
<td></td>
<td>- increased energy consumption</td>
</tr>
<tr>
<td></td>
<td>- provision of car infrastructure discourages alternate travel modes</td>
</tr>
<tr>
<td>Air Quality</td>
<td>- decline in air quality contributes to health disorders</td>
</tr>
<tr>
<td></td>
<td>- decline in quality of life</td>
</tr>
<tr>
<td>Water Quality</td>
<td>- creates acid rain in Eastern Canada</td>
</tr>
<tr>
<td></td>
<td>- urban run-off degrades drinking water supply</td>
</tr>
<tr>
<td>Car Disposal</td>
<td>- abandoned cars that litter the landscape are unattractive</td>
</tr>
<tr>
<td></td>
<td>- tire fires are environmentally hazardous</td>
</tr>
<tr>
<td>Car Accidents</td>
<td>- loss of time from work</td>
</tr>
<tr>
<td></td>
<td>- death from accidents can create greater need for government income assistance for survivors</td>
</tr>
<tr>
<td>Congestion and Lost Time</td>
<td>- employees late for work cost in unproductive work time</td>
</tr>
<tr>
<td></td>
<td>- loss of personal leisure time</td>
</tr>
<tr>
<td>Stress and Decline in Quality of Life</td>
<td>- stress from congestion increases probability of accidents</td>
</tr>
<tr>
<td></td>
<td>- change in physical neighbourhood characteristics can decrease quality of life</td>
</tr>
<tr>
<td>Transportation Disadvantaged</td>
<td>- funds directed to automobiles increasingly disadvantage carless people</td>
</tr>
<tr>
<td>Parking</td>
<td>- interferes with natural drainage</td>
</tr>
<tr>
<td></td>
<td>- unattractive</td>
</tr>
<tr>
<td></td>
<td>- encourages automobile use</td>
</tr>
<tr>
<td>Traffic Noise</td>
<td>- reduces property value</td>
</tr>
<tr>
<td></td>
<td>- decreases quality of life</td>
</tr>
</tbody>
</table>
CHAPTER SIX

6.0 TOTAL COST OF THE CAR TO VANCOUVER

As determined in Chapter 4 and summarized in Table 11, the direct 1992 cost of the car to the City of Vancouver was $185.6 million. The hidden costs discussed in Chapter 5 and summarized in Table 12 serve to identify that the cost of the automobile is even higher than calculated. Without translating hidden costs into dollar values, the true cost of the car is not known. The direct costs do, however, provide a good base cost and enable one to understand the absolute minimum each car costs Vancouver City taxpayers.

In order to translate the direct car costs into more meaningful terms, it is useful to determine the number of cars and people using Vancouver’s roads. Table 13 displays relevant information.

In the region, it is estimated that the number of vehicles on the road has increased nearly 35 percent since 1985, while the population has increased about 25 percent (GVRD News, Nov/Dec 1992, p. 4). Although, much of the population growth has occurred in outlying municipalities with higher car dependencies, the growth rates can be used as a method of estimating the present day Vancouver resident car ownership ratio. By assuming the 25 and 35 percent growth rates of population and automobiles in Vancouver proper, the 1992 Vancouver automobile per person ratio is 0.545. The actual 1991 Vancouver population was 471,844 (Peat Marwick, 1993, p. B6b). The 1992 population can be interpolated to be 472,700 and the number of Vancouver
owned automobiles to be 257,620. In January 1992, the entire Vancouver vehicle fleet was listed as 269,486 (Greater Vancouver Facts, 1992, p. 63). As this figure includes commercial vehicles, and based on the fact noted in Chapter 4 that commercial vehicles make up 9 percent of arterial road traffic, the estimate of private 1992 Vancouver automobile ownership is reasonable.

The City of Vancouver subsidized each Vancouver registered automobile, in terms of lost tax revenue and direct expenditures, $720.44 in 1992.

Table 13: Household Characteristics, 1985

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Vancouver (excluding Downtown)</th>
<th>Downtown Vancouver</th>
<th>Total Vancouver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>425,430</td>
<td>41,271</td>
<td>466,701</td>
</tr>
<tr>
<td>Population under 16</td>
<td>54,094</td>
<td>892</td>
<td>54,986</td>
</tr>
<tr>
<td>Households</td>
<td>183,862</td>
<td>29,127</td>
<td>212,989</td>
</tr>
<tr>
<td>Labour Force</td>
<td>213,911</td>
<td>25,212</td>
<td>239,123</td>
</tr>
<tr>
<td>Number of Autos</td>
<td>216,075</td>
<td>19,255</td>
<td>235,330</td>
</tr>
<tr>
<td>Persons/ Household</td>
<td>2.314</td>
<td>1.417</td>
<td>2.191</td>
</tr>
<tr>
<td>Labour force/ Household</td>
<td>1.163</td>
<td>0.866</td>
<td>1.123</td>
</tr>
<tr>
<td>Autos/ Household</td>
<td>1.175</td>
<td>0.661</td>
<td>1.105</td>
</tr>
<tr>
<td>Autos/ Person</td>
<td>0.508</td>
<td>0.467</td>
<td>0.504</td>
</tr>
</tbody>
</table>

The $720 figure may not seem fair to Vancouver drivers because Vancouver roads are used by many automobiles registered to other municipalities, in particular, regional commuters to downtown. However, each municipality presumably spends a comparable cost in subsidies to its own registered automobiles. Vancouver drivers using roads in other municipalities are also responsible for a portion of those costs.

Since each municipality has direct automobile costs, a method to more fairly determine direct costs per automobile is to determine the number of automobiles owned in the municipality as well as the number of commuting vehicles destined for the municipality. These figures are combined to find the total number of automobiles regularly using the municipality’s roads. The total is divided by the direct municipal automobile cost to more fairly determine the cost per automobile for each municipality.

The results of the November 1992 GVRD Origin-Destination Survey are not yet available (GVRD News, Nov/Dec 1992, p. 4) so the 1985 Metropolitan Vancouver Origin-Destination Survey figures are used to make interpolations of Vancouver’s commuter and resident automobile cost per vehicle for 1992. These results can be confirmed when the 1992 GVRD study is made public.

In 1985, 129,000 automobiles were destined for Vancouver and the Downtown during the morning peak period. Of these automobiles, 50 percent originated in municipalities other than Vancouver. Morning vehicle trips provide a good indication of the number of vehicles regularly commuting to downtown, as the majority of such morning trips are destined for the work place.
Of the total morning peak period trips destined for Vancouver, 61 percent were made by automobile drivers. The travel mode for the remaining trips was transit or vehicle passenger. Of the 235,330 Vancouver owned automobiles in 1985, 28 percent were commuting within Vancouver. Assuming 28 percent of Vancouver residents still commute within the city, 72,133 Vancouver automobiles in 1992 form part of the morning commute to Vancouver. A similar number of vehicles arrive in Vancouver each morning from other municipalities. The following calculation shows a revised method of determining the cost of automobiles to the city:

\[
257,620 + 72,000 = 329,620 \text{ automobiles}
\]

\[
\frac{185.6 \text{ million}}{329,620 \text{ automobiles}} = 563.07
\]

The total 1992 number of cars frequently using Vancouver roads and infrastructure, that is, Vancouver resident and Vancouver destined commuter traffic, is approximately 330,000. These automobiles cost the City of Vancouver $563.07 each in 1992.
CHAPTER SEVEN

7.0 RECOMMENDATIONS

This thesis has discussed the cost of the car to the City of Vancouver. It has identified that car drivers do benefit from hidden subsidies. These hidden subsidies encourage car driving as they create the false impression that driving is inexpensive. Subsidized services are overused.

Now that the cost of the car to Vancouver has been identified, the next step is to address means for the city to recover some of the costs from automobile drivers. It is important that drivers begin to cover the true cost of their own driving in order to curb some of their unnecessary driving behaviour. The hidden costs of the car, as discussed in Chapter 5, are too great to let unlimited car driving continue. This chapter will explore options to decrease the city’s subsidy to car driving.

7.1 Discussion

As individuals do not pay the full cost of their own driving, driving is underpriced and thus is encouraged. As this thesis has identified, the hidden costs of driving, including air pollution and urban sprawl, are so great, that not only should the true cost of driving be the responsibility of the car drivers but also, the total number of kilometres driven must be substantially decreased as the only way to mitigate some of the hidden driving costs.
If it is established that it is desirable to have drivers pay the full cost of their driving, it is useful to determine the true goal of such a policy. If drivers are to pay their full costs, should this be a money making venture for the city and thus a benefit to the city if cars are driven more? No. The ultimate goal of a driver pay system is to change peoples’ automobile travel behaviour. Payment needs to be structured to discourage car use. Addressing car ownership is a place to start.

The goal of the city should be to reduce car dependency. This thesis has demonstrated how much the car costs the city. The ultimate goal is not to get drivers to pay their full share, but to get people to substantially decrease their car use. The city can help people decide to leave their cars at home, or better yet, to reduce car ownership levels, by providing citizens with transportation alternatives to the car as well as punishing (through higher prices) those who continue to use their cars.

Driving can be further discouraged if driving becomes inconvenient. Parking supply greatly influences a driver’s choice of transportation mode. If the parking supply is perceived as being limited, drivers would likely consider alternate travel methods.

One grave concern implicit in introducing a driver pay system is equity. User pay systems favour those who can afford to pay. Those who cannot afford to pay are forced not to drive, while those who can afford to pay are able to make their own decision.
7.1.1 The Commuting Phenomenon

Prior to discussing the recommendations for decreasing car subsidies, it is important to note that the peak hour commuting phenomenon of North America is a huge problem which needs to be addressed. Roads and automobile facilities are built to handle peak hour loads. If the majority of people switched transportation mode from private automobile to transit for their daily commute, the problem would not be solved. Transit too must cater to peak hour demands so must own and maintain many more vehicles than needed throughout the most part of the day.

Many things need to happen to solve the rush hour phenomenon. People need to live closer to their place of employment so that their commuting needs can be met on foot or on bike. Work places need to stagger their working hours so that the peak periods are stretched to cover most of the day. Vanpooling, carpooling and more cooperation between families and neighbours need to be increased to assist in the war against single occupant automobiles as well as keeping transit from becoming overrun.

Any measures to reform peak hour commuting and in particular the popularity of driving alone should keep in mind that a comprehensive change in the way the city operates and develops needs to occur. Individual changes will create problems in other areas. An extreme example would be banning all automobiles without increasing the capacity of the transit system. Such a regulation would strain the transit system and drastically decrease the mobility of most people. Reform needs to be well thought out. The system needs to change in a way that it is not peoples’ mobility that is infringed upon but rather their method of mobility.
7.2 Car Ownership

This section discusses the trend of increasing car ownership and provides four original examples of creating ridesharing opportunities that could ultimately lead to a decrease in the populations' car ownership rate.

The trend of increasing car ownership, as demonstrated in Table 14, is a problem. Once a person has committed the capital required to own a car, the car is found to be both inexpensive (as one does not pay per ride) and convenient (as the car provides door to door service). These advantages of the car encourage owners to use their cars frequently. In contrast, transit must be paid for each time a ride is taken, or at best, on a monthly basis and does not normally provide door to door service. The trend of increasing car ownership means more people have a car at their personal disposal, rather than have a car that needs to be shared among two or more people. A person who is sole user of an automobile, is more likely to use the vehicle, rather than transit, for every trip, than a person who shares an automobile.

People in Vancouver need to re-learn how to share vehicles. As shown in Table 14, one-car families were the norm in the 1960’s, now they are the exception. In most cases, two working members of a household could easily share one vehicle by either carpooling or alternating their individual car use day or week. On the days when the co-owner has use of the car, the other individual can try transit, carpooling with the co-owner or a neighbour, or cycling to work.
Table 14: Vancouver Car Ownership Characteristics

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Population of Vancouver</td>
<td>384,522</td>
<td>426,298</td>
<td>413,147</td>
<td>471,844</td>
</tr>
<tr>
<td>Number of Families in Vancouver</td>
<td>95,740</td>
<td>101,650</td>
<td>**105,388</td>
<td>109,125</td>
</tr>
<tr>
<td>Number of Households in Vancouver</td>
<td>118,405</td>
<td>153,415</td>
<td>**176,478</td>
<td>199,540</td>
</tr>
<tr>
<td>Number of Passenger Automobiles in Vancouver</td>
<td>108,967</td>
<td>*167,055</td>
<td>188,366</td>
<td>257,505</td>
</tr>
<tr>
<td>Average Household Size (persons/household)</td>
<td>3.25</td>
<td>2.78</td>
<td>**2.34</td>
<td>2.36</td>
</tr>
<tr>
<td>Vancouver Car Ownership Rate (cars/person)</td>
<td>0.28</td>
<td>0.39</td>
<td>0.46</td>
<td>0.55</td>
</tr>
<tr>
<td>Family Car Ownership Rate (cars/family)</td>
<td>1.14</td>
<td>1.64</td>
<td>**1.79</td>
<td>2.36</td>
</tr>
<tr>
<td>Household Car Ownership Rate (cars/household)</td>
<td>0.92</td>
<td>1.09</td>
<td>**1.07</td>
<td>1.29</td>
</tr>
<tr>
<td>Shared Car Rate (persons/car)</td>
<td>3.53</td>
<td>2.55</td>
<td>2.19</td>
<td>1.83</td>
</tr>
<tr>
<td>Total Population of B.C.</td>
<td>1,629,100</td>
<td>2,184,600</td>
<td>2,744,200</td>
<td>3,282,061</td>
</tr>
<tr>
<td>Vancouver’s share of B.C. Population</td>
<td>23.60%</td>
<td>19.51%</td>
<td>15.06%</td>
<td>14.38%</td>
</tr>
<tr>
<td>Number of Passenger Automobiles in B.C.</td>
<td>467,370</td>
<td>856,086</td>
<td>1,115,959</td>
<td>1,806,972</td>
</tr>
<tr>
<td>Vancouver’s Share of B.C. Total Automobiles</td>
<td>23.31%</td>
<td>*19.51%</td>
<td>16.88%</td>
<td>14.25%</td>
</tr>
</tbody>
</table>

Source: Statistics Canada, "Census of Canada" and "Road Motor Vehicle Registrations".

Notes:

(*) In 1971 "Road Motor Vehicle Registration" listed the number of automobiles per B.C. city by issuing registration office. In Vancouver 247,824 automobiles were registered by Vancouver issuing offices. This total would include autos belonging to people living in other municipalities so is not comparable to the other census years. Based on the fact that in the other 3 census years, Vancouver’s share of total B.C. population and total number of B.C. passenger automobiles is equal, the number of automobiles registered to Vancouver citizens was estimated to be 167,055.

(**) In 1981, the census did not combine the total number of households or families from all census tracts within the City of Vancouver. These statistics have been estimated based on the total number of households and families in 1971 and 1991.
High residential parking surtaxes can be applied to excess household vehicles as an incentive to decrease the number of cars owned per household. Provincial sales tax or vehicle insurance rates could be altered to further discourage multiple car ownership. That is, the principal automobile could be insured for a base premium, while any further cars owned by the household could only be insured at a considerably higher rate. Provincial automobile sales tax on the first car bought into a household could be set at a certain rate, like 10 percent for example. Another car bought could be taxed at a much higher rate like 25 or 30 percent.

These ideas for discouraging multiple car ownership can be considered equity fair. That is, typically low income households are in possession of only one vehicle. As household income increases, so does the likelihood of multiple vehicle ownership. A system that charged a base rate for one vehicle and a disproportionately higher rate for each subsequent vehicle would not be hitting low income people unfairly.

A system of charging for unnecessary vehicles, could reduce the number of cars owned within the city. Families could be expected to seriously address whether their second or third car was really necessary. Perhaps it would be more economical for families to rent a car at those times when a second car is considered essential. If a second car is needed frequently, extended families or several households could investigate the possibility of combining resources to share another car.

It stands to reason that the fewer cars owned, the less cars will be used. Reducing the number of cars per household will naturally reduce car dependency.
7.2.1 Personal Automobile Sharing Schemes

The following three ideas for automobile sharing were originally discussed in "The Southeast of False Creek: A Sustainable Urban Community," an unpublished UBC class project (Bannister, Dehnel and Vaisbord, 1991). Automobile sharing schemes could be introduced by the city as a method of decreasing car ownership and therefore, car ridership. As the following schemes are original, there are no known world examples from which to discuss the working results. The ideas are logical and as attitudes about car ownership and car dependency change, they will be feasible.

7.2.1.1 Auto Pools Within Housing Co-ops

In housing co-ops, residents purchase a share in the cooperative which entitles them to occupy a specific unit and to use all common facilities, such as hallways, elevators and laundry facilities. Thus, housing co-ops are already structured to allow for auto pooling.

City operated housing co-ops could set an initiative in reducing overall car ownership by maintaining a small "fleet" of automobiles as a common facility. A member of the co-op board would be delegated to administer the vehicle pool. Subject to availability, monthly time quotas, and possible user fees, co-op members could book the use of a car with the administrator. In housing co-ops, the level of commitment to alternate lifestyles is high, so an auto pool system has a high likelihood of success.
7.2.1.2 Transportation Co-operatives

Transportation co-ops would operate much as the housing co-ops with auto pools but without the housing component. Membership of a transportation co-op could be open to all residents within a certain neighbourhood, subject to a share purchase requirement. Transportation co-ops would consist of an administration/booking office, a parking facility, and a fleet of automobiles. The facilities would be the common property of the members, who would be entitled to book auto trips through the administration office.

7.2.1.3 No-Car Condos

Strata housing, such as condominiums and town houses, are well-suited to auto sharing. Purchasers own the air space parcel containing their unit. All other areas are common property administered by the strata corporation. As in the case of co-ops, an auto pool would be part of the common property. The auto pool would be administered and maintained by the strata council, with expenses covered by user fees and annual maintenance fees.

In Vancouver, areas of the city with strong transit links would be perfect for no-car condos. As discussed in Chapter 4, parking facilities are expensive to develop. Developers of new strata buildings would no doubt welcome the idea of no-car condos since the elimination of the majority of parking provisions would considerably lessen the cost of construction. "No-car condos" would require only a few parking spaces to accommodate the auto pool.
Many older multi-unit buildings in Vancouver lack adequate resident parking. Some of these buildings, especially those that are presently co-op or strata titled should consider becoming "no-car condos". If the city imposed street parking permit fees as discussed later in this chapter, residents of these buildings would need to address their personal parking situation. "No-car condos" solve an individual's parking dilemma.

7.2.2 Employer Automobile Sharing

Large office complexes could also consider owning "pool cars" for the use of those employees within the complex who choose not to own cars. If a person needed a car on occasion for a trip, a visit to a far away regional friend, skiing or a biweekly grocery shop, a car could be borrowed or rented for the day or the hour from the person's employer. New office complexes could avoid providing adequate parking facilities and employees could be encouraged to get rid of their own cars and use the office's car co-op system.

7.2.2.1 Pool Cars

Downtown Vancouver workers have complained that taxis are unreliable during the day. In fact, one business person complained that he could no longer take transit to work because he needed his car during the day. He had tried to operate without his car but was disappointed by the recurring lateness of taxis hired to take him to appointments (conversation with Robert Fung, Concord Pacific Development Ltd., November 27, 1992).
In one sense, driving a private vehicle to work is a waste of resources. If one drives to work and parks in an expensive parking spot for eight hours while the car waits to drive home it seems wasteful. There should be more of a trade system with cars. In a business, few companies would make a huge capital investment on machinery to have the machinery sit idle most of the day. In such a case, the company would be better off renting the machinery for the few times it is needed.

With the case of a privately owned car that sits at work all day there must be a better system. If employers were to own the cars and employees, who felt that driving to work, for whatever reason, was their only transportation option, were to lease the car from their employer the following scenario is possible. The car could be used at home by the employee on weekends and evenings. In the morning, the employee could drive to work and drop the vehicle off to a driver, rather than park the car for the day. The driver could be an individual employed by the company to courier other employees to meetings or to be hired by other businesses or private citizens for taxi type trips. This would create more taxis when the demand during the day is highest. At the end of the day, the employee could relieve the driver and drive the car home.

In some respects this idea is a contradiction in terms because in reality a car that is parked is not polluting whereas a car being driven is polluting. However, a leased car that is used for commuting and then driven throughout the day has the potential of actually decreasing the total number of cars in the entire system. For example, a person who is currently driving to work only because they need their car during the day could stop driving to work if an employer system of daytime taxiing were introduced. Taxi companies would not have to own and operate so many vehicles in order to keep up with the higher daytime demand. Also, downtown parking
could be decreased if people can stop driving to work when they no longer need a car during the day. If fewer cars are in the system at any given time, there would be an overall benefit to society.

7.2.3 Feasibility of Car Sharing Schemes

With respect to automobiles, North America must try a more communal way of owning and operating them. Very few people need their cars at every moment of the day, so cars spend much of their time idle. There are so many people that need cars only once and a while but feel they need to own a car for those few times. A co-op ownership car system or a borrowing system of idle cars makes so much sense. These systems would drastically reduce people's car dependency because their car use could no longer be spontaneous.

Unfortunately, a co-operative car system will not easily become a reality, except for perhaps a very few progressive thinking companies or alternative lifestyle co-ops. Cars in North America are a symbol of social status. People care about what kind of car they drive. Cars are also easily damaged and expensive to repair. The current insurance policies would have to be altered to adapt to a communal car system. But, car sharing is a sound idea and worth pursuing. As communities become more aware of the environmental damage caused by automobiles and as the private automobile becomes more expensive to individually own and operate, communities will start to collectively address car dependency.
7.3 Parking

As suggested in Chapter 3, street parking is probably the only form of automobile infrastructure that can be eliminated. Free street parking is a subsidy unfairly enjoyed by automobile drivers. If parking was not available on city streets, the streets could be made much narrower, and thus more green space could be enjoyed by all.

Street parking can no longer be provided free of charge. People that work in non-downtown areas of Vancouver find it very easy to find all day free street parking in residential areas. This cannot continue to happen as it merely encourages these people to drive to work.

It is worth repeating Wachs explanation that "parking is one cost item which is priced so as to encourage rather than discourage auto use" (Wachs, 1981, p. 246). Free street parking in the non-downtown business areas of Vancouver merely encourages car commuting. The introduction of a system designed to make street parking commuters pay for their parking would no doubt decrease car use.

This section discusses three ideas the city could introduce to increase the cost of parking to the individual. This would result in making the car more expensive for the individual to operate.

7.3.1 Eliminate Free Street Parking

The city should establish a parking permit system for all non-metered streets within the city. This not only would discourage people who formerly parked for free from driving to work but
it would also provide residents with the incentive to park on their own property. Residents of multiple car households finding it expensive or difficult to find alternate parking facilities for their extra vehicles may be further encouraged to decrease their number of owned vehicles.

If the city were to introduce a street parking permit system, any car parking on non-metered streets at any time of the day would require a permit. Cars without permits would have to park on private property, parkades, or at metered parking spots. Fines for parking without a permit should be significant to deter people from trying. A vehicle towing system should also be relied upon to further inconvenience repeat offenders. A street permit system would require strict enforcement.

A permit fee parking system will provide the city with a revenue that can offset the $185 million per year currently spent on the cars of Vancouver. This system would only burden people who own more cars than they can store on their property. It also addresses commuters who work in non-downtown areas of the city who can currently park free on residential streets and highschool students who drive to their local school unnecessarily.

No doubt there would be opposition to a parking permit system, especially from local businesses that are frequented by drivers stopping on account of free convenient on-street parking. There is no clear understanding of what economic impact the elimination of free parking would have on small businesses. It is understood that small businesses oppose any suggestion of reforming parking in their neighbourhood.
An example of such opposition was experienced in 1991. The Downtown Communities Forum (DCF), a citizens’ group that met regularly in the early 1990’s to discuss issues pertaining to the livability of Vancouver’s Downtown vicinity, observed that the evening peak period parking restriction of 3 p.m. to 6 p.m., on the West End arterial streets of Davie, Denman and Robson, was insufficient. At 6 p.m., traffic volume on these streets is not sufficiently reduced to allow parked cars to occupy the curb lane. Consequently, at 6 p.m. a high traffic volume is forced to circulate in a single lane per direction. This especially restrained bus movement. DCF took the initiative to suggest to the Vancouver City Engineering Department that the West End evening peak period be extended by one hour to 7 p.m. DCF also suggested that the curb lane be used exclusively for buses, taxis and bicycles during the evening peak period.

When West End merchants discovered the DCF idea they were adamantly opposed. Excerpts from the merchants’ letter to the Assistant City Engineer are as follows:

We ... are greatly perturbed by this request and are appalled at this proposal which will adversely affect businesses in this the most prime of shopping and restaurant street in Canada. We will oppose this move most vigorously.

Rush hour traffic can be dealt with ... on a more imaginative basis, such as having police personnel conducting traffic at vital street junctions, at the required time.
(Source: letter to Assistant City Engineer from The Robson Street Committee, April 11, 1991.)

This example indicates the high degree of opposition businesses have towards the elimination of just one hour of free parking. Abandoning free parking all together would be extremely unpopular.

The merchants’ letter suggests increasing police enforcement is a solution to rush hour congestion. Such an introduction would have the result of increasing the cost of the car to the
City of Vancouver by giving the police department more traffic duty. It also would have little impact on deterring car usage.

If a city street parking permit system were introduced, businesses worried that the system would detract or deter business could finance the introduction of a parking meter system on the street abutting their business. Cars without a street parking permit would be entitled to park at meters.

Residents of the city who live in single family houses presently park on their private property or on city streets. Residents of multifamily dwellings often pay $20 to $30 per month to park in stalls owned and operated by their residential building. If the residents of multifamily dwellings choose to park on the street, there is high street parking competition in places like the West End. Many people pay the monthly fee in order to park hassle free. The system currently in place is unfair. Some city residents must pay for their home parking because of limited availability on the street. Others do not pay and yet have ample parking room on their property and on their street.

A city street monthly parking fee should be set at slightly higher that the average building parking fee. This would encourage people to park in their buildings if possible to avoid paying the city’s fee. This would free parking from the streets to make room for bicycles and transit on arterial streets and generally improve the aesthetic quality of city streets.

The city appears to have a problem with citizens keeping uninsured vehicles parked on city streets (personal observations). Vehicles that are uninsured but remain parked on city streets
or lanes are unattractive. Requiring uninsured vehicles to pay permit fees to park on city streets would decrease the number of such vehicles currently occupying city land.

There is concern felt that if owners of uninsured were required to pay street parking fees, an incentive to reinsure the vehicle would be created. One benefit of an uninsured vehicle is that it cannot be driven under any circumstance. So owners of uninsured vehicles have already addressed their own car dependency and are not contributing to air pollution. However, insuring a vehicle is very expensive, so, as long as the parking fee is less than insurance rates, there should not be much change in the number of cars being left uninsured. Vehicles are often kept but left uninsured because the owner does not need to use the car at this time. In order to save money the car is not insured. The owner keeps the car so that if the situation changes and the car is later needed, the owner simply purchases insurance. The owner saves the ordeal of buying a car.

According to an auto insurance representative, the cost of the minimum insurance coverage, as required by law, is $980 per year in Vancouver. If the car owner has been accident free for a minimum of four years, a 40 percent discount is applied to the premium, making the cheapest yearly insurance rate to be $588 (conversation with Autoplan representative, Ken MacDonald Insurance Agency, May 13, 1993). If the city introduced a $40 per month street parking permit system ($480 per year), the annual parking fee would still be at least $100 less than insurance premiums. There would still be incentive to keep the car uninsured or better yet, find storage for the car on personal property or get rid of the car.
A city street parking permit system would require establishing a system of parking for city visitors and tourists. A system of parking visitor passes could be established.

In addition, the city should eliminate any free parking provided at city owned or operated facility. For example, all surface parking in parks and at community centres should become user-pay through either parking meters or ticket dispensing machines.

7.3.2 Eliminate Free Work Place Parking

The city as an employer must set an example for other employers and cease providing free parking to its employees. As Chapter 4 indicates, free city parking is expensive to city taxpayers. Free employer provided parking is a prime incentive for driving to work alone. At present, income tax laws give employers a tax deduction if they provide free parking to their employees. Employer provided parking is also a tax free benefit to the employee (Downs, 1992, p. 156). If employees were given a choice between a free parking spot, free monthly transit pass or a cash transportation allowance, the latter two would be treated as a taxable benefit, the former would not (Clouds of Change, 1990). Income tax laws must be reformed.

People opposed to increasing the cost of driving are often opposed because they believe the poor will be unfairly disadvantaged. Ironically, eliminating free parking at work will hit the rich harder than the poor. That is, it tends to be people in the higher tax brackets who are provided with free parking. If the system were changed so that employees were given a taxable transportation allowance that could be used towards parking, transit or pocketed if the employee
walks or cycles to work, those in higher tax brackets would find most of such an allowance would be taxed (Wachs, 1981, p. 246).

Eliminating free parking at the work place would certainly decrease car usage. In the 1970's Ottawa eliminated free downtown parking. A study monitoring the effects of the change discovered that the number of single occupant cars commuting downtown, dropped by more than 20 percent (Transport Canada, 1978, cited in Wachs, 1981, p. 245).

7.3.3 Decrease Parking Availability

Wachs (1981) notes that carpooling will more effectively be encouraged through a decrease in number of parking spots than by expensive advertising jingles. Simple economics explains that a decrease in parking supply will drive up the price of parking. This would be a further disincentive to many commuters. However, decreasing the supply of parking would unfairly disadvantage lower income people.

7.4 Road Tolls

In 1975, Singapore implemented central area road pricing. Nearly twenty years later, Singapore is still the only city in the world with a working road pricing scheme. The objective of Singapore's scheme was to reduce peak hour traffic by 25 to 30 percent. The scheme was expected "to restore reasonably good traffic conditions" (Watson & Holland, 1978 cited in Liivamagi, 1989, p. 376) by restricting vehicle entry into the congested compact 6.2 square
kilometre central business district during the morning peak period only (Liivamagi, 1989, p. 376).

Hong Kong evaluated a prototype of electronic road pricing, a pricing scheme that requires every vehicle to be equipped with an electronic licence plate that can be sensed by detector loops in roadway. The detector loops transmit vehicle passage information onto a monthly generated bill. It is feasible to vary charges per pricing point depending on certain factors including day of week, time of day and direction of travel (Liivamagi, 1989, p. 376). After Hong Kong's initial eight month testing period, the scheme was not implemented on account of concern for invasion of individual privacy as closed circuit cameras are used to identify fraudulent vehicle passage (Downs, 1992, p. 51).

According to Liivamagi (1989), Vancouver's geography is ideal for road pricing. Water crossings are legitimate places to introduce congestion tolls as bridges do tend to be congested during peak hours. Toll booths could be either of the traditional staffed variety or of the newly developed electronic sensor type. Both types of toll booths have disadvantages. The staffed toll booths increase congestion as drivers must come to a stop to pay their toll and electronic toll booths require each car to be fitted with an electronic licence.

Another road pricing technique discussed by Liivamagi (1989) is similar to the Singapore system and involves cordonning the Vancouver downtown. Commuters would be required to buy a monthly pass in order to enter the downtown area. Liivamagi (1989) suggests that a $3.20 fee per entry into the downtown core be introduced to drivers. Such a fee would result in a $19 million yearly revenue for the city. The net benefits, he calculates to be $4 million per annum.
Small (1989) remarks that road pricing is widely accepted as the best way to deal with urban road congestion but it is seldom implemented. "Capital for highways, unlike that for electricity and telephones, has usually been provided by the public sector; hence a different pricing ethic has prevailed" (Small, 1989, p. 87). North Americans believe road travel is a basic right and the implementation of road pricing would be harmful to the poor. The same argument should apply to telephones and electricity. However, the logic does not seem to apply when society is in jeopardy of losing something it once had "for free" (Small, 1989, p. 87).

Downs also notes that "road pricing has been criticized for its inequity, inefficiency, and invasion of privacy." Although the cities of Singapore, Oslo, Trondheim and Bergen have adopted a cordon system within their downtown areas, no area-wide road toll system yet exists in the world. Downs explains this is partially due to the fact few transportation officials have been exposed to such a concept (Downs, 1992, p. 51). This seems ludicrous given the amount of energy and time devoted to addressing traffic congestion in cities.

Liivamagi (1989) concludes that road pricing based on charging those entering the downtown has the greatest advantage for several reasons. Firstly, the method is less novel and smaller in scale and scope than an electronic system. A downtown entry fee would be easy and cheap to implement, as well as easy to abandon if desired. Secondly, trips to downtown are different from other peak period trips. Travel to downtown is generally recognized as a cost of congestion. In Vancouver, transit is focused to the downtown so travel to the downtown is much less dependent on the automobile than trips to other points in the region. Thirdly, a downtown license scheme can be solely under Vancouver jurisdiction so other levels of government and other municipalities need not be involved. Currently many Vancouver officials,
including both NPA and COPE councillors and Mayor Gordon Campbell, are pro-public transit and anti private car. The political time for such a scheme is right.

Road pricing is still a new phenomenon. Without many world examples, road pricing is difficult to implement. However, once a few municipalities introduce it, other cities will see the advantage. Liivamagi (1989) thinks road pricing in Vancouver will be sooner than later. Without a freeway system, and without current plans to add road network to keep pace with population growth, Vancouver has reason to be one of the first municipalities to implement road pricing. The location of Vancouver’s central business district on a peninsula seems ideal for introducing a downtown pricing scheme.

One disadvantage of a downtown pricing scheme is that it would have no effect on short local car trips currently made. People may look at alternatives to getting downtown, but they could still hop in their cars at home to drive a few blocks to the corner store. In terms of air pollution, the short haul trips are much more harmful to the environment.

7.5 Community Design

Leigh Carter, director of public affairs for BCAA believes that the region’s transportation congestion will not be solved without efforts to change the structure of where people live and work. Land use and transportation are intricately linked (Carter, 1993). Decreasing car use can be addressed in actual community design. Urban villages need to be recreated. New residential areas must be designed for people, not for cars.
The Globe and Mail recently described neighbourhood as "a place where people can meet and mingle, where [hu]man is the measure of things and a shared experience is possible by means other than that of the television set" ("Rethinking the Canadian city," The Globe and Mail, March 27, 1993, p. D6). The article stresses that neighbourhood space needs to be built to a scale that can be experienced at human speed.

A landscape that is convenient for the driver - wider roads, bigger parking lots and everything designed to be understood by someone travelling at 10 times the speed of man - equals inconvenience, discomfort and incomprehensibility for those on foot ("Rethinking the Canadian city," The Globe and Mail, March 27, 1993, p. D6).

The key for planners is to create a neighbourhood where the car is not an everyday necessity. Medium density low rise buildings located in close proximity are less car oriented than high rise buildings separated by boulevards and parking lots. People oriented neighbourhoods do not banish the car. Rather, the car is asked to adapt itself to the neighbourhood and not the other way around ("Rethinking the Canadian city," 1993).

Roseland (1992) discusses "traffic calming" techniques as a method of reshaping communities to de-emphasize the automobile. Traffic calming uses engineering techniques and community process to reclaim streets into public space. For example, landscaping is introduced onto the street so that cars must manoeuvre slowly through gardens and trees to travel the street. Car access is put at a low priority in the neighbourhood but it is not banned. When traffic calming has been implemented on a large scale, the area has even found the local economy to improve. That is, people like to come to attractive green cities and businesses like to locate in high quality environment.
Traffic calming shows that the automobile can be accommodated but not surrendered to. Even the design of new houses can change to de-emphasize the automobile. The car and its garage should no longer be the grand entrance of the house. The car and its parking facilities (i.e., no on-street parking) should be slightly inconvenient. If a car is inconvenient to use, it is less likely to be used for short haul journeys. For example, consider a trip to the corner store, a few blocks away. If the car sits in front of the house, it is easy to use, and likely will be used even on very short trips. If the car must be retrieved from a garage behind the house, the effort may seem greater than the short walk. The car will not automatically be used.

If communities are once again built to be compact and if human scale can take over from suburban car scale, then the city will benefit not only from decreased car use, but also from more compact, and thus, cheaper infrastructure provision.

Land use planning and parking requirements are often car dominant pieces of legislation. Landlords on commercial streets are occasionally exempted from zoning restrictions and are allowed to add extra housing units. However, the exception is not extended to parking requirements. The required parking facilities for the extra unit must be provided. This is absurd since often these exceptions are found along transit corridors. The landlord is required to purchase extra land to provide the extra units with adequate parking ("Rethinking the Canadian city," 1993).

Society needs to understand that not everyone owns a car nor needs a car. Residential units can be built without parking facilities, just as they are built to contain a varying number of bedrooms. If a household does not own a vehicle, it does not require parking facilities. So a
no-car family can seek no-car accommodation. If the family situation changes and a vehicle is acquired, then the family needs to make adjustments in their housing situation by either moving or finding off site parking arrangements. This is no different from a change in housing requirements after the birth of a baby.

7.6 Alternatives

A user pay system will make driving more expensive and can enable car drivers to pay most of the car infrastructure costs. However, governments cannot price people out of their cars without providing an alternative. Improving bicycle and transit facilities are some of the alternatives. Presently, cars are cheaper, safer, more convenient and more comfortable than the alternatives. Decreasing subsidies to the automobile, while concentrating on the safety and convenience of the alternatives will improve the competitiveness of the alternatives.

People need convenient alternatives to their automobile before they will consider using another mode for their transportation needs. According to Clouds of Change (1990) fear of safety is one of the main deterrents of more bicycle use. According to the City of Vancouver Engineering Department, in 1988, there were 47,000 bicycle trips taken in the City of Vancouver per weekday. Of these trips, 85 percent of them were taken for non-recreational reasons (cited in Clouds of Change, 1990, p. 39). That is, bikes were overwhelmingly used for commuting and personal errand purposes. This data is encouraging because it means that if the city can devote time and funding energies to ensure bicycle safety, then bicycle riding could become a strong competitor to the automobile for many trips.
Lyster (1993) makes the point that huge amounts of public money goes into promoting non-smoking, seat belt use and an improved environment. Bicycles must surely fall into the improved environment category and public money could be diverted to increasing bicycle use, thereby decreasing automobile use. One more bicycle can mean one less car.

7.7 Recommendations for Vancouver

Seelig and Artibise (1991) suggest there are four necessary steps to be taken to solve Vancouver's mobility problems, of which the automobile is the chief villain. The steps are as follows:

- Create a powerful regional transportation authority;
- Stop building new roads and bridges;
- Start intelligently managing existing roads; and
- End the love affair with the car

(Source: Seelig and Artibise, 1991).

The fourth step, ending the love affair with the car, suggests a double strategy. The first part involves introducing policies that encourage a change in people's car dependency habits. Habit changing ideas include traffic calming and introducing high occupant vehicle (HOV) pricing strategies. HOV pricing strategies include providing cheaper and better located parking stalls to carpoolers, and allotting certain traffic lanes for HOV use only. The second part of the strategy is for the long term. It demands that the region spend money to provide realistic alternatives to the private automobile. That is, improve land use planning to create more human oriented communities, and concentrate energies on transportation alternatives (Seelig and Artibise, 1991). It is this fourth step that the recommendations in this thesis have concentrated upon.
Creating a regional transportation authority is of great importance. "Traffic problems are regional problems, but there is no regional planning body with the power to supersede the development impulses of individual municipalities, or the anti-development impulses of neighbourhoods" (Seelig and Artibise, 1991, p. 66). The regional transportation authority is beyond the scope of this thesis but it is recommended that the province create the new authority in the near future. Truly restricting the automobile requires a comprehensive approach that only a regional body can implement. Solving transportation problems from the municipal level has no overall consistency so the region is no better off.

This thesis suggests the following six recommendations which Vancouver can alone instigate as a means to recover some of the its municipal spending on private automobiles. The recommendations concentrate on decreasing the availability and increasing the cost of parking. They also focus on controlling Vancouver residents' love affair with the car.

### 7.7.1 Address City Hall Car Spending

The first step is to eliminate free city employee parking. Municipal tax payers are supplementing the parking for city employees and thus, encouraging city staff auto driving. City Hall must set an example for all Vancouver residents and employees.

The city can also reduce automobile spending by introducing the "pool car" system to City Hall. The city already owns a fleet of vehicles that are used by some departments for employee work related outings. A transportation coordinator could be employed to coordinate outings between
departments so that employees from different departments can carpool to the same meeting or project site.

City Hall can implement these two steps without affecting the present day behaviour of non-city employees. If these steps are introduced alone, the reduction in city car spending would be minimal. The example shown by Vancouver could be used to lobby the provincial government to amend the Municipal Act to require all municipalities to eliminate free staff parking and to introduce pool car coordinators.

7.7.2 Introduce a Street Parking Permit Fee

As discussed earlier, the city cannot continue to provide free on-street parking. A monthly permit parking pass system should be implemented as soon as possible. Free parking encourages driving. Eliminating free parking will discourage some driving, especially of those people who currently park on their properties at home and park free on the street at work. A permit system would require these people to purchase a permit to continue to park on the street at work. To avoid paying the parking fee, these people may turn to transportation alternatives.

This system would be met with strong opposition. It also is not believed to have been tried or even considered in any other municipality so the initiation of the system would require patience as the system is refined to operate smoothly. The system requires strict enforcement and expensive penalties to offenders in order to be successful.
Addressing street parking is equity fair because it is possible to park on private property to avoid the monthly parking fee. It is more characteristic of higher income households to own more than one car than of lower income households. Households with a home parking shortage will be those households owning more than one vehicle.

The introduction of a street parking permit fee would significantly reduce the cost of the car to the city by increasing car related revenues. A reduction of free parking would have the affect of decreasing unnecessary driving.

Coupled with the street parking permit fee, the city should eliminate any city provided free parking. That is all Vancouver owned and operated facilities, such as parks, should introduce parking meters or ticket dispensing machines.

7.7.3 Limit Arterial Street Parking

Any arterial street that currently limits parking during rush hours should extend the periods of no parking to at least the entire 12 hour day (i.e., 7 a.m. to 7 p.m.). This lane should then be devoted to alternate modes of transportation such as transit, carpools or cyclists depending on the need of each particular neighbourhood. The city could easily implement such a scheme.

Businesses located on arterial streets will be opposed to such an idea, especially if Vancouver has also implemented an on-street parking permit system as described in section 7.7.2. Merchants' associations can work together to set up minimal parking facilities, either by funding
the installation of parking meters on the side streets, or creating merchant owned parking
facilities on the back lane.

Businesses can work together to help end the love affair with the car. Rather than provide
parking facilities, they can establish delivery services. Local pizza places have started using
bicycles to deliver pizzas as bicycles do not have to contend with traffic congestion or lack of
parking facilities. Other businesses, in particular fast food restaurants and pharmacies, could
also set up bicycle delivery services.

7.7.4 Increase the Cost of Multiple Vehicle Ownership

The city can increase the owner’s cost of multiple vehicle ownership by requiring each
household to purchase permits for all but one of the vehicles owned within the household.

This idea would be better enforced provincially through the increased taxation rates of further
vehicles purchased and through higher insurance rates of all secondary household cars.

7.7.5 Initiate Car Sharing Possibilities

City owned co-op housing projects could establish a transportation co-op as described earlier in
this chapter. Such a project could set an example for other housing projects to set up similar
systems and help to reduce the car dependency of the project residents.
7.7.6 Investigate a Road Toll System

A road toll system is recommended on a regional basis to control long haul commuting from the suburban municipalities to Downtown. Such a system should be introduced by a regional transportation board.

It is not recommended that Vancouver introduce road tolls on its own. As Liivamagi (1989) described, the geography of Vancouver is ideal for road tolls. Toll booths could be installed on all bridges. The toll system would be ideal on a regional basis but without the cooperation of the other municipalities, Vancouversites could be unfairly disadvantaged. Residents of other municipalities would avoid coming to Vancouver, if possible, but would freely travel among the other municipalities. Vancouver residents would be forced to pay tolls if they wished to travel to another municipality.

A toll system does not address short haul trips. If tolls were introduced, a person could presumably drive to the corner store without paying a toll. It is this unnecessary driving that needs to be stopped. Ending the love affair with the car will confront the short haul drives.

A toll system is not as equity fair as a system that charges for multiple car ownership. For a toll system to be more equity fair, the system would have to work in conjunction with federal income tax laws. People could receive road toll credits based on income levels. To address equity issues, the road toll system would become very complicated and the system could be abused.
Prior to the introduction of a road toll system, Vancouver should implement the other recommendations that address car dependency and ownership. Once a system is in place that controls the short haul trips (reduced parking, lower rate of car ownership, safer transportation alternatives), the road toll system may be considered in cooperation with the entire region. The issue of equity must be studied before a road toll system is launched.

7.8 Summary

As discovered in Chapter 6, each car registered to the City of Vancouver costs the city $720 per year. This translates into a monthly fee of $60 per automobile. The city could recover a large portion of its subsidies by requiring any car regularly parking on city streets a $30 to $40 per month parking permit fee. The fee would most likely reduce car ownership as people would address the economic benefit of paying monthly to park cars they use infrequently. A reduction of car ownership would further lessen the impact of car costs on the city.

Other government levels can play their part in reducing the cost of cars to Canadian municipalities. The federal government needs to restructure the income tax laws so that employer provided free parking is no longer a tax incentive.

Municipalities themselves have to stop catering to the car. The parking facility requirements of new buildings should be lightened in the zoning laws. Existing bylaws that restrict parking in areas need to be stringently enforced. The penalties (i.e., fines) for breaking traffic and parking rules need to be severe.
In the end, Vancouver must concentrate on reducing car ownership levels. Policies to reduce car ownership can be directed towards strict parking regulations that make car owners responsible for their own parking needs; and high ownership taxation fees applied to each excess household vehicle. Individuals acting more responsibly towards the environment will positively reduce the cost of the car to the city. It is clear that individual behaviours created the car problem in the first place. Individuals moved to the suburbs, commuted to work alone and contributed to a huge congestion problem. Thus, individual behaviour can work to undo what has been done. Each person making the choice not to drive alone can make a difference. One less car means less pollution, less land needed for parking and one healthier person if the alternative to the car involves some walking or cycling.
CHAPTER EIGHT

8.0 CONCLUSION

8.1 Relationship of Thesis to Peat Marwick Study

Transport 2021 hired Peat Marwick Stevenson & Kellogg "to conduct an analysis of the full costs of various modes of passenger transport in the British Columbia Lower Mainland region" (Peat Marwick, 1993, p. i). Transport 2021 intends to recommend a long range transportation plan for the Greater Vancouver area. In order to make recommendations, there needs to be a basic understanding of the current trends and costs of the present transportation system. The Peat Marwick study was successful at achieving the terms of reference of their project. The model developed by Peat Marwick does indeed give Transport 2021 a tool to compare competing modes of regional human transportation.

The terms of reference for the Peat Marwick study were broad both in geographical area and in information to be covered. Given that the time frame of the project was limited to 3 months, Peat Marwick did an extremely thorough job. Peat Marwick analyzed 12 modes of people transport in 20 cost categories for an area that exceeds 2930 square kilometres.

The completed study enables one to compare costs of modes of transport as well as subsidies granted to each transportation mode. All transportation modes are subject to the same assumptions and expressed in the same terms, dollars per passenger kilometre.

This thesis is an accompaniment to the Peat Marwick study. Peat Marwick did an excellent job in providing city officials with information on the cost of transporting people. This thesis
provides municipalities with a model to actually determine what they themselves spend on one mode of transportation.

Because Peat Marwick looked at transportation from a regional perspective, it did not express the data by separate municipality. Their report concludes that municipal taxpayers spent $583 million dollars on private motorized vehicles in 1991 (Peat Marwick, 1993, p. 30). For an individual municipality to determine its own contribution to automobile subsidies, it cannot simply divide the Peat Marwick total by 28, the number of municipalities the report encompasses, because each municipality has different costs, population and area. For example, not all municipalities have their own police force, many use by contract the R.C.M.P. which is under federal jurisdiction. The cost of policing those municipalities is possibly shared between the federal government and the municipality.

This thesis enables the Peat Marwick study to be useful to individual municipalities. In 1990, Clouds of Change recommended Vancouver undertake a study, similar to this thesis, so that subsidies could be understood and reoriented from private to public forms of transportation (Clouds of Change, 1990, p. 43). This thesis provides a framework to monitor the private automobile subsidies for individual municipalities in each calendar year. Each municipality could then implement policies to mitigate the subsidies. Recoveries from private automobiles could be applied to improve the popularity and convenience of alternate modes of transportation as recommended by Clouds of Change.

This thesis also enhances the Peat Marwick study by personalizing the data. That is, both reports clearly show that private automobile drivers enjoy subsidies. However, the Peat
Marwick report covers too large an area to allow people to feel personally responsible for the costs. People generally relate more easily to the local level than the regional level. Peat Marwick exhibits that Lower Mainland automobiles were subsidized in 1991 by a total amount of $2,654 million dollars by businesses, municipal taxpayers, provincial taxpayers and society (Peat Marwick, 1993, p. 30). This thesis shows that each Vancouver vehicle is subsidized by the city $720 per year. It demonstrates that if one does not own or use a car in the city, one deserves some kind of reward. The Peat Marwick study does a good job at documenting the costs of the automobile but due to the large project scope, car drivers can feel removed from the costs they incur.

Peat Marwick places dollar values on hidden or societal costs. In this thesis the hidden costs are discussed but not expressed in monetary values. Thus, the subsidies in the Peat Marwick study are seen as much higher than those in this thesis. The hidden costs in this thesis are not expressed in dollar values because it was felt too many assumptions would be required. Also, since hidden costs like air pollution are more of a regional cost than a local cost, it did not seem appropriate to do more than discuss them. The background of the terms of reference for the Peat Marwick study describe that because the automobile enjoys a number of subsidies it is "underpriced and therefore overused" (Peat Marwick, 1993, p. A2). Thus, if the direct costs are fully accounted for by users, a decrease in automobile use should result, leading to less severe hidden costs.

The Peat Marwick report ends with a chapter entitled "Future Research Needs." Suggestion C, "analyze a broader range of costs" is unnecessary. The point of both the Peat Marwick study and this thesis is to illustrate that transporting people is costly to governments and to society.
Motorists have traditionally believed that they pay the cost of their right to drive automobiles in the form of fuel taxes, property taxes and the fixed automobile ownership costs. Both studies demonstrate that this belief is false. So, to analyze a broader range of costs would only add to the complexity of the study and the number of assumptions required. It would not change the point. The studies provide good approximations of the direct automobile costs. As for hidden costs, money cannot repair everything. Some of the hidden costs will only be mitigated through decrease in automobile use, not by throwing money at the problem.

8.2 Final Remarks

This thesis is not suggesting that the car should be eliminated from society. Rather, it is acknowledging that the automobile is an intricate part of society. Removing the automobile from the North American lifestyle would be much like severing an arm from a person. Many ordinary activities would have to be relearned using different techniques. Without losing the arm, it is difficult to catalogue all the functions of an arm. Similarly, without abandoning automobiles in urban society, it is difficult to understand and report all the automobile costs.

The intent of this thesis is to provide evidence that the car does cost city tax payers money and to discuss the nature and amount of the costs.

Owning and driving automobiles are not rights but privileges (Seelig and Artibise, 1991, p. 69). Drivers must be made aware of what the privilege is costing tax payers. Automobile driving, calculated to be costing the City of Vancouver in 1992 alone $185.6 million, is very expensive to governments, yet user-pay strategies for the most part are not in place. Society members
contribute equally in terms of tax dollars but the automobile system is not used equally. There are some people who make conscious efforts to decrease their use of automobiles. This effort by some enables others to benefit, as the less congested roads can be used more freely than before. As Bendixson (1975) puts it "cars are a marvellous way of getting about, provided that you have one and the rest of the world does not." Other people cannot or do not have the means to use automobiles. They are being taxed unfairly for the automobile usage of others.

Recent discussion about introducing tolls on Vancouver’s Lions’ Gate Bridge has brought to the forefront the issue of drivers paying the costs of the infrastructure they use. If drivers were expected to pay for the services they use, such as on-street parking, the city would either not have to collect so much money in property taxes, or would have more money available for other services. An automobile user-pay system of sharing the cost of automobile services would promote a decrease in automobile dependency and reward those who do not use cars. An editorial in The West Ender sums up this sentiment:

The provincial government should move ahead quickly with its plan to introduce tolls to finance major transportation projects, such as a new or rejuvenated Lion’s Gate Bridge.
Tolls would make users responsible for major bridge and highway construction, rather than forcing all taxpayers to contribute. In fact, in some jurisdiction private contractors have agreed to build major new highways and bridges in return for the right to collect tolls, an innovative way of fulfilling infrastructure needs without burdening taxpayers. With Greater Vancouver likely to need billions of dollars worth of transportation improvements over the next decade any additional method of funding is welcome.
In addition, tolls will pay an environmental dividend by having a dampening effect on traffic by convincing motorists to get out of their cars and onto public transit reducing pollution. That would also reduce pressure on existing transportation infrastructure, including downtown and arterial streets ("It’s time motorists paid their way," The West Ender, February 18, 1993, p. 8).

The automobile is finally starting to be checked in society. There has been an awakening to the fact that there are costs associated with the freedom the automobile has provided. The
newspapers now regularly discuss this "hot topic." Letters to the editor express concern and considerable insight into what the unleashed automobile represents. A February 1993 letter to *The Vancouver Courier* worried that a new widened Lion's Gate Bridge is not the solution to the congestion it presently experiences. The author recognizes that a widened bridge will enable more cars to enter downtown Vancouver and questions what will happen once the cars arrive in the downtown. He wonders if Stanley Park will be paved to provide more downtown parking. "Adding more cars to our streets will only make a bad problem worse" (David Black, "Wider bridge not answer," *The Vancouver Courier*, February 17, 1993, p. 7).

A second article in the same paper encourages the restriction of Stanley Park traffic by proposing ideas like: eliminating waterside roadway parking; and restricting nighttime automobile traffic (Brian Truscott, "Restrict park traffic, watchdog group says," *The Vancouver Courier*, February 17, 1993, p. 5).

The car is costing Vancouver. The $185.6 million figure relates to $392.64 per Vancouver citizen in 1992 alone. If Vancouver car owners and car commuters were charged an annual user fee of $563.07, each non-car owner would be $392.64 richer. Such an annual fee idea is not equity fair, but the elimination of free on-street parking and charging permit fees for multiple car owners, as discussed in Chapter 7, is fair and would work to reduce the property tax levels of non-car owners.

Now that the cost of the car is being realized, the next step is to mitigate the cost by introducing fair methods of car ownership and user payments.
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GOVERNMENT PUBLICATIONS


OTHER PUBLICATIONS


Carter, Leigh. "Whether as taxpayer or motorist, we still pay our share." The Vancouver Sun, March 18, 1993, p. A19.


"It's time motorists paid their way." The West Ender (Vancouver), February 18, 1993, p. 8.


"Vancouver’s traffic police to crack down at intersections." *The Vancouver Sun*, November 14, 1992.


### APPENDIX 1: COMPILATION of B.C. ASSESSMENT AUTHORITY FIGURES

#### West Side:

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Average West Side residential land value per square metre: $879

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Average East Side residential land value per square metre: $543
### APPENDIX 1: CONTINUED

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Average Downtown land value per sq. m.: $1,959

#### Commercial Strips: West Side

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Average West Side commercial land value per sq. m.: $2,060

#### Commercial Strips: East Side

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Average East Side commercial land value per sq.m.: $876

Average Commercial Land Value per sq. m.: $1,419