Synthesis of Practice

Survey of the Use of Highway Cost Allocation in Road Pricing Decisions

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FOREWORD

There is always a delay before the best and most current research information is transferred into common use. The practical value of new information results only after dissemination and technology transfer mechanisms enable practitioners to transform that information into knowledge, and then to use that knowledge to solve problems or implement improved practices.

In the transportation sector, working professionals are often faced with problems for which solutions already exist, either in published reports or in the undocumented experience and practice of others working in the field. The volume of information being produced in the world today makes it very difficult to keep fully apprised on the most current data and practices. In Canada, the sharing of information is further complicated by the decentralized jurisdictional responsibility for transportation and vast geographical distances. The TAC Synthesis of Practice series has been initiated to help alleviate the problem by compiling and disseminating state of the art information on topics of current interest to the Canadian transportation community.

For each topic selected, the project objectives are:

1. To locate and assemble all relevant information on the topic.
2. To identify the most current practices for addressing problems within the scope of the topic.
3. To identify all relevant ongoing research on the topic.
4. To learn what problems remain largely unsolved.
5. To organize, evaluate, synthesize and document the useful information that is acquired.
6. To evaluate the effectiveness of the synthesis after it has been in the hands of its users for a period of time.

The overall mission of the Transportation Association of Canada (TAC) is to promote the provision of safe, efficient, effective and environmentally sustainable transportation services in support of the nation's social and economic goals. The national, non-profit association acts as a neutral forum for the discussion of transportation issues and concerns, and acts as a technical focus in the roadway transportation area. Its corporate members include all levels of government, other associations, consultants, contractors, manufacturers, distributors, shippers, goods carriers, passenger transport services, and academic and research institutes.

The Synthesis of Practice series is sponsored by TAC's Research and Development Council. The role of the R&D Council is to foster innovative, efficient and effective research and technology transfer in support of Canadian transportation. Its responsibilities include the identification of national research priorities, the development and management of a national cooperative R&D program, and the monitoring and dissemination of transportation research information in Canada and abroad.

AVANT-PROPOS

Il s'écoule toujours un certain laps de temps avant que les résultats de recherches les plus à propos et les plus à jour ne puissent être mis en application. L'information nouvelle obtenue dans ce contexte n'a de valeur concrète qu'une fois que les mécanismes appropriés de diffusion et de transfert de technologie ont été mis en place afin de permettre aux praticiens de convertir cette information en connaissances qui seront elles-mêmes utilisées aux fins de résoudre des problèmes ou d'instaurer des pratiques améliorées.

Les professionnels oeuvrant dans le secteur des transports se heurtent souvent à des problèmes auxquels on peut d'ores et déjà apporter des solutions, solutions qui sont soit décrites dans des rapports publiés antérieurement, soit issues de l'expérience et de la pratique non documentée d'homologues du domaine. De nos jours, la quantité d'information produite dans le monde ajoute considérablement à la difficulté de demeurer au fait des données et des pratiques les plus récentes. Au Canada, l'échange d'information n'en est d'ailleurs rendu que plus complexe en raison de la décentralisation des compétences et responsabilités en matière de transport et de l'immensité du pays. Désirant avant tout atténuer ce problème, l'ATC a entrepris de constituer et de diffuser une *Synthèse des pratiques*, une série de rapports contenant l'information la plus actuelle sur divers sujets auxquels la collectivité canadienne des transports accorde présentement beaucoup d'intérêt.

Pour chaque sujet retenu, les objectifs poursuivis sont les suivants :

1. localiser et réunir toute l'information documentée pertinente;
2. cerner les plus récentes pratiques applicables à la résolution des problèmes ressortissant au sujet retenu;
3. répertorier tous les travaux de recherche pertinents en cours sur le sujet;
4. cerner les problèmes qui demeurent en bonne partie non résolus;
5. agencer, évaluer, documenter et faire la synthèse de l'information utile réunie au fil des étapes précitées;
6. évaluer l'utilité de cette synthèse une fois que les utilisateurs visés en auront été saisis depuis un certain temps.

La mission de l'Association des transports du Canada (ATC) est de promouvoir la sécurité, l'efficience, l'efficacité et le respect de l'environnement dans la prestation de services de transport, en vue d'appuyer les objectifs sociaux et économiques du pays. Organisme d'envergure nationale et sans but lucratif, l'ATC offre une tribune neutre pour la discussion des enjeux et des problèmes liés aux transports et sert de centre d'études techniques dans le secteur des transports routiers. Ses membres comprennent tous les paliers du gouvernement ainsi que d'autres associations, des experts-conseils, des entrepreneurs, des fabricants, des distributeurs, des expéditeurs, des transporteurs de marchandises, des exploitants de services de transport de voyageurs, des établissements de recherche et le milieu universitaire.

La série *Synthèse des pratiques* est parrainée par le Conseil de la recherche et du développement de l'ATC. Le rôle de ce conseil est d'encourager l'exécution de recherches innovatrices, efficientes et efficaces et le transfert connexe de la technologie qui en est issue, le tout pour le compte du secteur canadien des transports. Ses responsabilités comprennent notamment la détermination des priorités nationales de recherche, l'élaboration et la gestion d'un programme coopératif national de R-D de même que le repérage et la diffusion des résultats des travaux de recherche sur les transports exécutés au Canada et à l'étranger.

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The contents of this report reflect the views of the consultants and not necessarily the official views or policies of the Transportation Association of Canada. This document was prepared by Joseph Jones of Boone, Jones and Associates Inc. in association with Fred P. Nix, Transportation Consultant.

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EXECUTIVE SUMMARY

Canadian provinces are assessing opportunities and making decisions to finance new toll facilities and to apply a variety of taxes and fees to road improvements. An important role of TAC is to develop methodologies which encourage sound decision-making, in this case concerning road pricing policies, whether and when to use tolls, fees and taxes, how to set price levels.

Cost is one factor in road pricing decisions. Highway cost allocation provides decision makers with information about the costs incurred by various classes of road users on different types of roads. Other influences on road pricing include market factors (e.g. impacts on users, competitiveness issues) and road agency objectives (e.g. demand management).

The objective of this research project was to assess the extent to which highway cost allocation has been used in road pricing decisions in the United States, Britain, Australia and New Zealand. This assessment was based upon a survey of U.S. federal and state highway officials, an analysis of current U.S. road user charges and a review of the cost allocation literature for the countries which were studied. The primary focus was on the United States.

The study documents the large volume of cost allocation activity which has occurred in the United States and summarizes the methodologies, results, and impact of the state and federal studies. It also compares the sources and level of road user charges by state, making comparisons between states which do and do not carry out highway cost allocation studies. These comparisons address fuel taxes, charges levied on heavy trucks, the use of toll facilities and the degree of reliance on dedicated funding.

The main finding of the study is that the utility of cost allocation has varied significantly from state to state. Three groups of states are identified: (i) five or six states which have consistently used cost allocation as an input to road pricing; (ii) about ten states, which have made some use of cost allocation in road pricing decisions; (iii) the remaining states, including eighteen which have carried out one or more cost allocation studies, where cost allocation does not appear to have played a role in road pricing. The federal government would fall in the second category.

The study concludes with a number of recommendations for future actions by TAC with respect to highway cost allocation. Based on the review of foreign experience, these include the identification and resolution of key definitional, engineering and costing issues, and the provision of technical support. The final conclusion is that TAC can help potential users understand what cost allocation can and cannot do for them, but these "consumers" must be the ultimate judges of the usefulness of cost allocation.

SOMMAIRE

Les provinces canadiennes s'emploient actuellement à évaluer les possibilités qui leur sont offertes à l'appui de leurs décisions de financer la mise en oeuvre de nouveaux mécanismes de péage et de percevoir divers droits et taxes aux fins de l'amélioration du réseau routier. Dans cet ordre d'idées, l'un des rôles importants de l'ATC consiste à élaborer des méthodes favorisant la prise de décisions éclairées, notamment au regard de la politique de détermination des prix des routes et, plus concrètement, des modalités de fixation des niveaux de ces prix ainsi que des critères de détermination de l'opportunité de recourir ou non à des péages, des droits et des taxes.

Les coûts liés aux projets routiers représentent certes l'un des facteurs à prendre en compte dans le cadre des processus décisionnels associés à la détermination des prix des routes. En effet, la répartition des coûts des routes fournit non seulement aux décideurs des renseignements utiles sur les coûts par catégorie d'usagers et type de route, mais encore des données pertinentes à l'analyse de certains facteurs intéressant le marché (p. ex. les incidences sur les usagers, les questions de compétitivité) et aux objectifs des administrations routières (entre autres au plan de la gestion de la demande).

L'objectif des présents travaux de recherche était d'évaluer dans quelle mesure, aux États-Unis, en Grande-Bretagne, en Australie et en Nouvelle-Zélande, l'information sur la répartition des coûts des routes a été utilisée à l'appui des décisions relatives à la détermination des prix de ces dernières. Cette évaluation a été fondée sur l'examen des résultats d'une enquête menée aux États-Unis auprès des administrateurs routiers fédéraux et d'État, d'une analyse des frais actuellement imposés aux usagers des routes américaines et d'un examen de différents documents portant sur la répartition des coûts des routes dans les pays susmentionnés. Ceci dit, précisons que les analystes ont principalement concentré leurs travaux sur les renseignements provenant des États-Unis.

L'étude dresse un bilan exhaustif des nombreuses activités de répartition des coûts exécutées aux États-Unis et elle résume les méthodes employées dans ce contexte par les administrations routières fédérale et d'État de ce pays de même que leurs résultats et leurs incidences. Le document contient de plus une analyse comparative de la nature et de l'importance des frais imposés dans chaque État aux usagers de la route, analyse comparative que les auteurs ont par ailleurs étendue aux États qui fondent leurs décisions sur des études de répartition des coûts des routes et à ceux qui s'en remettent à d'autres méthodes. Concrètement, ces comparaisons ont trait aux taxes sur les carburants, à tous les droits d'exploitation des poids lourds, au recours à des systèmes de péage et à la mesure dans laquelle les États en question font appel à des mécanismes de financement spécial.

Au terme de leur analyse, les auteurs de l'étude en sont notamment arrivés à la conclusion que l'application de la méthode de la répartition des coûts des routes variait considérablement d'un État à un autre. Trois groupes d'États ont ainsi été établis : un premier groupe de cinq ou six États ayant régulièrement eu recours à la répartition des coûts aux fins de la détermination des prix des routes; un deuxième groupe d'une dizaine d'États ayant de temps à autre fait appel à cette méthode; enfin, un troisième groupe constitué des autres États, où la répartition des coûts des routes ne semble pas avoir joué un rôle digne de mention dans la détermination des prix de ces dernières (ce groupe comprenant tout de même dix-huit États ayant mené une ou plusieurs études de cette nature). Le gouvernement fédéral s'inscrit pour sa part dans le deuxième de ces groupes.

L'étude préconise enfin à l'intention de l'ATC différentes mesures d'intervention inspirées de l'expérience acquise par d'autres pays dans le domaine de la répartition des coûts des routes. Au nombre de ces mesures, notons la détermination des principales questions en matière définitionnelle, technique et d'établissement des coûts visés, la recherche de solutions à ces dernières ainsi que la prestation de services de soutien technique. En dernière analyse, les auteurs de l'étude soutiennent que l'ATC peut certes aider les utilisateurs potentiels à mieux comprendre les avantages et les limites de la méthode de la répartition des coûts des routes, mais qu'en définitive, il appartient à ces «consommateurs» de juger de l'utilité de celle-ci.

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LIST OF EXHIBITS

1. INTRODUCTION

1.1 What is Highway Cost Allocation?

Highway Cost Allocation (HCAS) has been defined (in U.S. legislation of the late 1970s) as the study of:

> (1) the costs occasioned in design, construction, rehabilitation, and maintenance of . . highways by the use of vehicles of different dimensions, weights, and other specifications, and by the frequency of such vehicles in the traffic stream; [and]
>
> (2) the proportionate share of such design, construction, rehabilitation, and maintenance costs attributable to each class of persons and vehicles using such highways (CBO, 1979, quoting from Section 506 of the Surface Transportation Assistance Act of 1978).

Based on U.S. and international theory and practice of the past fifteen years, this classical definition could be modified in at least two respects, to incorporate highway revenues and external effects:

(1) "Cost allocation" is a somewhat misleading term; it is generally a shorth and term for "cost and revenue allocation". Generally, a key objective of HCAS is to compare the costs occasioned by each vehicle class to the revenues paid by each class in order to establish cost-responsibility ratios, i.e., to determine whether each class of vehicles is paying its "fair share". Revenue issues are often the driving force behind HCAS studies: a number of those who were surveyed for this study commented that the main reason for commissioning an HCAS was to raise additional revenue by changing road prices.

(2) In addition to costs imposed by highway users on the road agency, costs imposed on the rest of society (*external costs*) are also a potential subject for cost allocation studies. They were a component of the last U.S. federal study and are likely to be included in the forthcoming federal study. (The issue of the existence and extent of external *benefits* has generated a fair amount of controversy in recent years, the main issue being whether the benefits associated with highway use are fully reflected in market prices. To this date, *external* benefits have not been incorporated in HCAS studies. A Benefits Method was partially applied in the 1956 U.S. federal study, but was abandoned because of conceptual and implementation problems.)

1.2 Objectives and Scope of the Report

The main objective of the report is to assess the extent to which HCAS have actually been used to influence road pricing decisions. The raw material for the report was a telephone survey of U.S. federal and state highway officials, supplemented by a review of HCAS studies in the United States, Australasia and the United Kingdom.

The report is not intended to be a primer on HCAS or road pricing. There are many issues associated with defining a "highway", "road taxes", "costs" and allocation procedures. However, these are only raised insofar as they become relevant to the issue of the influence of HCAS on road pricing.

Chapter 2 of the report provides background information on HCAS in the United States, notably the status of the states' experience in implementing HCAS and some comparisons of road user charges by state.

Chapter 3 consists of case studies of state experiences with HCAS, based on the interviews and reports.

Chapter 4 summarizes some international experience in a number of countries which have made considerable use of HCAS.

Conclusions and recommendations are presented in Chapter 5.

2. HCAS IN THE UNITED STATES: BACKGROUND

2.1 Introduction

The purpose of this chapter is to present background material on HCAS and user charges in the United States. Section 2.2 lists the major federal studies. Section 2.3 summarizes study activity at the state level. Section 2.4 presents information about state road user charges and funding mechanisms, comparing the experiences of states which have undertaken HCAS to those which have not. Discussion of individual studies takes place in Chapter 3.

2.2 Federal Studies

2.2.1 Previous Studies

Exhibit 2.1 summarizes U.S. federal experience with HCAS, focussing on the two major studies of 1956-65 and 1978-82, plus a number of studies which have taken place since 1982.

Exhibit 2.1: Summary of Major Federal Studies

Year	Study	Issues	Approaches	Results
1956-65	Highway Cost Allocation Study	Allocation of federal costs and revenues during construction phase of federal aid highway network	Incremental method	
		Benefits of interstate system	Benefits method	Method abandoned because of "difficulty of making impact estimates" (Urban Institute, 1990)
1978-82	Federal Highway Cost Allocation Study	Equitable allocation of federal costs and revenues during reconstruction/rehabilitation phase	Federal Method	Increases in charges (e.g. 5c/gal for both gasoline and diesel), but smaller than increases recommended by FHWA.
		Promotion of efficiency, including incorporation of externalities	Marginal Cost Method	Relegated to an appendix.
1984	Alternatives to Tax on Heavy Vehicle Use	Options to improve the equity of the highway user fee structure	Not an HCAS, but critical review of options	Weight-distance tax study required: major improvements in equity not possible within existing fee structure because existing fees do not directly reflect weight and distance travelled.

Exhibit 2.1: Summary of Major Federal Studies

Year	Study	Issues	Approaches	Results
1985	Feasibility of a Nationwide Network for Longer Combination Vehicles	Costs and benefits of a national LCV network	Cost allocation only one input to the study	Study contributed to improved understanding of factors associated with pavement costs.
1988	Heavy Vehicle Cost Responsibility	Comparison of costs and revenues associated with 14 classes of heavy vehicle	Federal method	Confirmed 1982 findings re. heavy trucks underpaying Indicated that axle weights are more significant in pavement deterioration than GVW
1988	The Feasibility of a National Weight-Distance Tax	As per title	Federal method	Federal WDT administratively feasible; additional cost responsibility analysis required.

2.2.2 Methodologies

Although they are not the main subject of this report, it is necessary to describe briefly the two main cost allocation methodologies which have been used in recent years in the United States. The most widely used approach has been the **federal method**. This was a departure from the **incremental method**, which was used in the 1956 federal study.

The basic principle of the **incremental method** is that of avoidable costs: "if a cost can be avoided because a particular vehicle class is excluded, then this cost is properly attributable to that class. In effect, the methodology recognizes a base road and associated cost which is assigned to all vehicles. Pavement costs are assigned to all vehicles in proportion to axle-miles and other costs (bridges, grading) in proportion to vehicle-miles. Costs for features of the road not included in the base system are assigned to larger and heavier vehicles" (Nix et al., 1992, 990).

The **federal method**, which was developed for the 1982 federal study, differs from the incremental approach in its treatment of pavement costs and bridge replacement/repair costs. Under the federal approach, a minimum pavement is defined. The costs associated with additional pavement thickness are allocated among vehicles based upon equivalent standard axle loads, using AASHTO pavement design procedures. Expenditures for rehabilitation and replacement (not considered under the original incremental method) are allocated based on the role of each vehicle class in pavement consumption (Urban Institute/Sydec, 1990, 26). Since the 1982 study, the federal method has become the most widely used one and has been endorsed by AASHTO (Minnesota, 1990).

The most important practical consequence of the choice of methods is on the costs allocated to heavy vehicles. Because a small increment in pavement thickness beyond the basic pavement thickness permits significant increase in axle loads, heavy axle vehicles receive a much lower pavement cost allocation under the incremental method than under the federal method. As pavement costs represent an important proportion of highway expenditures, this can have an important bearing on study results.

2.2.3 The New Federal Study

In the fall of 1994, the Federal Highway Administration initiated plans for a new federal HCAS, convoking a cost allocation workshop and eliciting input through a Notice in the *Federal Register* (reproduced as Appendix C). The scope and workplan for the study have not yet been finalized. (Unlike the 1982 study, this HCAS is not being

carried out under a Congressional mandate.) However, the *Federal Register* Notice identifies five potential areas of investigation:

(1) External costs of highway use, as well as highway agency costs;

(2) Use of alternative cost approaches, especially a marginal cost approach, in addition to the traditional ones;

(3) Treatment of highway costs and revenues at all levels of government, not just at the federal level;

(4) Implications for HCAS of multimodal investment programs; and

(5) Life-cycle cost analysis principles to estimate future investment requirements.

2.3 State Studies

Exhibit 2.2 summarizes the HCAS status of the individual states. The column entitled "First Study" represents information gathered in a survey carried out by officials of the Nevada Department of Transport, with a number of corrections. It is possible that information about some early studies is not reflected in this column. Also, as many studies go through a number of "final" drafts, there is sometimes ambiguity about when a study was actually issued.

Exhibit 2.2: Summary of State HCAS Studies

State	First Study	Last Study	Last Study		
			In-House	Consultant	Combination
Alabama	na	na			
Alaska	na	na			
Arizona	1993	1993		X	
Arkansas	1973?	1973			
California	1987	1995 (in progress)			X
Colorado	1988	1991		X	
Connecticut	1982	1982	X		
Delaware	1991	1991	X		
Florida	1989	1989		X	
Georgia	1982	1982	X		
Hawaii	na	na			
Idaho	1994	1994		X	
Illinois	na	na			
Indiana	1984	1988			X
Iowa	1980	1983	X		
Kansas	1985	1988	X		
Kentucky	1988	1994			X
Louisiana	na	na			

Exhibit 2.2: Summary of State HCAS Studies

State	First Study	Last Study	Last Study		
			In-House	Consultant	Combination
Maine	1956	1989	X		
Maryland	1982	1992	X*		
Massachusetts	na	na			
Michigan	na	na			
Minnesota	1990	1990		X	
Mississippi	na	na			
Missouri	1964	1990	X*	X	
Montana	1950s	1992			X
Nebraska	na	na			
Nevada	1984	1994	X		
New Hampshire	na	na			
New Jersey	na	na			
New Mexico	1972	1972		X	
New York	na	na			
North Carolina	1983	1983	X		
North Dakota	na	na			
Ohio	1982	1982			X
Oklahoma	na	na			
Oregon	1937	1993	X		
Pennsylvania	1990	1990		X	
Rhode Island	na	na			
South Carolina	na	na			
South Dakota	na	na			
Tennessee	1975	1975	X		
Texas	1985	1991		X	
Utah	1940	1976	X		
Vermont	1990	1993		X	
Virginia	1981	1993	X		
Washington	1977	mid-1980s		X	
West Virginia	na	na			
Wisconsin	1982	1990	X		
Wyoming	1981	1981		X	

Notes: * update was conducted in-house
Sources: AASHTO (1991); survey by C. Bosch (Nevada DoT); authors' files.

From Exhibit 2.2, it appears that:

- 32 states have conducted one or more HCAS, while 18 states have never carried out an HCAS;
- 3 states conducted their first study before 1970, 4 between 1971 and 1979, 18 between 1980 and 1989 and 7 since 1990. The most important factor in the growth of HCAS in the 1980s was probably the influence of the 1980-82 Federal Highway Cost Allocation Study, following which the Federal Highways Administration provided technical guidance for states wishing to conduct HCAS;
- Since 1990, 17 states have carried out studies, of which 8 are repeat studies or updates;
- Of the latest studies for each state, 15 were primarily conducted in-house, 12 primarily by consultants and 5 by a combination of consultants and in-house staff. In some instances, the first study was conducted by consultants, while in-house staff were responsible for updates. Where consultants have been involved, states have either hired one of the firms specializing in HCAS (e.g. Wilbur Smith & Associates or Sydec, Inc.) or a local university transportation centre (Indiana, Kentucky, Maryland and Texas are among the states which have done so).

2.4 Taxes, Funding Arrangements and HCAS

2.4.1 Introduction

In this section, we present information concerning road user charges and HCAS. This information deals with:

- fuel taxes: is there any correlation between states which have carried out HCAS and the level of state gasoline (or diesel taxes)?
- road user charges for heavy trucks: are these higher for states which have carried out HCAS?
- use of toll facilities; and
- highway and transportation trust funds.

2.4.2 Fuel Taxes

Exhibit 2.3 shows recent information concerning state fuel taxes and also indicates the HCAS experience of each state. The states are ranked in descending order according to the level of **gasoline** taxes.

Exhibit 2.3: Effective State Tax Rates as of February 1, 1995
Canadian Cents per Litre

STATE	GASOLINE	DIESEL	LPG	GASOHOL	HCAS SINCE 1980	HCAS SINCE 1990?
Connecticut	11.9	6.7	6.7	11.5	1	N
Rhode Island	10.8	10.8	10.8	10.8	0	N
Montana	10.0	10.3	0.0	10.0	1	Y
West Virginia	9.4	9.4	9.4	9.4	0	N

Exhibit 2.3: Effective State Tax Rates as of February 1, 1995
Canadian Cents per Litre

STATE	GASOLINE	DIESEL	LPG	GASOHOL	HCAS SINCE 1980	HCAS SINCE 1990?
Nebraska	9.2	9.2	0.0	9.2	0	N
Oregon	8.9	8.9	8.9	8.9	>1	Y
Nevada	8.9	10.0	8.6	8.9	>1	Y
Maryland	8.7	9.0	8.7	8.7	>1	Y
Wisconsin	8.6	8.6	8.6	8.6	>1	Y
Washington	8.6	8.6	0.0	8.6	1	N
Delaware	8.6	8.2	8.2	8.6	1	Y
New York	8.4	9.1	3.0	8.4	0	N
Pennsylvania	8.3	8.3	8.3	8.3	1	Y
Ohio	8.2	8.2	8.2	8.2	1	N
Colorado	8.2	7.6	7.6	8.2	1	Y
North Carolina	8.1	8.1	8.1	8.1	1	N
Massachusetts	7.8	7.8	3.2	7.8	0	N
New Mexico	7.8	7.1	6.7	7.8	0	N
Idaho	7.8	7.8	7.8	7.0	1	Y
Texas	7.4	7.4	5.6	7.4	>1	Y
Iowa	7.4	8.4	7.4	7.1	1	N
District of Columbia	7.4	7.4	7.4	7.4	0	N
Tennessee	7.4	6.3	5.2	7.4	0	N
Minnesota	7.4	7.4	0.0	7.4	1	Y
Louisiana	7.4	7.4	6.0	7.4	0	N
Illinois	7.1	8.0	7.1	7.1	0	N
Maine	7.1	7.4	6.7	7.1	>1	N
Utah	7.1	7.1	7.1	7.1	0	N
Arkansas	7.0	7.0	6.1	7.0	0	N
New Hampshire	7.0	7.0	6.7	7.0	0	N
Mississippi	6.8	6.8	6.3	6.8	0	N
California	6.7	6.7	2.2	6.7	>1	Y*
South Dakota	6.7	6.7	6.0	6.0	0	N
Alabama	6.7	7.1	6.3	6.7	0	N
Arizona	6.7	6.7	6.7	6.7	1	Y
Kansas	6.7	7.4	6.3	6.7	1	N
North Dakota	6.7	6.7	6.7	6.7	0	N
Virginia	6.5	6.0	3.7	6.5	>1	Y
Oklahoma	6.3	5.2	6.3	6.3	0	N

Exhibit 2.3: Effective State Tax Rates as of February 1, 1995
Canadian Cents per Litre

STATE	GASOLINE	DIESEL	LPG	GASOHOL	HCAS SINCE 1980	HCAS SINCE 1990?
Kentucky	6.1	5.0	5.6	6.1	>1	Y
Hawaii	6.0	6.0	4.1	6.0	0	N
Vermont	6.0	6.3	0.0	6.0	1	Y
South Carolina	6.0	6.0	6.0	6.0	0	N
Missouri	5.6	5.6	5.6	5.6	1	Y
Indiana	5.6	6.0	0.0	5.6	>1	N
Michigan	5.6	5.6	5.6	5.6	0	N
Florida	4.6	8.9	5.8	4.6	1	N
New Jersey	3.9	5.0	2.0	3.9	0	N
Wyoming	3.3	3.3	0.0	3.3	1	N
Alaska	3.0	3.0	0.0	0.0	0	N
Georgia	2.8	2.8	2.8	2.8	1	N
Mean	7.2	7.2	5.4	7.1	>1: 10	Y: 17
Weighted Average (based on net gallonage taxed)	6.9	7.0	4.6	7.3	1: 18	N: 34
Federal Tax	6.8	9.1	6.8	4.8	0: 23	

Source: Monthly Motor Fuel Reported by States, Table MF-121T, February 1995
NOTES
AZ: 8c/gal surcharge on fuel used for vehicles of more than 2 axles and GVW > 26,000 lb
IL: Motor carriers pay an additional 5.6c/gal on gasoline and 6c/gal on diesel
KY: 2% surtax on gasoline, 4.7% on special fuels for vehicles with 3+ axles; additional 2c/gal for vehicles with combined licence weight of > 59,999 lbs.
MI: 6c/gal diesel discount for commercial vehicles licensed under the motor carrier fuel tax.
NJ: In addition to the taxes shown there is a Petroleum Products Gross Receipts tax levied on range of petroleum products
NY: Motor carriers pay an additional 7.7c/gal for gasoline and 8.9c for diesel
OH: Commercial vehicles pay an additional 3c/gal
OR: Vehicles paying weight distance tax are exempt from fuel tax
PA: Motor carrier pay an additional 6c/gal
VA: Motor carrier road tractors, tractor trucks and straight trucks with more than 2 axles pay extra 3.5c/gal
Exchange rate: C$1.00 = US$0.71.
* California post-1990 study is in progress.

These data on fuel taxes suggest a relatively weak, but positive correlation between states which have carried out cost allocation since 1990 and gasoline tax levels. For example:

- the (unweighted) mean gasoline tax for states which have carried out an HCAS since 1990 is 7.7 Canadian cents per litre; for other states, the mean rate is 7.1 cents;

- 6 of the 10 states with the highest gasoline taxes have carried out an HCAS since 1990, while 8 out of the 10 states with the lowest gasoline taxes have not; and

- the unweighted mean tax for diesel and gasohol was also slightly higher for states which had carried out HCAS since 1990.

Note: the numerical estimates derived from Exhibit 2.3 do not include the surtaxes which are listed in the notes to the Exhibit.

Finally, it should be stressed that correlation between fuel taxes and HCAS activity does not necessarily indicate causality.

2.4.3 Taxation of Heavy Trucks

Two sources of information were obtained on the taxation of heavy trucks: tables produced by the Association of American Railroads and a table which appears annually in *American Trucking Trends*, a publication of the American Trucking Associations. Both provide data for charges faced by an 80,000 lb. GVW, 5-axle tractor-semitrailer combination. The main difference between the two sets of estimates is in the assumption concerning annual distance travelled: the ATA assumes 80,000 miles, whereas the AAR takes a national average distance travelled for this type of vehicle from FHWA sources (122,000 miles for 1994) and apportions these miles among the states based on diesel fuel consumption data. Because the AAR applies the fixed charges over a greater distance, their estimates of user charges per mile are lower than the ATA's.

In this report, we have used the AAR data for analysis purposes. The primary reason is that in addition to the current AAR data, we had on file a comparable table from 1987, which gave the possibility of making some comments about how heavy vehicle user charges had changed over time. This choice does not imply a judgement about which is the appropriate assumption of annual distance in computing per mile user charges. Because our interest is in comparisons between states, not in the absolute levels of the user charges, this issue was of lesser importance to us. The two data sets, however, were compared to ensure that the input data were consistent.

Exhibit 2.4 ranks the states on the basis of total tax in Canadian cents per vehicle-kilometre as of January 1995. The line between Ohio and Washington separates states with taxes above the national average from those with below average taxes.

Exhibit 2.4: Apportioned State Highway User Fees for Heavy Interstate Trucks
January 1995 Tax Rates, Canadian Dollars and Metric Units

	Diesel Fuel Tax c/km	Reg. Fees c/km	Third Structure Tax Rates c/km	Total Tax c/km	HCAS Studies since '80	HCAS Studies since'90?
Oregon	0.00	0.24	12.73	12.97	>1	Y
New York	4.76	0.81	3.41	8.99	0	N
Arizona	3.67	0.70	4.18	8.55	1	Y
Idaho	2.96	0.11	3.93	6.99	1	Y
Kentucky	2.71	0.92	2.49	6.12	>1	Y
New Mexico	2.69	0.10	2.77	5.56	0	N
Illinois	3.85	1.58		5.43	0	N
Montana	3.91	1.25		5.17	1	Y
Vermont	3.68	1.18		4.86	1	Y
Pennsylvania	4.01	0.82		4.83	1	Y

Exhibit 2.4: Apportioned State Highway User Fees for Heavy Interstate Trucks
January 1995 Tax Rates, Canadian Dollars and Metric Units

	Diesel Fuel Tax c/km	Reg. Fees c/km	Third Structure Tax Rates c/km	Total Tax c/km	HCAS Studies since '80	HCAS Studies since'90?
California	3.68	1.13		4.81	>1	Y*
Indiana	3.81	0.99		4.80	>1	N
Nevada	3.70	0.99		4.69	>1	Y
Wisconsin	3.28	1.34		4.62	>1	Y
Mississippi	2.54	2.05		4.59	0	N
Colorado	2.89	1.70		4.59	1	Y
Rhode Island	3.90	0.62		4.52	0	N
Ohio	3.53	0.98		4.51	1	N
Washington	3.24	1.18		4.43	1	Y
West Virginia	3.58	0.82		4.40	0	N
Iowa	3.18	1.22		4.39	1	N
Maryland	3.43	0.93		4.35	>1	Y
Nebraska	3.42	0.92		4.34	0	N
Kansas	2.82	1.26		4.08	1	N
Minnesota	2.82	1.26		4.08	1	Y
Florida	3.33	0.71		4.04	1	N
Massachusetts	2.97	0.88		3.84	0	N
North Carolina	3.10	0.69		3.79	1	N
Virginia	2.78	0.88		3.66	>1	Y
Connecticut	2.54	1.11		3.65	1	N
Delaware	2.69	0.93		3.62	1	Y
Tennessee	2.60	1.02		3.61	0	N
South Dakota	2.54	1.05		3.59	0	N
Arkansas	2.61	0.98		3.59	0	N
Utah	2.69	0.86		3.54	0	N
Maine	2.83	0.64		3.46	>1	N
Texas	2.82	0.61		3.43	>1	Y
Missouri	2.12	1.23		3.35	1	Y
North Dakota	2.53	0.75		3.28	0	N
Louisiana	2.82	0.37		3.19	0	N
New Hampshire	2.56	0.51		3.07	0	N
Michigan	2.12	0.94		3.05	0	N
Alabama	2.40	0.57		2.97	0	N

Exhibit 2.4: Apportioned State Highway User Fees for Heavy Interstate Trucks
January 1995 Tax Rates, Canadian Dollars and Metric Units

	Diesel Fuel Tax c/km	Reg. Fees c/km	Third Structure Tax Rates c/km	Total Tax c/km	HCAS Studies since '80	HCAS Studies since'90?
Wyoming	1.27	1.59		2.86	1	N
South Carolina	2.26	0.58		2.83	0	N
Oklahoma	1.84	0.72		2.55	0	N
New Jersey	1.91	0.61		2.52	0	N
Georgia	1.62	0.53		2.15	1	N
States with HCAS since 1990	3.10	0.94	0.88	4.91	>1: 10	Y: 18
States with no HCAS since 1990	2.94	0.90	0.27	4.10	1: 18	N: 33
Sum	3.00	0.92	0.53	4.45	0: 23	

Source: Association of American Railroads, based on FHWA data.
Notes:
Exchange rate: C$1.00 = US$0.71.
* California post-1990 study is in progress.

Exhibit 2.4 indicates that:

- On average (without weighting by distance travelled or other factors), taxes per vehicle-kilometre for 5-axle tractor-semitrailers are almost 20 per cent higher in states which have carried out an HCAS since 1990 than in those which have not; and

- 61% of the states with tax levels above the national average have carried out an HCAS since 1990; 77% of the states with lower than average tax levels have not.

Hence, there appears to be a positive correlation between tax levels and HCAS studies, although we repeat that this does not demonstrate cause and effect.

Exhibit 2.5: HCAS Status and Taxation of Heavy Trucks, 1987-95

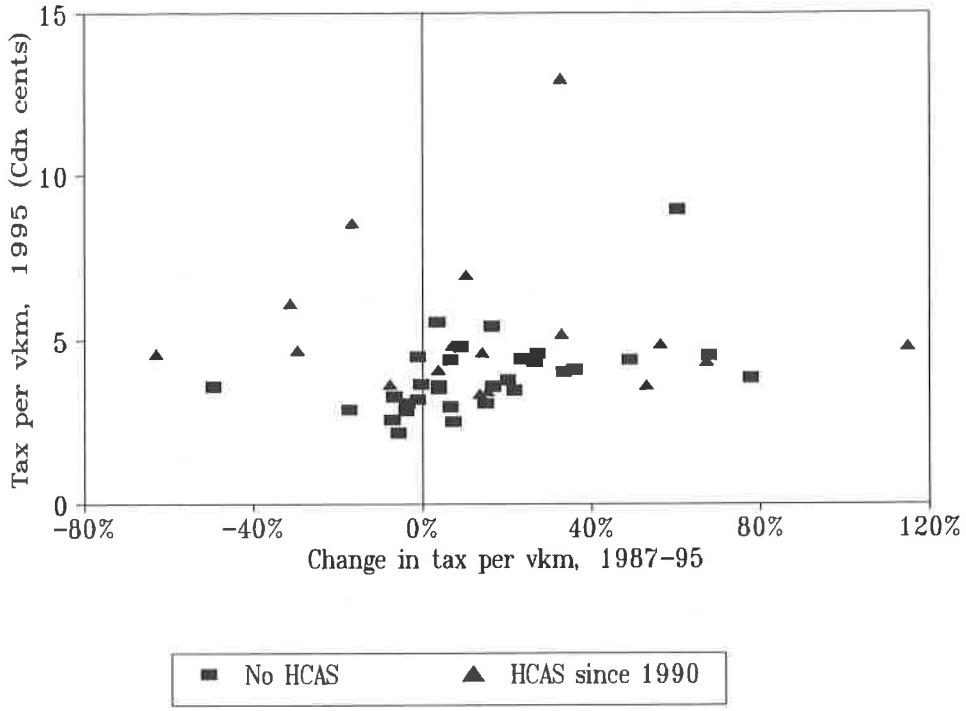

Exhibit 2.5 shows 1995 state user charges for heavy trucks, the change in these charges over the past eight years and HCAS activity by state. Beyond the correlation between 1995 user charge levels and HCAS activity mentioned earlier, there appears to be little pattern here. There have been some very significant changes in user charges, both increases and decreases. Examples of sharp increases and decreases can be found for both HCAS and non-HCAS states.

The most striking trend is one of "regression to the mean": a number of states with user charges which had been sigificantly above or below the mean apparently taking action to bring them closer to some `norm'. The lack of a correlation between HCAS activity and increases in heavy truck user charges does not prove that HCAS are ineffective, merely that many factors are at play in the setting of user charges:

- pressures to raise revenues;
- pressures to remain competitive with neighbouring states; and
- pressures from interest groups.

In addition, a number of recent studies have found that combination trucks were already being charged an amount which covered the costs they imposed on the state road network: Oregon (1993), Idaho, Delaware and Arizona all fall into this category. Under such circumstances, an HCAS study would not support an increase in charges.

Exhibit 2.6: Weight Distance Taxes and Changes in User Charges

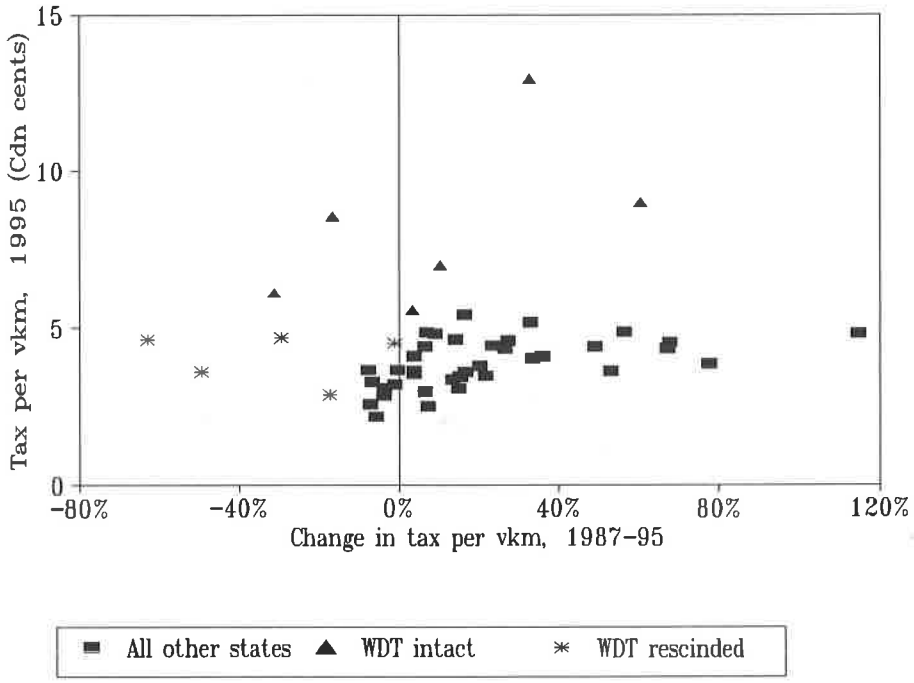

Exhibit 2.6 pinpoints another factor which has influenced the evolution of heavy vehicle user charges: the status of weight distance taxes (WDT).

There are two reasons, after netting out inflation, heavy vehicle user charges per kilometre have decreased in fifteen states since the late 1980s:

1) In some states, the fuel tax rate remained unchanged (e.g., Connecticut, Michigan, Oklahoma and Utah) or increased at a slower rate than the improvement in vehicle fuel economy (e.g., Georgia and Virginia). Of these states, only Virginia has been actively involved in HCAS in the 1990s;

2) Weight distance taxes were either abolished (Arkansas, Colorado, Nevada, Ohio and Wyoming) or are under pressure (Arizona and, perhaps, Kentucky, which has rescinded a weight-distance surcharge of 1.15¢ per mile "by administrative action in accord with statutory provisions" [Deacon and Pigman, 1994, 8]).

2.4.4 Toll Facilities and HCAS

The study Terms of Reference call for an assessment of the extent to which HCAS has influenced decisions on:

- the implementation of road pricing;
- road pricing policies (types of tolls, fees and taxes implemented); and
- the actual level of prices.

Table SF-38 of the FHWA's *Highway Statistics* (1993 edition) indicates the following concerning state administered toll road and crossing facilities:

- 11 of the 23 jurisdictions (states and District of Columbia) which have never undertaken an HCAS administer toll road and/or crossing facilities. These facilities generated US$5.3 billion in total revenues in 1992; and

- 17 of the 28 states which have undertaken an HCAS administer toll and/or crossing facilities. These facilities generated US$2.8 billion in total revenues in 1992.

The two states which collect the largest revenues from tolls, New Jersey ($1.9 billion) and New York ($1.4 billion) have never undertaken an HCAS.

There appears to have been little correlation between tolling and HCAS activity. Historically, the two have developed more or less independently. The toll road network in the United States, despite the recent flurry of public/private activity, remains primarily a network built from public funds and bond proceeds in the **pre**-1956 period. However tolls were set, it was not by cost allocation. With a few exceptions, HCAS developed in the **post**-1956 period as a means of ensuring an adequate flow of revenues (i.e., road **taxes**) to sustain federal and state highway programs.

HCAS could be a useful tool to both public and private toll operators, by providing information about the costs of providing services to different classes of vehicles. This would supplement, rather than replace, other approaches to setting road prices (e.g. demand studies, competitiveness considerations, etc.). However, **if** cost allocation is used by tolling authorities, it must have taken the form of proprietary analyses, because we have not found evidence of such activity in the public domain.

2.4.5 Trust Funds and Dedicated Funding

Exhibit 2.7 reports on the existence of trust funds and dedicated funding sources by state.

Exhibit 2.7: Status of Trust Funds and HCAS

STATE	TRANSPORTATION TRUST FUND	HIGHWAY TRUST FUND	DEDICATED FUNDING SOURCE	HCAS STUDY
Alabama	N	Y	Y	N
Alaska	N	N	N	N
Arizona	N	Y	Y	Y
Arkansas	N	N	Y	Y
California	Y	Y	Y	Y
Colorado	N	Y	Y	Y
Connecticut	Y	N	N	Y
Delaware	Y	N	N	Y
District of Columbia	N	N	N	N
Florida	Y	N	N	Y
Georgia	N	Y	Y	Y
Hawaii	N	Y	Y	N
Idaho	Y	Y	Y	Y
Illinois	N	Y	N	N
Indiana	N	Y	Y	Y
Iowa	N	Y	Y	Y
Kansas	N	Y	N	Y
Kentucky	N	Y	Y	Y

Exhibit 2.7: Status of Trust Funds and HCAS

STATE	TRANSPORTATION TRUST FUND	HIGHWAY TRUST FUND	DEDICATED FUNDING SOURCE	HCAS STUDY
Louisiana	Y	N	N	N
Maine	N	Y	Y	Y
Maryland	Y	N	PARTIALLY	Y
Massachusetts	N	Y	Y	N
Michigan	Y	Y	Y	N
Minnesota	N	Y	Y	Y
Mississippi	N	Y	Y	N
Missouri	Y	Y	Y	Y
Montana	N	Y	Y	Y
Nebraska	N	Y	Y	N
Nevada	N	Y	Y	Y
New Hampshire	N	Y	Y	N
New Jersey	Y	N	N	N
New Mexico	N	Y	Y	Y
New York	N	N	N	N
North Carolina	N	Y	Y	Y
North Dakota	N	Y	Y	N
Ohio	N	Y	Y	Y
Oklahoma	Y	N	N	N
Oregon	N	Y	Y	Y
Pennsylvania	N	Y	Y	Y
Rhode Island	N	N	N	N
South Carolina	N	Y	Y	N
South Dakota	N	Y	Y	N
Tennessee	N	Y	Y	Y
Texas	Y	N	N	Y
Utah	Y	Y	Y	Y
Vermont	Y	N	N	Y
Virginia	Y	Y	Y	Y
Washington	Y	Y	Y	Y
West Virginia	N	Y	Y	N
Wisconsin	Y	N	N	Y
Wyoming	N	Y	Y	Y
SUM (Y)	17	36	36*	32

* includes one "partially".
Source: 1992 State Highway Finding Methods (The Road Information Program).

From Exhibit 2.7, it appears that:

- 25 states have both undertaken an HCAS study and have a dedicated funding source;
- 8 jurisdictions (7 states plus the District of Columbia) have neither a dedicated funding source nor any HCAS experience;
- 11 states have a dedicated funding source, but have never carried out an HCAS study; and

- 7 states do not have a dedicated funding source, but have HCAS experience. Some of these states, such as Kansas, Texas and Wisconsin, have undertaken more than one HCAS.

While it would appear logical for HCAS (no HCAS) and dedicated funding (no dedicated funding) to go hand in hand, and this is true in most cases, there are still over one third of the states which do not fit the expected pattern.

2.4.6 HCAS and Sources of State Funding of Highways

Finally in this chapter, we report on the relationship between the use of HCAS and the sources of state highway funding. Exhibit 2.8 compares the sources of funding for states where HCAS has consistently influenced policy, sometimes influenced policy and had little or no influence on policy (see section 3.1 for more details).

Exhibit 2.8: Sources of State Highway Funding: 1992
Thousands of U.S. Dollars

	HCAS Influential	HCAS Somewhat Influential	HCAS Not Influential	TOTAL
State User Taxes and Tolls [A]	$1,844,874	$9,544,472	$22,389,972	$33,779,318
Other State Imposts and General Funds [B]	65,754	902,163	2,022,029	2,989,946
Federal Funds [C]	807,323	4,117,547	10,662,017	15,586,887
Other [D]*	199,065	1,988,747	7,053,725	9,241,537
Total [E]	2,917,016	16,552,929	42,127,743	61,597,688
State User/Total [A/E]	63.2%	57.7%	53.1%	54.8%
Federal/Total [C/E]	27.7%	24.9%	25.3%	25.3%
Other [B + D]/Total	9.1%	17.5%	21.5%	19.9%

* Miscellaneous Income, Bond Proceeds, Payments from Local Governments
Source: FHWA, *Highway Taxes and Fees, How They Are Collected and Distributed*

The main conclusion from Exhibit 2.8 is that states where HCAS is influential are more reliant on state highway user fees and less reliant on general revenues or other sources of funds. It should be cautioned that this Exhibit is based on only one year's data. Also, within each category of states there are significant differences. States such as New York and New Jersey, which rely heavily on bond funding, have a significant influence on the "HCAS Not Influential" category.

2.5 Conclusions

The findings and conclusions for this chapter, as well as chapters 3 and 4, are consolidated and presented in Chapter 5.

3. HCAS IN THE UNITED STATES: INFLUENCE ON DECISION MAKING

3.1 Introduction

The focus of this chapter is on the role of HCAS in decision making concerning road pricing at the state level in the United States. The raw material for the chapter consists of:

- interviews with over 40 state highway or transportation officials (listed in Appendix B) and
- the HCAS studies referenced in Appendix A and summarized in Appendix D.

The initial contact list was obtained from AASHTO (1991), supplemented by new contacts through telephone inquiries within the highway/transportation department. Resources did not permit more exhaustive inquiries within the individual states to validate the information and interpretation we received. Wherever possible, we cross checked information received against published reports to ensure it was correct and/or that we had interpreted it correctly. However, it was not always possible to do so because in many cases, written material was not available. In light of this, it is more than usually important to stress that **the opinions expressed in this chapter are the sole responsibility of the authors.**

The chapter focusses on three types of states:

- states where HCAS has materially influenced decision making (corresponding to Project Objective 3 d);
- states where HCAS has had little or no influence on decision making (Project Objective 3 e); and
- states where HCAS has been applied in some cases but not in others (Project Objective 3 f).

Exhibit 3.1 shows our subjective assessment of the influence of HCAS on road pricing for each state. "Influence" is treated as a continuum so that, where the evidence is mixed we have given states an intermediate ranking. In addition, states which have undertaken HCAS studies are designated "X", so that Exhibit 3.1 also indicates those studies which, in our opinion, either did not materially affect road pricing or which no longer affect road pricing.

Exhibit 3.1: Assessment of the Influence of HCAS on Road Pricing

State	Influential	←	Somewhat Influential	→	Not Influential
Alabama					X
Alaska					X
Arizona			X		
Arkansas					X
California			X		
Colorado				X	
Connecticut					X
Delaware			X		
Florida					X
Georgia					X
Hawaii					X
Idaho		X			
Illinois					X
Indiana			X		
Iowa				X	
Kansas					X
Kentucky	X				

Exhibit 3.1: Assessment of the Influence of HCAS on Road Pricing

State	Influential	←	Somewhat Influential	→	Not Influential
Louisiana					X
Maine	X				
Maryland			X		
Massachusetts					X
Michigan					X
Minnesota			X		
Mississippi					X
Missouri					X
Montana	X				
Nebraska					X
Nevada	X*				
New Hampshire					X
New Jersey					X
New Mexico					X
New York					X
North Carolina					X
North Dakota					X
Ohio					X
Oklahoma					X
Oregon	X				
Pennsylvania					X
Rhode Island					X
South Carolina					X
South Dakota					X
Tennessee				X	
Texas					X
Utah					X
Vermont				X	
Virginia			X		
Washington					X
West Virginia					X
Wisconsin			X		
Wyoming					X

To summarize, it is our assessment that:

- HCAS has been (or is likely to be) consistently influential in setting road prices in a small number of states (5 or 6);
- HCAS has little or no influence on road pricing in approximately two-thirds of the states, including 18 states which have, at one time or another, conducted HCAS; and
- HCAS has had some influence in road pricing in 9 or 10 states (Idaho could move up to the first group of states).

3.2 States Where HCAS Has Materially Influenced Decision Making

Cost allocation has had a material influence on the setting of road user charges in a number of states:

- Oregon
- Kentucky
- Maine
- Montana and
- Nevada .

In addition, Idaho appears to be embarked upon a charge setting process in which HCAS would play an integral part.

The following information was gathered about the strong HCAS states:

- HCAS studies have a long tradition in **Oregon**, dating back to 1937, with subsequent studies in 1947, 1963, 1974, 1980, 1984, 1986, 1990, 1992 and 1994. Cost responsibility studies are carried out in-house and typically require 1.5-2 people, one for traffic/revenue issues, the other for expenditure data. The recommendations of these studies have generally been implemented by the legislature and it is well established that all tax packages should be passed through the "cost responsibility filter", i.e. to assess their implications for equity.

  As a result of the 1986 study, Oregon's truck taxation was comprehensively restructured by the 1989 legislature, in order to reduce cross subsidization at the expense of vehicles in the 8,001-26,000 lb registered gross weight class. Based upon the results of the 1990 update and the 1992 study, Oregon appears to be at the fine tuning stage. The 1992 study concluded that "basic vehicles" were slightly underpaying, while heavy vehicles were overpaying by one or two per cent. (From Chapter 2, it will be remembered that Oregon's user charges for heavy trucks are the highest in the country by a significant margin.)

  Oregon's process appears to work because of an established relationship between the DoT and the legislature, commitment to HCAS within the department and continuity. Although a Policy Advisory Committee exists to ensure that user groups are represented, the HCAS process appears to be closely controlled by the department so as to ensure that there are "no surprises".

- **Kentucky** has carried out six HCAS, beginning in 1982, with the most recent study being carried out in 1994. The studies are carried out by the Kentucky Transportation Center at the University of Kentucky in cooperation with the Kentucky Transportation Cabinet. They are overseen by a small, *in-house* Study Advisory Committee. The results of the studies are used to take to the General Assembly to show where Kentucky stands with regard to cost responsibility. There is also a Governor-appointed Motor Carrier Advisory Committee which makes tax recommendations, based on the studies. They are mostly intrastate.

  According to the interviewee, Kentucky has gradually come up the learning curve, improving their data base and refining their methodology. Based on the 1994 report, they also appear to have reached the fine-tuning stage. The only vehicle class which was significantly underpaying was buses.

Kentucky's studies are used to assess a variety of scenarios. For example, the 1994 study assessed a legislative proposal from the Motor Carrier Advisory Commission, a proposal from the Highway Contractors Association and changes arising from membership in the International Fuel Tax Agreement (IFTA).

The influence of HCAS on policy should be kept in perspective. The 1994 report expresses the position well: "Cost allocation studies do not determine tax policy. While they provide indispensable information to the policy maker regarding the equity of alternative tax policies, they do not consider a host of other critical factors including competitive balance between modes, economic development and prosperity, funding levels necessary to maintain and enhance efficient commerce, energy conservation, etc." (Kentucky, 1994, 11). Nonetheless, in the words of our interviewee, HCAS has been "exceedingly beneficial".

- **Maine** conducted HCAS in 1956, 1961, 1982 and 1989. According to AASHTO: "MDO instituted a suppliers' law for diesel fuel to reduce evasion, reduced fees on certain vehicles, instituted a commodity permit system, recommended a diesel differential and introduced the concept of weight-distance taxation. The 1989 study recommended dual registration for straight trucks and semi trailer combinations, tighter control on axle distribution, improvements in record systems, further study of weight distance, adjustment of the fuel use decal fee and operating authority fund structure. . . . The results of the 1989 study will be utilized to develop other legislation to address highway user equity" (AASHTO, 1991, 28). Given that the 1989 study indicated that combination vehicles were approximately paying their way, the report concluded that "a weight-distance tax would further promote the payment of fair shares among and within vehicle groups, but does not appear to be a primary tax mechanism to institute presently" (Maine, 1989, v).

- **Montana** is known to have conducted a HCAS in the 1950s (Johnson, 1957), although what use was made of the results is unclear. More than three decades later, the state conducted its next HCAS and this one has had a major influence on road taxes. Not all details on changes made to Montana taxes, and the relation these changes had to the 1992 cost allocation study are known. But, the basic elements of the story appear to be as follows.

  The HCAS in 1992 showed "basic" vehicles (those with a registered weight of less than 10,000 lbs) were underpaying somewhat, intermediate vehicles (10,000 to 26,000) were overpaying by about 11%, and large trucks were overpaying by 7%. But within these three broad classes, there was a good deal of variability caused by factors such as reduced registration taxes for some trucks (e.g., agricultural) or for vehicles such as buses which were taxed on a "per seat" basis rather than a registered weight basis.

  In an attempt to correct these inequities (over or underpaying), in an attempt to raise additional tax revenues for the highway system, and of considerable importance, in an attempt to redesign the registration tax schedule for trucks to forestall some nasty developments within the International Registration Plan, a number of options were evaluated. (*The problem in terms of IRP was that Montana was one of only two states that still collected registration fees on trailers. This increases the workload considerably for other IRP members and IRP members were thought to be considering ways of forcing Montana to change its system. There was even thought to be some possibility that other IRP members would cease to collect trailer taxes for Montana.*)

  At this point, the knowledge of just what tax changes were made (or when they were made) becomes a little hazy (*information is based on conversations with the Montana DoT and a number of documents submitted by the DoT to the Legislature*). What appears to have happened is that some of the "special" vehicles had their registration fees increased (*these may be registration fees and/or property taxes on vehicles)*; the state switched to a power-unit basis for registration; the total impact of these changes

was a reduction in the amount collected from gross vehicle weight based fees; and the state increased fuel taxes.

- **Nevada** is just completing its sixth HCAS. The first one, in 1984, showed that lighter vehicles were subsidizing heavier ones. Because of this finding, legislation was enacted in 1985 "to partially rectify this inequity." A second study in 1986 again showed that there was cross-subsidization and, again, legislation was introduced "to correct this inequity." A third cost allocation study in 1988 showed, according to the Director of the Nevada Department of Transport, that "equity had been achieved." (*Mr Garth Dull, testimony before a legislative subcommittee, Oct 28/93*)

  The information on the history of HCAS activity in Nevada is taken from the 1992 study; this does not provide actual details on the tax changes introduced in both 1985 and 1987. However, from conversations with staff of the Nevada Department of Transport, it is understood that the tax introduced in 1985 was a weight-distance tax for interstate motor carriers. As understood, interstate truckers had to pay this tax while purely intrastate truckers continued to pay registration fees and diesel fuel taxes. (*The phrases "weight-distance tax" and "mileage tax" were interchanged during the conversation; it is assumed here that these both referred to the same tax. It is thought that this tax was first introduced in 1985 and then raised in 1987, although these details are not certain.*)

  In 1988 or 1989, a court decision found the Nevada tax unconstitutional: "the 1989 Legislature was forced to revise the heavy-vehicle fee structure because a Supreme court ruling held that fee structures like Nevada's, where interstate and intrastate carriers were not treated equally, were unconstitutional." (*Nevada, 1992, p 2*) Subsequent cost allocation studies in 1990 and 1992 found that the previous inequity had returned. Further, because "basic-vehicle fees" (*presumably registration fees for automobiles and small trucks*) were raised in 1991, the size of the "inequity" grew. In the 1992 study, it was found that "heavy vehicles" (those with a registered weight of 10,000 lbs or more) were underpaying to the tune of $61 million.

- **Idaho** carried out its first HCAS in 1994, under contract to a consultant (Sydec, Inc.). The federal method was used, with the incremental approach as a validator. The study found that, including the weight-distance tax, trucks were slightly overpaying, based on existing revenues, but were somewhat underpaying, based on needs, projections of expenditure required to meet future demands on the highway system. (Note: Idaho is in the top quintile of states for heavy truck charges per mile.)

  The study was guided by an Advisory Committee appointed by the legislature; it included four legislators, local representatives, motor carrier representatives, and representatives from the department of transportation, 14-16 members in all.

  The department is now validating the results. They have decided that all proposals regarding user charges should be run through the cost allocation filter to determine their impact on equity. A Highway Needs Study has just been completed. In the summer and fall, they will run the needs study through the HCAS model, prior to taking proposals to the legislature.

3.3 States Where HCAS Has Had Little Or No Influence

3.3.1 Reasons for No HCAS Study

The following reasons were advanced for not carrying out HCAS studies:

- The most common reason was that cost allocation was viewed as "too political". One respondent commented that so many assumptions have to be used in doing an HCAS that in the end nothing can be proved. Any of the assumptions can be attacked by special interests. Another person commented that "it's too political", i.e., the trucking industry would object. In a southern state which has never

carried out an HCAS, our respondent commented that the "funds received from trucks don't come close to paying for the damage they cause", but that the industry was too powerful to allow an HCAS.

- In Alaska, the main reason for not doing HCAS is reportedly the lack of a strong tradition of user pay. Historically, the state has benefitted from revenues from the oil industry and it is possible that user fees cover barely half of the infrastructure costs.

- A further consideration in some states is the cost and expertise required to perform an HCAS, particularly the costs of collecting weight-related traffic data and hiring consultants.

- In some instances, officials commented that they were familiar with HCAS conducted outside their jurisdiction and that the results of these studies influenced their thinking. It was not possible to assess whether this comment was wishful thinking or something more substantial.

3.3.2 Basis for Road Pricing

The most commonly reported approaches to setting road prices in non-HCAS states were through needs studies submitted to the legislature or through judgements made at the political level.

Many states used the needs study process as the basis for revising user charges. Here are a few examples:

- **Arkansas** has been projecting its revenue needs on the basis of a 15 Year Program instituted in 1991. The legislature is approached for additional funding (i.e., tax/fee increases) if revenues are inadequate to meet the needs projected in the program.

- **Iowa** submits road user charge proposals to the legislature based on planning studies. State road use tax funds are distributed to the counties based on needs studies and population/network formulae.

- **New Hampshire** prepares long term capital and maintenance plans and submits user charge proposals based on the associated funding requirements. However, these proposals are not based on use or cost causation.

- In **Texas,** taxes are generally increased across the board when a needs study indicates more money is required.

In other cases, the setting of road user charges appears to be a highly sensitive political process. In **Illinois,** we were told, taxes are set via the political process, depending on what the public will bear and what the General Assembly will pass. (A Five Year Needs Study serves as input to this process.) The setting of user charges in **Massachusetts** is closely controlled by the Governor's office and the Department's role appears to be purely advisory. In a number of other states, not identified at the request of the interviewees, departmental officials believed that significant increases in user fees were justified because of highway conditions, but the political anti-tax mood prevented changes from the status quo.

3.4 States Where HCAS Has Been Applied In Some Cases But Not Others

The states which fall into this category are a disparate group. Their experiences can best be decribed on a case by case basis:

- **Arizona** did not undertake an HCAS until the early 1990s. The first study was performed by consultants and published in January 1993. The study recommended annual study updates. An in-house update was produced in 1994. In response to the question "Why Do We Need a Highway Cost Allocation Study", the Arizona Department of Transportation answers: ". . .to provide information that will enable lawmakers to assess the equity of the existing highway user tax structure and determine whether changes are needed. The basic premise is that users ought to pay an amount sufficient to cover the cost incurred by highway agencies in providing the facilities needed by these users. Likewise, users should not have to pay more than it costs to provide the facilities they need" (Arizona DoT, 1994,

1). The results of the HCAS studies provide an input to policy debates at a time when there has been (successful) pressure to shift emphasis from the weight-distance tax to the diesel tax. Both the 1993 and 1994 studies indicated that combination vehicles had the highest cost responsibility ratios of any vehicle class, i.e. were overpaying.

- **California** carried out its first HCAS in 1987. The results had little impact on user charges. The state is in the process of initiating a new HCAS, to be carried out by consultants. The objective is quite focussed: to help the department change the basis of commercial vehicle registration from unladen weight to gross vehicle weight. (The objectives of most other HCAS have been cast in very general terms of obtaining information concerning cost responsibility for all vehicle classes.)

- **Delaware** carried out its first HCAS in 1991, using its own methodology, which attempted to combine elements of the Federal and Incremental approaches. Following the study, the department was able to secure increases in the document fee and in fuel taxes.

- **Indiana** carried out an HCAS in 1984 and updated it in 1988. Following the study, the Legislature voted an increase in user fees, although these were insufficient to fully meet the recommendations of the study.

- **Maryland** carried out a full HCAS in 1982. For the past few years, the state has conducted internal revenue allocations. These have helped the department understand the fiscal situation of the highway sector. However, HCAS has not affected user fees. These seem to have been affected more by the courts (which ordered a reduction in the decal tax) and by Maryland's impending membership in IFTA, whereby it expects to lose revenues as motor carriers report only to their base state.

- The two **Vermont** HCAS of 1990 and 1993 had no direct influence on road taxes. However, they influenced a number of other policy decisions, e.g. changes in allowable gross weights for trucks, and also provided "invaluable data for financial and program planning, particularly in projecting future revenue and VMT trends" (AASHTO, 1991, interview with Tony Redington).

- **Virginia** has undertaken a number of HCAS studies in the last two decades. The studies of the 1980s indicated that trucks, particularly mid-sized ones, were underpaying. The taxes which resulted from these studies represented a political compromise, but they did increase the diesel differential (vis-à-vis gasoline) and raised the "steepness" of the registration tax schedule.

- **Wisconsin** has carried out two studies: one in 1982, followed by a 1990 update. The 1982 study had little impact on either the level or the structure of taxes. The 1990 update did have an impact. It recommended an increase in the registration fees for large trucks. This recommendation was incorporated into the Department's budget submission and, after some compromises engineered by the Secretary of Transportation and the Governor, a more modest registration fee increase was implemented. The 1990 study was not published. Possibly the Department did not want to have to defend the HCAS numbers supporting the tax recommendation and the subsequent compromise.

4. EXAMPLES OF THE USE OF HCAS OUTSIDE THE U.S.

Although the original terms of reference for this study did not include a consideration of HCAS in other countries, a brief summary of experiences elsewhere may be helpful. What follows is a selective review of experience in Australia, New Zealand and the United Kingdom, as well as Canada.

4.1 Australia

4.1.1 Background

Australia has had a long history of HCAS and is currently embarking into bold new territory. Within the course of this research, it has not been possible to explore (or even understand) all facets of these developments. In particular, there are aspects of the institutional arrangements that are unknown (who collects various taxes, the nature of the federal/state division of powers, the sharing of tax revenues or the division of responsibility for road expenditures, etc?) However, a review of three recent reports from the National Road Transport Commission—a national body which has, among other things, a responsibility for recommending heavy vehicle taxes—and two more historical papers (Laird, 1990; Ogden, 1988), leads to a number of observations.

In what follows, all Australian terminology has been put into language more familiar to a Canadian audience. So "non-separable costs" are referred to as "fixed;" "charges" are referred to as "taxes"; an "ESA-km" is referred to as an "equivalent axle load kilometre;" and (the correct) Australian term "AGM-km" for "average gross mass kilometre" is referred to here (in the less correct, but more conventional) "ARGVW-km" for "average registered gross vehicle weight." There is always a possibility that this translation of terms leads to slight errors of interpretation. We hope it does not here.

4.1.2 Reasons for Interest in HCAS

According to Ogden (1988, p 101), one reason Australians have long been interested in the question of road cost recovery (i.e., the comparison of taxes from a vehicle class to the costs those vehicles impose on the roads) is the Australian constitution and a series of court decisions. The constitution says that trade among the states "shall be absolutely free". The courts have interpreted this to mean that states cannot tax road vehicles engaged in interstate commerce. However, in a series of decisions in the 1950s, the court determined that the states could charge for the wear and tear of the road caused by trucks. This is a fairly compelling reason for an interest in HCAS.

Ogden continues on to suggest that another reason for the interest in HCAS is Australian railways' long interest in road costs, given their competition with the trucks. In this sense, the Australian experience parallels that of North America.

While no direct information on HCAS performed in the years after the 1950s court decisions has been reviewed, Laird makes a comment from which it is possible to speculate on the purpose of the initial attempts to allocate costs. He notes (p 221) that "most" Australian states did have weight-distance taxes after 1958. While this is speculation, it is likely these taxes were based on someone's analysis (guess? back-of-the envelope calculation? or full blown HCAS?) of the relationship between road costs and truck weight. In any case, Laird also notes that all these taxes were abolished in 1979. Apparently, the tax faced collection problems and opposition from the motor carrier industry.

4.1.3 Key Issues

Ogden and Laird discuss many studies. Summarizing details from these is not important. However, there are several key points to be made. Laird notes that there was "a wide variation in the findings of recent road cost recovery studies" (p 224). The difference between what trucks were shown to cost the road system and what they paid in taxes varied considerably. This is important in terms of what is says about the "methodology" of HCAS and/or the assumptions used in these exercises and, ultimately, for what it says about the engineering and

economic "science" involved. Ogden has another way of putting this. After commenting on the lack of consensus, he writes as follows:

> "In some cases there are questions underlying the physical or engineering basis of cost causality, and at almost every turn the analyst is confronted with a lack of information or hard data on upon which to base the analysis. "All of this has the result that there is no consensus about the `answer' to the question (or even in some cases about what the question is); the answer is always 'assumption-sensitive' . . ., and indeed one could probably produce a set of (defensible) assumptions to support almost any `answer'."

4.1.4 The "Australian Method"

While knowledge of events after the Ogden and Laird papers and the formation of the NRTC 1992 is incomplete, there was a great deal of activity and appears to have been an agreement between the states and the federal government about a new way of treating interstate trucks. Whatever the actual details, the NRTC was established as a body with specific responsibility for advising on heavy vehicle taxes. To do this, it conducted a cost allocation study.

Only the methodology from the latest NRTC work has been reviewed, but Laird and Ogden provide enough details on earlier studies to suggest that there is a continuum in the "Australia cost allocation method." Undoubtedly, there are hotly debated variations among practitioners in Australia. But, from a distance, there are enough similarities for the purposes of this research to use the label "the Australian method." The important points of this methodology are as follows:

- "Costs" are equated to annual road expenditures (there is no attempt to measure the sunk costs in the road, the cost of the land, or a capital cost).

- The key step in the allocation process is to assign all road expenditures to a number of accounts (e.g., pavement rehabilitation). Each account is then given a number of allocators. The two chief classes of allocators are "fixed" versus "variable" costs where variability means that expenditure levels vary with vehicle usage.

- Fixed costs are allocated according to the total distance travelled by each vehicle class.

- Variable costs are allocated in a number of ways, depending on the type of expenditures. Pavement expenditures, for example, are allocated on the basis of a measure of axle equivalences; bridge expenditures, as another example, are allocated on the basis of vehicle weight (assumed to be RGVW, although there are aspects of the terminology not entirely understood). These factors (vehicle weight, axle weight or others such as passenger-car equivalencies) are all weighted by the distance travelled of each vehicle class.

- All of these allocators are based on engineering relationships. So, for example, about 60% of pavement costs are shown to vary with axle loads. The balance, a fixed costs, do not. (Presumably, these vary with time or the environment.) Obviously, then, both the measure of axle equivalencies and this notion that 60% of pavement wear is accounted for by axle loads is based on an engineering model of pavement performance.

- The final translation of the allocated costs into road taxes—there are basically two: a diesel fuel tax and an annual vehicle charge—is done on the basis of the average annual distance of vehicles in an class.

4.1.5 Recent Trends, Consultations and Plans for Applications

Two final observations on the Australian experience with HCAS are that (i) all the latest costing work has not yet translated into road taxes; and (ii) there has been what appears to be an enormous amount of consultation. In particular, the NRTC in recent years seems to be fully occupied with issuing discussion papers, receiving comments

and holding public hearings. Here is how Margaret Starrs, from the National Road Transport Commission, explains the situation in Australia (with some slight translation of the original words):

> "The national heavy vehicle charges . . . were approved in August 1992 for introduction on July 1 1995. To date, it is still not clear whether all States and Territories will introduce the charges . . .
>
> "The new . . .report has a brief description of how the charges were set . . . There is a formal cost allocation process . . . , but adjustments were made to the outputs of that process. The charges have to be able to work in an administrative sense, and also be acceptable to the State and Territory governments (who collect the revenues and build and maintain roads), the users (mainly the road transport industry) and wider community interest groups" [letter to the authors, dated March 8 1995].

4.2 New Zealand

New Zealand appears to be an interesting case. We says "appears" to be as we have found little information on the specifics of any cost allocation work done. The interest, however, arises from New Zealand's decision in 1978 to replace (or partially replace) the diesel tax as the primary mechanism used to charge trucks for their use of the road with a form of a weight-distance tax.

Starting in 1978, all trucks with a registered weight of 3.5 tonnes or more were required to purchase a distance tax. In effect, then, a truck operator "buys" so many road kilometres upon paying the tax. To enforce the system—i.e., there has to be a way of knowing how many kilometres have been operated—all trucks are fitted with hubodometers. Other than knowing that this tax or "road user charge" is quite high and is based on a calculation of the pavement impacts of the axle loads of the particular configuration and weight class for which the tax is sold, no other details have been found on the costing used to set this tax.

Our latest information on New Zealand dates from 1990 (Laird) so there may have been more recent changes of which we are unaware. It has been asserted anecdotally in the literature that New Zealand has an enforcement problem with its road pricing system. This may or may nor be true.

4.3 United Kingdom

4.3.1 The British Approach

From what is known about conditions in the U.K., there has been an annual attempt by the Department of Transport since 1968 to compare taxes paid by various vehicle classes with road costs attributed to those vehicle classes. In broad terms, the system used to allocate costs is similar to that used in Australia and, to a less extent, in the United States. One key difference between the methodology used in the U.K. in comparison to Australia is that, since the focus in the U.K. is on long run marginal costs (i.e., the size of the system, or capital expenditures can vary), there is no identification of "fixed" costs (the Australians use the term "non separable"). Instead, capital costs in the U.K method are allocated to vehicles on the basis of maximum GVW-kilometres (15% of capital costs) and passenger-car-equivalent kilometres (85% of capital costs). (*Again, as in the description of Australian HCAS, terminology more common to a Canadian audience is being used here.*) One would suspect, although this has not been tested, that the effect of this would be to allocated a much higher proportion of total costs to heavy vehicles than in Australia (where fixed costs are allocated on the basis of vehicle kilometres of travel).

The other apparent difference (again, not tested) between the U.K. method and either the American or the Australian, is the size of the network included (in the U.K. the entire road network down to sidewalks is included) and the number of expenditure items (in the U.K. elements such as administration and policing are included). However, similar to the HCAS exercises in both the United States and Australia, there is no consideration of externalities (overlooking exceptions such as Appendix E of the 1982 FHWA report and the possibility that the Americans may include externalities in their next federal study).

On this last point, however, the U.K. has had an explicit policy, since the Armitage Committee in 1980, of ensuring that tax revenues from motorists cover at least 130% of total road costs. This margin of 30% is in consideration of externalities.

4.3.2 The Link With Road Pricing

Although the details on vehicle taxation in the U.K. are sketchy, it appears that the annual calculations made by the Department of Transport are just a check on the level of the fuel taxes and an annual vehicle charge (referred to as a "VED"). That is, no other taxes appear to be considered as "road user charges" and there appear to be no arrangements to direct these tax revenues to road agency budgets.

The latest departmental figures we have seen are for 1993/94. (The Royal Commission on Environmental Pollution published a modified version of the department's estimates for 1994/95.) Based on the 1993/94 calculations, British motorists pay 2.7 times in taxes what the total road system costs (again, without considering externalities). According to *The Economist*, "In 1993-94, fuel and vehicle-excise duties amounted to £16 billion, compared with just over £6 billion spent on road maintenance, construction, enforcement and administration." This same report suggests that road taxes are likely to rise even higher. Because of the work of the Royal Commission on Environmental Pollution [November 1994], the Treasury in the United Kingdom has indicated that it plans to raise fuel taxes considerably over the next few years (The political debate, based on Parliamentary press coverage in the weeks following the release of the Royal Commission report, appears to be not whether road taxes should be raised in the future, but by how much). Various possibilities—road pricing (i.e., congestion prices) for London and certain other towns/cities, toll roads—are being actively considered.

4.4 Canada

4.4.1 Historical Background

The first highway cost allocation study in Canada was completed by a C.B. Breed in 1938. No copies of this study have been located; nor is it known how the results were used. Breed did his work for the Railway Association of Canada.

More work was undertaken on highway cost allocation in the 1950s: Carswell completed the first analysis for the Canadian Tax Foundation in 1955. He concluded that road users were only paying for 60% of road costs[1]. From 1957 to 1969, there were also a total of nine provincial and/or federal Commissions or Inquiries that looked at either transportation in general or road financing in particular[2]. Some work undertaken for these Commissions developed rudimentary cost allocation numbers (*although the majority simply relied on literature reviews and/or "findings" from other states or provinces*). The best work was done for the 1958 British Columbia Commission and the 1967 "Smith Committee" in Ontario.

The BC Commission concluded that road users should pay for two-thirds of the cost of roads and that, of this amount, commercial vehicles should pay 25% of "base" road costs plus any additional costs required for base roads to accommodate commercial vehicles. The Smith Committee recommended that road users pay for 65% to 75% of road costs and further recommended a rigorous "user pay" system of taxes. An important point (for here) is that both the BC Commission and the Smith Committee had to rely on US technical studies for their highway cost allocation work (there were none in Canada).

Over-simplifying, the best that can be said about the impact of all of this cost allocation work was that: (i) it had an influence on the establishment of a differential tax rate for diesel fuel in comparison to gasoline (*by 1962, all*

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[1] In 1956, the Canadian Trucking Association responded to this work by presenting the Gordon Commission with an analysis that showed that road users were paying for 90% of the cost of roads.

[2] A recent summary of these Commissions is contained in Nix and Jones. 1995. *Highway Finance: Synthesis of Practice*, TAC

provinces and territories except one had followed Ontario's lead and set diesel taxes higher than gasoline); and (ii) it may have had an influence on the relationship between vehicle registration costs and vehicle weight (*it has never been clearly established whether the establishment of a registration tax as a function of gross weight was the result of cost allocation work—or assumptions about cost allocation—or whether it was more simply a practice borrowed from the United States*).

Considering the much broader subject of tax policies—and not just the narrower, but related subject of highway cost allocation—Nancy Bryan questions whether any provincial government really changed its tax policies on account of the work done by any of the inquiries in the 1950s and 1960s.[3]

Following the work of the these provincial and federal (MacPherson) Commissions, the academic and government-policy community took up the cudgel and produced a series of papers on the subject (Dalvi, 1969; Bryan, 1972; Haritos, 1970, 1971, 1972 & 1973). While some of this work produced "numbers," none really qualifies as a full highway cost allocation study: Dalvi's work was on high on theory, but suffered from a lack of good data; Bryan's main contribution was to document the history of the policy questions; and Haritos' contribution was to develop the "road cost" information necessary to perform allocations. The actual allocations in Haritos' work appear more as an example (using Ontario data only) of how a cost allocation study might be done. His methodology is copied from the US "incremental" method.

The work after this point, during the 1970s (again, mainly by Haritos at Transport Canada[4]) is concerned with the question of "total road costs" versus "total road taxes." That is, it did not delve into the particular question of how costs should be attributed to individual users.

In the 1980s, several attempts were made to allocate costs to individual users. In 1983 Bunting, from the Canadian Institute of Guided Ground Transport in Kingston, found that trucks in Ontario were receiving an enormous public subsidy ($326 million in road costs versus $91 million in taxes). Most of his methodology consisted of borrowing findings (ie, allocation ratios) from US work and/or adopting heroic assumptions about the nature of taxes in Canada. Bunting followed up his original work with a series of papers on methodology. In 1984 Innes and others from the University of New Brunswick produced an innovative study wherein they looked only at a portion of the road network. They were interested in the question of the incremental road costs of hauling bulk commodities by truck (*ie, the road system and all associated costs are already in place and the question is what happens when a new bulk trucking operation begins; the "what happens" being in respect of both added road costs and additional tax revenues from fuel and vehicle registration taxes*). They found that where a road already exists, the incremental tax revenues more-or-less matched the incremental road costs. Where a new road had to be built, the road taxes did not pay for the added road costs. In 1989, Nix replicated Haritos' original study with new road cost data from the Transportation Association of Canada.

4.4.2 Canadian Studies in the 1990s

There have been several efforts in the 1990s that verge on highway cost allocation studies. Rilett and Hutchinson at the University of Waterloo have produced several studies where the emphasis has been on the important role pavement performance models play in the allocation of costs. Most of their actual allocated costs are more "illustrative" than empirical. Toms, from Peat Marwick Stevenson & Kellogg (now KPMG Management Consulting), following the University of Waterloo's work on pavement performance, produced a paper in 1991 on truck road costs in Ontario. This is what might be called a "first cut" at the subject (*the author himself warns that the results would benefit from a more comprehensive study*). Nix, Boucher and Hutchinson developed road cost information for the Royal Commission on National Passenger Transportation. The main thrust of this work was to: (i) massage the RTAC data on road costs into good enough shape to be used for allocation purposes; (ii) explore what the use of methodologies from other countries (US, UK, Australia) would do to this road cost data; and (iii) address several important questions about the relationship between road costs and pavement design and/or maintenance (*at the time, there was (a) a serious claim being made in the United States that pavements had been designed too thin*

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[3] Bryan, 1972, p 12.

[4] Transport Canada. 1982

and that, as a result, costs for axle loads were higher than they would be if optimal investments in pavements had been made; and (b) a claim being made in Canada that under-funding for pavement maintenance meant higher road costs in the longer term). The authors of this work for the Royal Commission warn that their findings are not robust enough for policy conclusions.

There have also been a number of what might be called "full cost" road studies where the emphasis has been on such things as user costs (ie the vehicle operator's costs) and externalities (ie, the cost of accidents or air pollution). Bein (1994) in British Columbia has done work in this area, as has Levelton (1994). Transport Concepts (Darrell Richards) has also done work in this area and IBI/Boon, Jones and Associates have recently completed some "full cost" work for an environmental body in Ontario. These studies tend to suggest that the use of roads is vastly under-priced.

To summarize:

- There actually is quite a body of literature on highway cost allocation in Canada (and the above review has not even mentioned the papers that might be called "pure literature reviews" or "commentaries.")

- None of this work really qualifies as a full highway cost allocation study—at least not in the sense the British, the Americans, the Australians and others would use this term. Most of the research actually uses findings from cost allocation studies in other countries and then "attaches" the resulting ratios to questionable Canadian data and/or assumptions about Canadian conditions.

- With the possible exception of the (now long dated) practice of taxing diesel fuel at a rate different than gasoline, there is no evidence that any of this work—the pure "theory" papers, the assembling of data, the "illustrative number crunches—has had one iota of influence on tax policy in Canada.

5. FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Findings and Conclusions

1) **LARGE AMOUNT OF HCAS ACTIVITY:** There has been a tremendous volume of HCAS activity in the United States, involving the expenditure of large sums of money, not only on the studies themselves but on supporting research.

   - The federal government has undertaken two major HCAS studies and several smaller, more specialized ones. It has recently embarked upon a two year HCAS study designed to provide input to the reauthorization of the Intermodal Surface Transportation Efficiency Act, which is scheduled in 1997.

   - 32 states have conducted one or more HCAS, while 18 have never done so. HCAS activity has been fairly steady for the past fifteen years. 17 states have carried out an HCAS since 1990, or are in the process of doing so.

   It is clear from a brief perusal of activities in Australia and the United Kingdom, that the United States is not alone in being a prolific generator of highway cost allocation studies.

2) **COMMON METHODOLOGY:** There is a surprising degree of similarity in the methodology employed in all these studies. Those who do the studies would disagree with this statement as they are absorbed in debates concerning critical questions such as how to treat pavement deterioration, or how to figure out what a truck means in terms of passenger car equivalents, or what to do with those irksome common costs. Looking at the broad picture, however, the main elements of this methodology are:

   - "Costs" are typically defined as the annual expenditures of road agencies. In some cases, these may be a multi-year averages or a future year "needs" estimate of expenditures. The scope of these expenditures varies from study to study (e.g. road agencies may be responsible for policing, administration, or even sidewalks, as in the U.K.).

   - In all cases, whether it is by considering how the road is designed ("why did we design the pavement this thick?") or whether it is by considering how the road wears out or needs maintenance, a set of "allocators" is developed. Examples are ESALs for pavements, PCEs for capacity, or GVW-kms for bridges.

   - Costs are assigned to each class of vehicles on the basis of traffic data and the cost allocators just decribed. The common weakness of all of these studies is that (for lack of adequate traffic data) they do not deal satisfactorily with variations within vehicle classes, hence they don't deal with intra-class cross-subsidization.

   - As a general rule, these studies have not incorporated the cost of capital (i.e., a return on the capital invested over the years in the highway system), externalities, or user costs (ie, the vehicle owner's own costs). This may not matter, depending on what is the objective of the study, but in other cases these considerations are of critical importance.

3) **RESULTS:** There is no simple summary of the results of all of these studies. It is safe to conclude that the majority of state and federal studies of the 1980s found that heavy trucks were underpaying relative to other classes of vehicles and that small (fuel-efficient) cars were also underpaying relative to large cars. In the 1990s, the picture has become less clearcut. In a number of states, particularly where weight distance taxes are in place and user charges are higher, it has been found that heavy trucks are paying their way and in some instances overpaying relative to other classes of vehicles (Oregon, Arizona, Idaho, for example). These results cannot be generalized to states with lower user charges or to the federal trust fund.

4) **THE LINK BETWEEN HCAS AND ROAD PRICES:** In the United States, there is some correlation between the level of fuel taxes and highway cost allocation studies: HCAS states **tend** to impose higher taxes.

There appears to be a stronger link between HCAS activity and the total level of all truck taxes: large truck taxes tend to be higher in those states where HCAS are undertaken. But, perhaps surprisingly, when changes in road taxes are examined over the last few years, there doesn't seem to be much connection at all between the process of undertaking a highway cost allocation study and the direction of change in taxes. It should be remembered that one result of an HCAS may be to conclude that the status quo is basically equitable (e.g. recent Oregon and Kentucky studies), in other words that few if any pricing changes are justified on equity grounds.

Other factors can blur the HCAS-road pricing link. HCAS can be used to justify (or challenge) existing high road user charges (Arizona, perhaps). Also, costing is only one input into setting charges along with considerations of:

- politics (what will the taxpayer tolerate?);
- economics (competitiveness with neighbouring jurisdictions, although this does not stop the spread of heavy truck user charges from being quite wide in the U.S.); and
- institutional constraints (e.g. limits on the freedom of a state to set charges unilaterally, arising from membership in IFTA or IRP).

5) **THE LINK BETWEEN HCAS AND FINANCING METHODS:** The link between highway financing methods—say the establishment of very specific road-user charges and dedicated funds—is extremely fuzzy. First, the link between the use of dedicated funding and the conduct of highway cost allocation studies is not as direct as one might expect. (*One might assume that states with a strong user-pay basis for financing would be the ones to conduct HCAS and to use dedicated funding.*) Second, and somewhat at odds with the first observation, there does seem to be greater reliance on user fees as a source of highway financing in those states where HCAS are done. These may not be in the public domain.

While HCAS has some influence in setting state-wide user fees, it does not appear to have been a serious factor in setting tolls. Toll roads (and revenues) are somewhat more important in non-HCAS states than in HCAS states. No examples of HCAS studies by tolling authorities were uncovered. These may not be in the public domain.

6) **HCAS INFLUENCE ON PRICING: THREE CLASSES OF STATE:** The utility of HCAS to decisions on road pricing policies and actual prices has varied widely from state to state. Three categories of state were identified, recognizing that grey areas exist:

- **States where HCAS has materially influenced policy:** (Kentucky, Maine, Montana, Nevada and Oregon, with Idaho a possible sixth state). Nevada is included because of the DoT's commitment to HCAS, notwithstanding changes to user charges which were imposed by the courts.
- **States where HCAS has had little or no influence on policy:** by our (subjective) count, this includes, about 2/3 of the states. Among this number are 18 states that have conducted highway cost allocation studies, which do not seem to have had a direct influence on tax policy. These 18 states are: Arkansas, Colorado, Connecticut, Florida, Georgia, Iowa, Kansas, Missouri, New Mexico, North Carolina, Ohio, Pennsylvania, Tennessee, Texas, Utah, Vermont, Washington, and Wyoming).

The following caveats should be made. In a few cases, such as New Mexico, where the last study was done many years ago, it is possible that HCAS had an impact at one time. In addition, in some states there may have been decisions other than taxes which benefitted from HCAS.

"Politics" appears to have been the main factor preventing the implementation of the results of HCAS. The main alternative approaches for setting user charges appear to have been needs studies and political `gut-feel'.

- **States where HCAS has had some influence:** nine states were identified: Arizona, California, Delaware, Idaho, Indiana, Maryland, Minnesota, Virginia and Wisconsin.

7) **USER CONSULTATION IS UNIVERSAL, BUT THE DEGREE OF CONSULTATION VARIES:** It is inconceivable that any HCAS study could be undertaken in the U.S. today without some form of user consultation. The FHWA has solicited user input to its new study through a two-day workshop, a notice in the *Federal Register* (Appendix C) and a docket to which interested parties are invited to append their comments. An Advisory Committee is a customary feature of state studies. Nonetheless, the perception exists in some user/interest group quarters that user input is more welcome in some studies than in others.

States such as Oregon and Kentucky, which are experienced at HCAS, have effectively used two important counterweights to interest group influence:

- A well established methodology, buttressed by strong in-house technical committees. This can be perceived as `closed minded', but it ensures that their studies are undertaken in a timely, businesslike fashion. Incremental changes are made to the methodology in specific studes, but they do not need to `reinvent the wheel' each time they do an update.

- A close relationship with the political powers, e.g legislative committees and/or the state executive. This is necessary to protect public officials from lobby group criticisms.

In contrast, states implementing an HCAS for the first time, lacking these intellectual and political assets, are likely to be less sure of the technical issues, and more dependent on outside input. Some first time HCAS states address this problem by engaging experienced HCAS consultants, often acquiring in-house training and/or software from the consultant, so that study updates can be performed.

8) **FUTURE PLANS:** The new federal study will be the most noticeable feature on HCAS landscape in 1995/97. Some state studies are occurring or will occur independently of the federal study, e.g. California, plus update activity in some of the HCAS-intensive states. Other states may wait to see what methodological directions are taken by the FHWA before embarking on further studies, e.g. Delaware.

5.2 Recommendations

The assumptions underlying our recommendations are as follows:

- **HCAS will only be applied in Canada (or parts of Canada) if it is perceived to be useful in setting tax policy.**

- While knowledge of foreign experience is indispensable, **HCAS should be (and is sufficiently flexible to be) adapted as much as possible to local conditions.** The mechanistic application, for example, of U.S. approaches is neither desirable nor necessary. Institutional, physical and market conditions are sufficiently different that Canadians should adapt their own approach(es), much as the Australians have.

- If the two preceding assumptions are accepted, it follows that **provincial or regional applications of HCAS (a "bottom up" approach) are more desirable, as a first step, than a "top down" or national study,** the key being that HCAS is most useful when it coincides with a taxation/expenditure jurisdiction.

- **Issues associated with engineering relationships, data acquisition/management, the identification of road user taxes, and costing (including external costing) are the most important technical hurdles to the performance of credible HCAS studies.** The commitment of time, money, intellectual resources - and political savvy- required to address these issues successfully should not be underestimated.

Here are our recommendations:

1) **TEST THE MARKET:** The first step should be to assess the degree of interest within the provincial and federal transportation policy/planning community in finding out more about HCAS. Following approval of this report by TAC, one approach might be to produce and distribute a brief summary of the report along with a simple survey exploring the degree of interest in exploring applications of HCAS in Canada.

2. **DEVELOP THE KNOWLEDGE BASE:** Assuming there is a reasonable degree of interest, going beyond only one or two jurisdictions, TAC should play a role in identifying the methodological and data issues which would be reasonably common to a wide range of Canadian HCAS applications, and developing a strategy for addressing them.

3. **PROVIDE HANDS-ON HELP:** The production of an HCAS primer would be a logical next stage. This would draw upon the process information summarized in this report and upon the 'consumer' needs and knowledge base development described in Recommendations 1 and 2. It should incorporate spreadsheet and other software, which could be adapted by regions or provinces to local circumstances.

4. **MANAGE THE POLITICAL PROCESS OF HCAS:** Care should be taken to finding a constructive role for user groups throughout the process. Two extremes should be avoided:

   - developing HCAS without regard for the needs and concerns of transportation system users and
   - allowing the HCAS process to be crippled by adversarial lobbying.

   In practice, this objective will only be achievable if public officials are able to demonstrate to their political masters that HCAS provides tangible benefits within their jurisdiction that exceed the costs of undertaking the study.

   The bottom line: **HCAS can influence road pricing, but is not a panacea.** TAC can play a lead in helping potential users understand what HCAS can and cannot do for them and in helping them up the learning curve, but these 'consumers' must be the ultimate judges of the utility of cost allocation.

APPENDIX A

BIBLIOGRAPHY OF HIGHWAY COST ALLOCATION STUDIES

APPENDIX A: BIBLIOGRAPHY OF HIGHWAY COST ALLOCATION STUDIES

This bibiliography is not intended to be an exhaustive listing of references on HCAS. We have not referenced theoretical works on cost allocation methodologies, engineering studies on various aspects of pavement/bridge deterioration or optimal construction/maintenance practices, or monographs on alternative road pricing mechanisms. Instead, the focus is squarely on the cost allocation studies which have been carried out in the jurisdictions which are covered in this study.

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California	*Highway Cost Allocation Study* (1987, Caltrans/Sydec)
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Colorado	*Colorado Highway Cost Allocation and Tax Alternatives Study* (1988, Wilbur Smith Associates)

Connecticut	*Highway User Costs in Connecticut* (1982, State of Connecticut Department of Transportation)
Delaware	*Delaware Highway Cost Allocation Study* (1992, Delaware Department of Transportation/Bureau of Economic Research, University of Delaware)
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Kentucky	*Allocation of Highway Costs and Revenues* (1994, J. Deacon and J. Pigman [Kentucky Transportation Center])
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Pennsylvania	*Feasibility of Pennsylvania Highway Cost Allocation Study* (1989, A. Jacoby [Pennsylvania Transportation Institute]/State Transportation Advisory Committee)
	A Preliminary Pennsylvania Highway Cost Allocation Study (1990, Pennsylvania Transportation Institute)

Texas	*Texas Highway Cost Allocation Analysis and Estimates, 1992-1994* (1993, M.A. Euritt, C.M. Walton, Z.A. Goff and D. Burke)
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	Texas Highway Cost Allocation (1985, Texas Transportation Institute/Texas Department of Transportation)
Utah	*Study of Utah Highway and Street Costs as a Basis for Charges Against Motor Vehicles as Compensation for Road Use* (1940, Utah State Tax Commission)
Vermont	*Highway Cost Allocation Study* (1989, Sydec Inc. in association with The Urban Institute)
Virginia	*Continuation of the Vehicle Cost Responsibility Study* (1992, SJR 238, Virginia Department of Transportation)
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APPENDIX B

LIST OF CONTACTS

APPENDIX B: LIST OF CONTACTS

The following individuals were contacted during the course of the study. Their assistance and insights were greatly appreciated. The authors alone are responsible for the interpretation of the information presented in this report.

Federal Highway Administration	Jim March
State Highway Departments	
Alabama	Robert Pickett
Alaska	Ronald Lind
Arizona	Suzanne Sale/John Semmons
Arkansas	Roger Almond
California	John Van Berkel
Colorado	Tom Talmadge
Connecticut	Dr. Charles Dougan
Delaware	David W. Matsen/Ramesh Batanayak
Florida	Don Powell
Georgia	Lamar Caylor
Idaho	Doug Benzen
Illinois	Robert Plunk
Indiana	Prof. Kumares Sinha
Iowa	Don Ward
Kansas	Dennis Slimmer
Kentucky	Sandra Pullen
Louisiana	Bill Temple
Maine	Gedeon Picher
Maryland	Janice Hedemann
Massachusetts	Richard Conard
Michigan	Al Friend
Minnesota	Chuck Sanft/Don Kiefer
Mississippi	Lowell Livingston
Missouri	Keith McGowan
Montana	Drew Liversay
Nebraska	Roger Winkelhake
Nevada	Chuck Bosch/Russ Law
New Hampshire	Dick Marshall
New Jersey	Mike Silvestrov
New Mexico	Noble Lieu
New York	Clarence Fosdick
North Carolina	Chris McAdams
North Dakota	Garry Berreth
Ohio	William E.Davis
Oklahoma	Larry Griffin
Oregon	Loyd Henion/John Merriss
Pennsylvania	Dennis Lebo
Rhode Island	John DiTomasso
South Carolina	Jimmy Campbell
Tennessee	Doug Warpoole
Texas	Vic Holuvec
Utah	Van Sutherland
Vermont	Tony Redington
Virginia	Mary Lynn Tischer
Washington	Amy Arnis

West Virginia	John Lancaster
Wisconsin	Mark Wolfgram
Wyoming	Floyd Foresman

Other

American Automobile Association	George Viverette
American Trucking Associations	Ted Scott
Association of American Railroads	John Linek
Sydec, Inc.	Joe Stowers

APPENDIX C

FEDERAL REGISTER NOTICE CONCERNING NEW HIGHWAY COST ALLOCATION STUDY

Federal Highway Administration

[FHWA Docket No. 95–6]

Federal Highway Cost Allocation Study

AGENCY: Federal Highway Administration (FHWA), DOT.

ACTION: Notice; request for comments.

SUMMARY: This notice requests public comment on issues related to a new Federal highway cost allocation study (HCAS) that the FHWA is initiating. Comments on recommendations emanating from an October 1994 cost allocation workshop are requested, in addition to comments on other issues that should be considered in planning and conducting the new study. Preliminary copies of the workshop proceedings are available from Mr. James March, who may be contacted at the phone number shown below.

DATES: This docket will remain open until the study is completed. However, in order for comments responding to issues raised by this notice to be considered during critical early stages of the study, they should be received no later than April 11, 1995.

ADDRESSES: Submit written, signed comments to FHWA Docket No. 95–6, Federal Highway Administration, Room 4232, HCC–10, Office of the Chief Counsel, 400 Seventh Street, SW., Washington DC 20590. All comments received will be available for examination at the above address between 8:30 a.m. and 3:30 p.m., Monday through Friday, except Federal holidays. Those desiring notification of receipt of comments must include a self-addressed, stamped envelope or postcard.

FOR FURTHER INFORMATION CONTACT: Mr. James March, Office of Policy Development, at (202) 366–9237 or Mr. Steven Rochlis, Office of Chief Counsel, at (202) 366–0780, Federal Highway Administration, Department of Transportation, 400 Seventh Street, SW., Washington, DC 20590. Office hours are from 7:45 a.m. to 4:15 p.m., e.t., Monday through Friday, except Federal holidays.

SUPPLEMENTARY INFORMATION:

Background

The last comprehensive Federal HCAS was conducted from 1978 to 1982, pursuant to Section 506 of the Surface Transportation Assistance Act (STAA) of 1978 (Pub. L. 95–599). That section stipulated that the study was to investigate the distribution of Federal highway program costs among the various classes of highway vehicles that occasion such costs. It also called for an assessment of current Federal user charges and recommendations for more equitable user charge alternatives. In addition, Section 506 directed the Congressional Budget Office (CBO) to develop guidelines for the cost allocation study, including procedures to be employed in determining the equitable allocation of highway costs and the information needed to apply those procedures.

Section 506 and the subsequent CBO guidelines established the general scope of the 1982 Federal highway cost allocation study. Specifically, the study was to focus on evaluating Federal highway program costs, not highway costs incurred by State and local transportation agencies. Also, the Federal user fee structure was to be evaluated on the basis of equity rather than economic efficiency, with equity measured in terms of the ratio of Federal user fees payments to Federal program costs occasioned by different vehicle classes.

The CBO guidelines listed several factors underlying the need for the 1982 Federal cost allocation study, including the effect of energy policies on fuel consumption and tax revenues, the shift in the Federal highway program's emphasis away from new construction and toward repair and rehabilitation, the long time that had elapsed since the last comprehensive Federal cost allocation study, and the fact that methods used in previous studies could be improved upon in a number of technical aspects and in the way they reflected the new mix of Federal highway programs.

Similar factors are relevant today and suggest that a new Federal cost allocation study would be timely. The last comprehensive highway cost allocation study was completed over 12 years ago and much of the data upon which that study was based are outdated. Energy and environmental initiatives continue to affect fuel tax receipts, and considerations leading up to reauthorization of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, Public Law 102–240, 105 Stat. 1914, may require changes in current highway user fees. The ISTEA made fundamental changes in the structure of the Federal-aid highway program that have significant implications for cost allocation. Proposals currently being discussed to consolidate Department of Transportation programs could have even greater ramifications for highway cost allocation.

The General Accounting Office recommended in its 1994 report, Highway User Fees: Updated Data Needed to Determine Whether All Users Pay Their Fair Share, (report number GAO/RCED–94–181) that a new Federal cost allocation study be conducted as the basis for assessing the equity of Federal highway user fees. Without explicit Congressional guidance on the scope of a new cost allocation study, and recognizing the many changes in the highway program since the last study was completed, the FHWA conducted a two-day workshop in October 1994 to discuss a range of policy and technical issues that might be considered in the study. Over 75 persons representing Federal and State transportation agencies, transportation industries, academic institutions, consulting firms, and other organizations participated in the workshop. Preliminary proceedings of that workshop, which include many specific recommendations made by workshop participants, will be available for inspection in the docket; copies may be requested by calling Mr. James March at the phone number listed above under "For Further Information Contact:". During the course of the cost allocation study, working papers and other interim work products will be placed in the docket.

Among other things, workshop participants recommended that the cost allocation study consider:

(1) External costs of highway use and operation, such as congestion, accident costs, and air and noise pollution costs, as well as traditional highway agency costs;

(2) Alternative cost allocation methods, especially a marginal cost approach, along with traditional cost allocation methods;

(3) Highway-related revenues and expenditures for all levels of government, not just Federal revenues and expenditures;

(4) Implications for highway cost allocation of multi-modal investment programs; and

(5) Life-cycle cost analysis principles for estimating future highway investment requirements.

Participants also recommended that, while many new issues deserve consideration in the cost allocation study, a primary focus of the study should be on allocating Federal costs using methods consistent with the 1982 study.

Comments are requested on these recommendations and on other technical issues and recommendations included in the workshop proceedings.

A preliminary plan for the new cost allocation study has been developed. The study will be divided into four phases: (1) Issues analysis and workplan development; (2) update and refinement of highway cost allocation data and methods; (3) analysis of highway cost responsibility and the equity of the user fee structure; and (4) evaluation of alternative cost allocation procedures. Work envisioned under each phase is summarized below. Comments are requested on this plan.

Phase I—Issues Analysis and Workplan Development

Many issues were raised at the October workshop concerning the scope of the next cost allocation study and the advantages and disadvantages of pursuing alternative highway cost allocation methods. Several issues could have major implications for the direction of the next study, including: (1) The extent to which marginal costs can and should be reflected in the study; (2) the extent to which revenues and expenditures by all levels of government can be estimated and incorporated in the study; and (3) the extent to which cost allocation can be applied to multi-modal transportation investment programs that will replace mode-specific investment programs in the future. White papers will be prepared to evaluate issues related to the analysis of these and other concerns in the next cost allocation study. An important factor that will affect the extent to which these issues can be considered is the availability of needed data and analytical methods. An assessment of data needs to evaluate the emerging cost allocation issues will be conducted during this initial phase of the study.

The FHWA has maintained a continuing research program to update highway cost allocation data and methods. Research has focused primarily on refining data and methods used in the 1982 study. A review of current cost allocation data and methods is already underway. Working papers will be prepared which discuss current methods for analyzing cost responsibility for: Pavement, bridge, and other highway costs; sources of data on vehicle miles of travel, operating weight distributions, and registered weight/operating weight distributions; estimates of highway user revenue contributions by each vehicle class; and other aspects of highway cost allocation. Additional research and data needs will be discussed in those working papers.

At the end of the first phase, the study work plan will be reviewed based on analysis and data needs identified in the white papers and technical working papers. Input from internal and external review committees will be sought.

Phase II—Update and Refine Highway Cost Allocation Data and Methods

Based upon the revised study plan developed in Phase I, data and analytical tools will be updated and refined. Among the areas where significant work already can be foreseen are improving pavement cost models, improving the consideration of life cycle costs, improving estimates of highway travel by different vehicle classes, improving operating weight distributions for different vehicle classes, improving estimates of operating weight/registered weight distributions, and improving other data needed to estimate revenues generated by different highway user fees. Data and information needed to apply alternative cost allocation approaches identified at the workshop will be collected, consistent with the relative importance of each approach and the resources available.

Phase III—Analyze Highway Cost Responsibility and the Equity of Alternative User Fee Structures

In this phase information from Phase II will be used to analyze the highway cost responsibility and user fee contributions of different vehicle classes and to evaluate the equity of the current user fee structure. Alternative user fee structures will be analyzed to evaluate improvements in equity and efficiency that potentially could be realized through changes in highway user fees. Sensitivity analyses will be performed throughout the course of this phase to evaluate the most critical factors that affect cost allocation results.

Phase IV—Evaluate Alternative Cost Allocation Procedures

In this phase alternative approaches to highway cost allocation will be evaluated, including application of a marginal cost approach, analysis of the responsibility of different vehicle classes for external highway costs and benefits, estimates of the overall responsibility of different vehicle classes for highway costs at all levels of government, evaluation of the overall equity of highway user fees imposed by all levels of government, and consideration of applying cost allocation principles to costs and revenues for all surface transportation modes. The level of analysis for these issues will depend on several factors, including the availability of data, the relevance of each issue to broader policy objectives, and the time and resources available to analyze the issues. Docket comments will be considered in evaluating the type and level of analysis required for these and other emerging cost allocation issues.

In addition to comments on this broad study plan, comments also are requested on the following questions that arose from the cost allocation workshop:

1. ISTEA provides greater flexibility in the use of Federal-aid highway funds for transit and other expenditures not directly related to the construction, operation, and maintenance of the highway system. Many of these newly eligible costs are intended to promote broad societal goals that extend beyond transportation goals. Should expenditures of Federal-aid highway funds for such non-transportation costs be allocated to highway users, and if so how? Is there a rationale for allocating certain transit expenditures to highway users and not others? Should all highway users share equally in such costs? Should fuel taxes for deficit reduction be considered in cost allocation, and if so, how?

2. Previous cost allocation studies have been criticized for using different approaches to allocate different types of costs. Should cost allocation methods be varied according to the types of costs and differences in the incidence of those costs among highway users or should the same approach be used for all types of costs?

3. The workshop did not explicitly consider alternative user fees, but user fee issues will be important considerations in the cost allocation study. Several alternative highway user fees were analyzed in the 1982 cost allocation study and in subsequent FHWA studies. Comments are requested on the advantages and disadvantages of potential modifications to the existing user fee structure including new types of fees that might be imposed, on the desirability of maintaining current tax exemptions such as for various

alternative fuels, and on other user fee issues.

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Rodney E. Slater,

Federal Highway Administrator.

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APPENDIX D

SUMMARY OF KEY STUDIES

Exhibit D.1: Summary of Key Studies

Study (Short Name)	Key Objective(s)	Approach	Results
FEDERAL STUDIES			
U.S. DoT, 1982	(1) Allocate *federal* highway program costs by vehicle class. (2) Assess current federal user charges and recommend more equitable alternatives. (3) Evaluate need for long-term monitoring of pavement deterioration.	`Federal method' developed to assess pavement costs. `Marginal cost' method developed, but not used to frame recommendations.	revenue/cost ratios for 1977 were 1.1 for cars, 0.5 for buses, 1.5 for single-unit trucks, 0.6 for combination trucks. Various tax packages proposed to ensure that revenue/cost ratios for all vehicle groups approximated 1 by 1985.
U.S. DoT, 1988	Analyse the extent to which vehicles with taxable weights over 80,000 lbs pay their fair share of user fees.	Federal method. Assessment of cost responsibility in relative terms (compare relative damage to relative fee contributions of different classes of vehicle), rather than in cents-per-mile terms.	These trucks do not pay their fair share. The revenue/cost ratios decrease with GVW for each truck configuration. Different axle configurations produced better results (e.g. multi-unit combination vehicles with seven or more axles; twin trailer combinations with nine or more axles).
STATE STUDIES			
Arizona, 1993	Compare highway revenues and costs by vehicle class at both the state level and for all three levels of government	Federal method	In past 5 years, user taxes have only covered 68% of highway expenditures. For FY 1993-97, pickups and combination trucks will cover costs; buses, single-unit trucks and cars will significantly underpay.
California, 1987	Cost responsibility analysis based on state revenues and costs	Federal and Incremental	Federal: Revenues from car covered 80% of costs; buses overpaid; single-unit trucks significantly overpaid; combination trucks covered 89% of costs. Under incremental method, car revenue/cost ratio slipped, while combination trucks covered costs.

Exhibit D.1: Summary of Key Studies

Study (Short Name)	Key Objective(s)	Approach	Results
Connecticut, 1982	Compare revenues and costs of state highway system; determine approapriate methodologies for determining cost responsibility; to "offer guidance in devising the most equitable means of distributing cost responsibility among Connecticut's highway users."	Incremental	Report did not estimate revenue/cost ratios. It determined that highway user revenues had exceeded costs by $200 million over the past five years. Cost allocation method was recommended. Also recommended that ConnDoT determine the level of serviceability to be achieved for the state highway system.
Delaware, 1992	Find ways of ensuring that highway funding keeps pace with rising demand and higher capital/maintenance costs. Study considered state costs and revenues.	`Delaware Method' which combines "the most reasonable attributes" of the federal and incremental methods.	Revenues cover only 62% of costs, overall. Combination trucks come closest to paying their way.
Idaho, 1994	Compare highway revenues and costs by vehicle class at both the state level and for all three levels of government	Federal method (Incremental method also used for validation purposes)	For all vehicles and all levels of government, revenue/cost ratio for 1993-97 = 0.8. For state + federal, single unit trucks and pickups will be paying their way, while other vehicle classes will be underpaying.
Indiana, 1988	Cost responsibility analysis for state revenues and costs	Similar to Federal	Revenue/cost ratios: Cars 1.29, buses 0.91, single-unit trucks 1.05, combination trucks 0.66.
Maine, 1989	Cost responsibility analysis for combined federal and state revenues and costs	Elements of both Federal and Incremental	Basic vehicles and combination trucks were paying their fair share of expenditures during the 1980s; single-unit trucks were overpaying during the 1980s, but would only be covering 76% of their share in 1990/91.
Maryland, 1989	Analyse the revenue impact of various legislative, administrative and judicial actions related to heavy vehicles over 26,000 lbs.	This was a revenue allocation study. Separate approaches were used to allocate registration fees, fuel taxes and titling tax.	Estimates of annual revenue effects of: o membership in the International Registration Plan; o replacement of titling tax with higher registration fees; o reduction of decal tax.

Exhibit D.1: Summary of Key Studies

Study (Short Name)	Key Objective(s)	Approach	Results
Maryland, 1982	Comparison of state revenues and costs; "not to produce tax proposals, but rather to provide a technical framework against which the existing tax structure, as well as possible changes, could be evaluated".	Incremental and federal methods, plus improved bridge cost allocation method developed by University of Maryland	Incremental method: cars and light trucks pay their way; straight trucks overpay; combination trucks significantly underpay. Federal method: cars/light trucks overpay; all trucks significantly underpay.
Minnesota, 1990	(1) Comparison of costs and revenues for all levels of government (2) Determine equity of existing finance structure and propose changes as required	Federal method (Incremental method also used for validation purposes)	Revenues slightly exceed costs. Combination trucks significantly underpaying; cars, light trucks, 2-axle straight trucks paying their way.
Missouri, 1994	Determine the proper allocation of [state] costs to the various registration classes of vehicles	Federal? Analysis was segmented into "local" and "beyond local" vehicles.	Revenue/cost ratios tended to decrease steadily as registered gross weight increased.
Montana, 1992	"To determine if all users are equitably sharing highway costs"	Modified incremental method	Basic vehicles (≤10,000 lbs) are underpaying and heavier vehicles are overpaying
Nevada, 1992	"To ascertain whether highway users are contributing [taxes] in proportion to their share [of expenditures]"	Described as "modified incremental"; relatively simple allocators	Heavy vehicles (over 10,000 lb) underpay by $61 million
North Carolina	To allocate costs to various classes of highway users and to compare these costs with revenues collected	Federal method	Trucks as a class pay a "fair" share but, within this class, largest trucks underpay
Ohio, 1982	To identify the costs directly attributable to various vehicle classes (the Dept of Taxation had the responsibility of comparing these costs to taxes)	Federal method	About 75% of road costs are common and are allocated on the basis of miles travelled; most of the other 25% are allocated to trucks

Exhibit D.1: Summary of Key Studies

Study (Short Name)	Key Objective(s)	Approach	Results
Oregon, 1993	"Determine the fair share that each class of road users should pay for the maintenance, operation and improvement of Oregon's highways, roads, and streets [and] . . . recommend adjustments to existing tax rates."	Federal method, applied to state revenues and expenditures; prospective.	Basic vehicles (< 8,000 lbs) should contribute 61.3% of road user revenue and heavy vehicles 38.7%. Based on 1994 tax rates, it was anticipated that basic vehicles would be slightly underpaying and heavy vehicles slightly overpaying. Chapter 6 traces how results have evolved since 1937. In the 1980s, a shift in the highway program mix (from pavement preservation to modernization; more urban road work) caused a decrease in the share of costs attributed to heavy vehicles.
Pennsylvania, 1990	The main purpose was to develop a cost methodology	Essentially similar to (but probably more elaborate than) the Federal method	Provides revenue/cost ratios only in an illustrative manner; generally smaller vehicles overpay and heavy vehicle underpay
Texas, 1993	(1) to compare costs and tax revenues of vehicle classes. (2) to update a series of earlier studies and to improve the allocation method used for bridge costs	The "Texas" method	Severe imbalance in revenue/cost ratios: car and pickups overpay and large trucks underpay
Virginia, 1991 & 1993	". . . to review the cost responsibility of vehicle classes and to make recommendations . . . on the need for modifications to the current mix of revenues"	Similar to Federal (? appears to treat pavement rehabilitation differently)	Most recent figures (given SB 895) show cars slightly overpaying and large trucks slightly underpaying
Wisconsin, 1982	"To compare cost responsibility to revenue payments for the various classes of vehicles. . ."	Similar to Federal method (simpler system of allocators used)	Small cars and heavy combination trucks underpay; large cars , straight trucks and light combination trucks overpay