Technical I

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
TX-95+1919-3F / 1910-4F		

4. Title and Subtitle	5. Report Date
TEXAS HIGHWAY COST ALLOCATION ANALYSIS AND ESTIMATES, 1993-1995	November 1994
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
Mark A. Euritt, C. Michael Walton, Zane A. Goff, and Dock Burke	Research Report 1919-3F / 1910-4F

9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
Center for Transportation Research / Texas Transportation Institute The University of Texas at Austin / Texas A&M University Austin, Texas 78705-2650 / College Station, Texas 77843	11. Contract or Grant No. Research Studies 7-1919 and 7-1910
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address Texas Department of Transportation Research and Technology Transfer Office P. O. Box 5080 Austin, Texas 78763-5080	Final
	14. Sponsoring Agency Code

15. Supplementary Notes

Study conducted in cooperation with the Texas Department of Transportation
Research Study Title: "Cost Allocation Procedure Enhancement"

16. Abstract

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17. Key Words	18. Distribution Statement
highway cost allocation, estimates, analysis, cost responsibility, methodological process, vehicle classes, revenue/cost comparison, single-unit vehicles, combination trucks, pickup trucks, buses	No restrictions. This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161.

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	64	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

TEXAS HIGHWAY COST ALLOCATION ANALYSIS AND ESTIMATES, 1993–1995

Research Report 1919-3F / 1910-4F

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— *"Cost Allocation Procedure Enhancement"* —

Prepared for the

TEXAS DEPARTMENT OF TRANSPORTATION

November 1994

IMPLEMENTATION STATEMENT

Cost recovery analysis provides a policy tool for evaluating changes in highway user taxes and fees and changes in vehicle use and vehicle size and weights in Texas. The model can be adjusted for a variety of traffic and cost conditions. Implementation of cost recovery analysis findings, however, is contingent on action by the state legislature. The cost recovery analysis should be updated annually to reflect basic changes in traffic, as well as changes in user taxes and fee rates.

Prepared in cooperation with the Texas Department of Transportation

DISCLAIMERS

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented within. The contents do not necessarily reflect the official views or policies of the Texas Department of Transportation. This report does not constitute a standard, specification, or regulation.

NOT INTENDED FOR CONSTRUCTION,
BIDDING, OR PERMIT PURPOSES

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PREFACE

Highway cost responsibility analysis for Texas began with a coordinated research effort by the Center for Transportation Research (CTR) and the Texas Transportation Institute (TTI) — Research Studies 362 and 332, respectively. Two research reports summarizing this work were presented, Research Reports 332-1 and 332/362-2F. The cost responsibility methodologies and models were improved in subsequent studies by both CTR and TTI. A list of the studies and the responsible institution, period of analysis, and products for each is given below:

Research Study	Institution	Base Period of Analysis	Product
332	TTI	1980	332-1
362	CTR	1980	332/362-2F
390	CTR/TTI	1985	390-1F
974	CTR/TTI	1985	Videotape
1937	CTR	1988	1937-1F and Videotape
1910	TTI	1988	1910-1
		1990	1910-2 (Briefing Report)
1919	CTR	1990	1919-1
1919	CTR	1992	1919-2/1910-3
1910	TTI	1992	1919-2/1910-3

This report (1919-3F/1910-4F) summarizes the continuations of research studies 1910 and 1919. The base year of analysis is 1993, with estimates included for 1994 and 1995.

ABSTRACT

A summary of the 1993 analysis of cost responsibility, including estimates for 1994 and 1995, is presented. The methodological process is described. This process involves 1) designation of vehicle classes and fleet estimation; 2) revenue estimation and allocation; 3) cost estimation and allocation; and 4) revenue/cost comparison. Based on the analysis, combination trucks pay 46 percent of their assigned costs; buses pay 40 percent of their assigned costs; single-unit trucks, except pickup trucks, pay 98 percent of their assigned costs; passenger cars pay 28 percent more than their assigned costs; and pickup trucks pay nearly twice their assigned costs.

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SUMMARY

The goal of planners, engineers, and administrators in the highway transportation sector of government is to manage available public funds in the most efficient and equitable manner possible. Because of the enormous financial and social consequences of highway investments, the use of economic analyses of existing and proposed policies is of paramount importance. These analyses are important tools in the decision- and policy-making process. In the development of the tools involved, basic principles suggest that the price incurred by users of the highway facilities should equal the cost responsibility of each user. Given this fundamental assumption, the problem becomes how to fairly distribute these costs and then recover the costs through user charges and fees. In evaluating the total cost of highway transportation, the following overall factors must be considered:

- The cost of operating vehicles on a facility.
- The cost of providing a facility.

Obviously, the cost of operating vehicles is the direct responsibility of the users of the facilities. Fuel and oil consumption, tire wear, maintenance, repair, insurance, and depreciation are the types of costs in which equitable distribution, as reflected in the price to specific users, already exists. These costs comply with the basic principle stated above.

The cost of providing a facility, however, does not directly follow this rule. Constructing, rehabilitating, maintaining, and administering highways requires great financial investments. These investments are the responsibility of the Texas Department of Transportation (TxDOT). The equitable distribution of these costs and subsequent pricing strategies set to generate revenues are achieved by applying the process of highway user cost responsibility and road cost recovery.

The principal objective of the study is to determine whether each vehicle or class of vehicles contributes fairly to the cost of providing highway systems. Traditionally, equity is used as the fairness criterion. The cost of supporting a highway is deemed fair if there is an equitable distribution of costs and revenues among different groups of vehicles. Under a cost-occasioned approach, equity occurs when each group's percentage of total assigned costs is equal to that group's percentage of total contributed revenues. A revenue/cost equity ratio is used for this purpose. A ratio with a value greater than one means that the vehicle class is contributing more in user taxes and fees than the costs for

which it is responsible. A value less than one means the vehicle class is not paying enough. The results for 1992 through 1995 are shown below:

Revenue/Cost Equity Ratios

Vehicle Class	1992 Actual	1993 Preliminary	1994 Estimate	1995 Estimate
Passenger Car	1.19	1.28	1.21	1.18
Pickup Truck	1.67	1.93	1.68	1.77
Buses:	0.30	0.40	0.34	0.34
2-Axle	0.41	0.55	0.45	0.45
3-Axle	0.18	0.24	0.21	0.22
Single-Unit Trucks:	1.11	0.98	0.99	0.98
2-Axle	1.00	0.89	0.86	0.85
3- or more Axle	1.36	1.17	1.28	1.27
Combination Trucks:	0.52	0.46	0.52	0.53
3-Axle	0.09	0.12	0.10	0.10
4-Axle	0.13	0.14	0.10	0.10
5-Axle	0.61	0.51	0.63	0.64
6-Axle	0.20	0.37	0.26	0.25
5-Axle Twin	0.46	0.49	0.41	0.40
6-Axle Twin	0.17	0.21	0.14	0.13

These results represent the most accurate estimates to date. Previous studies on Texas Highway Cost Allocation have served to define and refine the methodologies used to estimate and allocate Texas highway costs and revenues. The Preface to this report provides a summary of the previous studies that have served as a foundation for the results presented in this report.

SECTION 1. INTRODUCTION

OVERVIEW

The goal of planners, engineers, and administrators in the highway transportation sector of government is to manage available public funds in the most efficient and equitable manner possible. Because of the enormous financial and social consequences of highway investments, the use of economic analyses of existing and proposed policies is of paramount importance. These analyses are important tools in the decision- and policy-making process. In the development of the tools involved, basic principles suggest that the price incurred by users of the transportation facilities should equal the cost responsibility of each user. Given this fundamental assumption, the problem becomes how to fairly distribute these costs and then recover the costs through user charges and fees. In evaluating the total cost of highway transportation, the following overall factors must be considered:

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The cost of providing a facility, however, does not directly follow this rule. Constructing, rehabilitating, maintaining, and administering highways requires great financial investments. These investments are the responsibility of the Texas Department of Transportation (TxDOT). The equitable distribution of these costs and subsequent pricing strategies set to generate revenues are achieved by applying the process of highway user cost responsibility and road cost recovery.

PRINCIPLES OF HIGHWAY USER COST ALLOCATION

The principal objective of the study is to determine whether each vehicle or class of vehicles contributes fairly to the cost of providing highway systems. Traditionally, equity is used as the fairness criterion. The cost of supporting a highway is deemed fair if there is an equitable distribution of costs and revenues among different groups of vehicles. Under

a cost-occasioned approach, equity occurs when each group's percentage of total assigned costs is equal to that group's percentage of total contributed revenues.

Although equity is a goal for most highway cost allocation studies, it is not necessarily synonymous with fairness. It is possible to have an unfair, yet equitable, system. This outcome can be avoided by including certain principles into the overall design of the cost/revenue allocation methodology. These three principles are completeness, rationality, and marginality. Inclusion of these principles establishes a context for a fair and equitable highway support system.

The principle of completeness suggests that the provision and upkeep of highways are entirely financed by the various users of the system. This is a traditional component of the user-pay method for highway finance and is accepted by most transportation departments. Basically, it argues that the highway system is designed principally to meet the needs of the motoring public and, therefore, should be financed by vehicle operators.

A logical element in a fair distribution of costs is an allocation mechanism that ensures efficiency, i.e., vehicle groups will not pay more by participating in a joint or common facility than they would pay for their own exclusive facility. This concept is known as the rationality principle. A major problem with traditional methods of cost allocation is that they overlook other strategic alternatives which may exist for the users. The rationality principle constitutes an essential element of fairness, and provides an incentive for an individual vehicle class to share a common facility. An allocation of system costs which violates this principle would bring about strong objections, since a given vehicle class might not be willing to participate in the financing of the common facility when it is economically more attractive to participate in another type of facility. In practice, an exclusive facility is not a real option; however, inclusion of this principle into design of cost allocation helps assure a fairer distribution of costs.

The third principle is marginality. The marginality principle states that no individual vehicle class should be charged less than the marginal cost, or separate cost, of including it in the joint project. For example, the marginal class cost for vehicle class A is the cost of the facility for all vehicle classes less the cost of the facility for all but vehicle class A. Assuming the completeness principle is met, violation of this marginality concept implies the existence of cross-subsidization among the vehicle classes.

The preceding three principles guide the framework of the cost allocation structure used in Texas as developed in previous studies. Inclusion of these principles helps

establish a reasonable and fair mechanism for distributing costs to various groups of users.[1]

REPORT OUTLINE

Figure 1-1 illustrates the basic design used in the Texas highway cost responsibility study. The study focuses on the state highway and farm-to-market road system. (City and local roads are outside the scope of this analysis.)

The first step in the cost responsibility process is the classification of vehicles into meaningful groups for analysis. The significant challenge in this part of the analysis is determining the relationship between registered vehicles and operational data. For example, combination trucks are registered according to the heaviest load that they will carry, which is not necessarily identical with their operating load. Procedures for adjusting the registration data and operational data were developed, with the results summarized in Section 2.

The revenue analysis is concerned with the identification of user-generated fees and taxes that support the highway system and the allocation of these revenues to specific groups of vehicles. Both state and federal revenues are included in the study, although the two are reported separately. A discussion of revenue analysis is presented in Section 3.

The cost analysis is presented in Section 4 and is concerned with the estimation of highway system costs and allocation of those costs to vehicle groups.

Section 5, equity analysis, combines the previous chapters to determine the relationship of user cost responsibility and user-generated revenues. Revenue/cost equity ratios are used to compare these elements.

Conclusions of the study and future implications of the results are presented in Section 6. Appendix A discusses the development of a flexible pavement construction cost equation. Appendix B reviews the implications of updating the cost model in a timely manner. Finally, Appendix C summarizes three additional state highway cost allocation studies.

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[1]For a more complete discussion on the cost allocation methodology, see Garcia-Diaz et al, *Analysis of Truck Use and Highway Cost Allocation in Texas*, SDHPT Research Report 332-1, Texas Transportation Institute, Texas A&M University, College Station, Texas, 1985, and Villareal-Cavazos et al, *The Texas Highway Cost Allocation Study*, SDHPT Research Report 390-1F, Center for Transportation Research/Texas Transportation Institute, Austin, Texas, 1988.

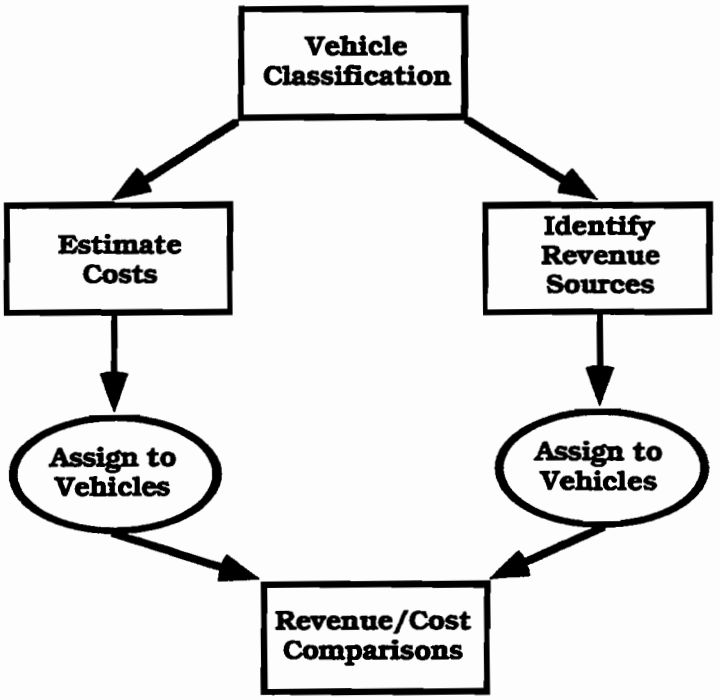

Figure 1-1
Texas Cost Allocation Procedure

SECTION 2. VEHICLE CLASSIFICATION

Ideally, it would be beneficial to know the amount of revenues and costs associated with each vehicle operating on the highway system. Only then is it possible to develop a perfectly equitable highway financing scheme. Individual vehicle revenue/cost allocation, however, is impractical. Generally, it is deemed acceptable to classify vehicles according to similar characteristics. Only if the vehicle classification scheme is chosen with care is it possible to use average values for vehicle groups and not sacrifice, significantly, measures of accuracy. Any vehicle classification scheme is a trade-off between what is desirable to know and what is possible to do, given time, personnel, and data constraints.

Based on data from the Texas Department of Transportation (TxDOT) registration files, Highway Performance Monitoring System (HPMS) data, vehicle classification data, and the 1987 Texas Truck Inventory Use Survey, vehicles are classified into five major categories: passenger cars, motorcycles, buses, single-unit trucks, and combination trucks. The bus category consists of 2-axle and 3-axle groups, and, for revenue allocation purposes, buses also are identified as either intercity-motor, private, transit, or school. Single-unit trucks include pickups, other 2-axle trucks, and 3- or more axle trucks. Combination trucks are categorized as tractor-semitrailers with 3 axles, 4 axles, 5 axles, or 6 or more axles and tractor-semitrailer-trailer combinations with 5 axles or 6 or more axles. The single-unit trucks and combination trucks are further categorized by weight and type of registration. Table 2-1 shows the number of vehicles in each of the various vehicle groups used for the 1993 cost allocation analysis.

The weight units for categorizing trucks in Table 2-1, as well as those in the other tables in this report, are in metric units. The selected weight groups are based on the registration categories for Texas which are reported in English units. The English/metric equivalents of the registration groupings for single-unit trucks and combination trucks are as follows:

Single-Unit Trucks		*Combination Trucks*	
lbs	*kg*	*lbs*	*kg*
0 – 6,000	0 – 2,724	0 – 18,000	0 – 8,172
6,001 – 8,000	2,724 – 3,632	18,001 – 36,000	8,172 – 16,344
8,001 – 10,000	3,632 – 4,540	36,001 – 42,000	16,344 – 19,068
10,001 – 17,000	4,540 – 7,718	42,001 – 62,000	19,068 – 28,148
17,001 – 24,000	7,718 – 10,896	Over 62,000	Over 28,148
24,001 – 31,000	10,896 – 14,674		
Over 31,000	Over 14,674		

Table 2-1
1993 Vehicle Distribution

	Number of Vehicles	Percent of Total Vehicles
PASSENGER CARS	8,874,714	67.11965%
0-3 years old	1,830,127	13.84129%
4-6 years old	1,968,672	14.88911%
More than 6 years old	5,012,123	37.90679%
Over 2,724 kg	63,791	0.48246%
MOTORCYCLES	143,764	1.08729%
BUSES	63,337	0.47902%
2 Axle	61,585	0.46577%
Transit	5,295	0.04005%
Private	8,590	0.06497%
School	47,700	0.36076%
3 Axle	1,752	0.01325%
SINGLE UNIT TRUCKS	4,009,008	30.32021%
Pickup	3,465,394	26.20884%
0 - 2,724 kg	3,336,669	25.23530%
2,724 - 3,632 kg	111,118	0.84039%
3,632 - 4,540 kg	15,446	0.11682%
4,540 - 7,718 kg	2,161	0.01634%
7,718 - 10,896 kg	0	0.00000%
10,896 - 14,674 kg	0	0.00000%
Over 14,674 kg	0	0.00000%
Other 2 axle	422,790	3.19757%
0 - 2,724 kg	73,564	0.55637%
2,724 - 3,632 kg	266,633	2.01655%
3,632 - 4,540 kg	40,529	0.30652%
4,540 - 7,718 kg	27,868	0.21076%
7,718 - 10,896 kg	9,245	0.06992%
10,896 - 14,674 kg	4,624	0.03497%
Over 14,674 kg	328	0.00248%
3 or more axle	120,824	0.91380%
0 - 2,724 kg	0	0.00000%
2,724 - 3,632 kg	0	0.00000%
3,632 - 4,540 kg	8,013	0.06060%
4,540 - 7,718 kg	25,817	0.19526%
7,718 - 10,896 kg	27,389	0.20714%
10,896 - 14,674 kg	26,813	0.20279%
Over 14,674 kg	32,792	0.24801%

	Number of Vehicles	Percent of Total Vehicles
COMBINATION TRUCKS	131,407	0.99383%
3 axle, Single Trailer	4,284	0.03240%
0 - 8,172 kg	2,781	0.02103%
8,172 - 16,344	1,393	0.01054%
16,344 - 19,068 kg	70	0.00053%
19,068 - 28,148 kg	40	0.00030%
Over 28,148 kg	0	0.00000%
4 axle, Single Trailer	8,082	0.06112%
0 - 8,172 kg	4,004	0.03028%
8,172 - 16,344	3,006	0.02274%
16,344 - 19,068 kg	339	0.00257%
19,068 - 28,148 kg	602	0.00455%
Over 28,148 kg	129	0.00098%
5 Axle, Single Trailer	110,789	0.83790%
0 - 8,172 kg	2,931	0.02217%
8,172 - 16,344	18,183	0.13752%
16,344 - 19,068 kg	3,688	0.02789%
19,068 - 28,148 kg	15,349	0.11608%
Over 28,148 kg	70,638	0.53424%
6 or More Axle, Single Trailer	2,917	0.02206%
0 - 8,172 kg	31	0.00023%
8,172 - 16,344	257	0.00195%
16,344 - 19,068 kg	80	0.00061%
19,068 - 28,148 kg	396	0.00300%
Over 28,148 kg	2,152	0.01628%
5 Axle, Twin Trailer	4,455	0.03369%
0 - 8,172 kg	132	0.00100%
8,172 - 16,344	388	0.00293%
16,344 - 19,068 kg	143	0.00108%
19,068 - 28,148 kg	1,206	0.00912%
Over 28,148 kg	2,586	0.01955%
6 or More Axle, Twin Trailer	880	0.00666%
0 - 8,172 kg	25	0.00019%
8,172 - 16,344	40	0.00030%
16,344 - 19,068 kg	32	0.00024%
19,068 - 28,148 kg	261	0.00197%
Over 28,148 kg	522	0.00395%
TOTAL VEHICLES	13,222,230	100.00000%

SECTION 3. REVENUE ANALYSIS

OVERVIEW

Texas motorists contribute significant financial resources to the Texas state government. While the Texas highway cost responsibility study is concerned with user contributions that support the Texas highway system, users of Texas highways also pay other taxes and fees. Table 3-1 identifies the various state taxes and fees that Texas motorists pay directly or indirectly, and how they are used. This data is summarized in Figure 3-1. Overall, about 52 percent of the taxes and fees paid by motorists are used for highway operations and public safety. The remaining funds are used for other state purposes. Importantly, the Texas highway cost responsibility study allocates revenues generated by motorists that are used exclusively for highways. This excludes all revenues used for non-highway purposes (including public safety). Also excluded are revenues contributed by non-users to the State Highway Fund, a negligible amount in recent years.

Texas highway expenditures include funds from state and federal sources. Of the $3.5 billion in revenues for the state highway system in 1993, state sources accounted for nearly 65 percent and the remaining 35 percent came from the Federal Highway Trust Fund. The taxes and fees for these two sources are highlighted in the following sections.

STATE HIGHWAY USER TAXES AND FEES

As shown in Figure 3-2, motor fuel taxes and registration fees account for nearly 94 percent of the non-federal revenues to the Texas State Highway Fund. Other sources grew from just under 1 percent in 1992 to 5 percent in 1993. The motor lubricants sales tax continues to account for about 1 percent of the state revenues to the Highway Fund. The motor fuel taxes, registration fees, and motor lubricants sales tax are the only state sources of revenue allocated to users in the Texas highway cost responsibility study.

Motor Fuel Taxes

During 1993, motor vehicles paid approximately $1,258.8 million in gasoline taxes, a 6 percent increase from 1992. Diesel and other fuel tax collections amounted to $248.1 million, a 9 percent increase from 1992. The motor fuel tax rates did not change from 1992 to 1993 and, therefore, the change represents an increase in fuel consumed. The tax rates for the various vehicle types are illustrated in Table 3-2.

Registration Fees

Registration fees amounted to $736.5 million in 1993, a 3 percent increase from 1992. Vehicle registrations are based principally on weight, except those passenger cars under 2,724 kg (6,000 lbs), which are registered according to vehicle age. State- and federal-owned vehicles are exempt from registration fees. Table 3-3 presents a summary of the number of exempt vehicles in Texas. Farm trucks register at one-half the normal truck registration rate, and their numbers and types are summarized in Table 3-4. Vehicles registered as apportioned are included in the appropriate vehicle groups.

State Oil Lubricating Sales Tax

The Comptroller of Public Accounts estimated $19.8 million in 1993 for the motor lubricants sales tax. This is about a 5 percent increase from 1992.

Total State User Taxes and Fees

Overall, nearly $2.3 billion was collected in 1993 from state user taxes and fees. Table 3-5 presents a summary of the state user tax and fee distributions for the various vehicle groups. Fuel taxes and the oil lubricants sales tax are distributed on the basis of fuel/oil consumption and distance traveled. Registration fees are allocated on the basis of the 1993 registration fee rates and the average weight for each of the vehicle classes, with the exception of automobiles under 2,724 kg (6,000 lbs), fees for which are based on the age of the vehicle.

FEDERAL HIGHWAY USER TAXES AND FEES

Federal Highway Trust Fund contributions from Texas motorists remained at about $1.2 billion in 1993. There was very little change in the relative distribution of federal user taxes and fees. As shown in Figure 3-3, federal fuel taxes remain the major source of revenues to the Federal Highway Trust Fund.

Texas was apportioned, via federal aid programs, 98 percent of what it contributed into the Highway Trust Fund in 1993 (FHWA, various years). This is considerably higher than the 89 percent the state received in 1992. Since 1956, however, Texas has been apportioned only 86 percent of what it has contributed in the Highway Trust Fund, the second lowest of any state in country.

This study continues the practice of previous studies, allocating all federal highway user taxes and fees paid by Texas motorists to the Highway Trust Fund, except the portion

to the Mass Transit Account, and not the amount Texas receives in federal aid from the Fund.

Motor Fuel Taxes

The federal fuel taxes are the predominant source of federal revenues. During 1993, $832.5 million was collected from Texas highway users for gasoline use, a 1 percent increase from 1992. Texas federal diesel tax collections decreased 7 percent, from $249.5 million in 1992 to $232.0 million in 1993.

In Texas, as with state fuel taxes, all federal fuel taxes are not allocated to the Highway Trust Fund. The federal motor fuel tax rates and their fund allocation are shown in Table 3-6. (In addition to these published rates, there are a variety of special exemptions.) The estimated distribution of federal motor fuel taxes generated in Texas is shown in Figure 3-4. In recent periods, a growing percentage of federal fuel taxes are being used to reduce the national deficit. Beginning in fiscal year 1995, the tax rate supporting deficit reduction, 1.8¢/liter (6.8¢/gallon), is reduced by 0.66¢/liter (2.5¢/gallon). Of this amount, 0.53¢/liter (2.0¢/gallon) is reallocated to the Highway Trust Account and the remaining 0.13¢/liter (0.5¢/gallon) is reallocated to the Mass Transit account.

Truck and Trailer Sales Tax

There was no change for the truck and trailer sale tax rate in 1993; it remained at 12 percent of the retail sales price. Exemptions to this tax remain for house trailers; school buses; camper bodies; motor homes; truck and trailer bodies designed for seed, feed, and fertilizer; trucks under 14,982 kg (33,000 lbs) gross vehicle weight; and trailers under 11,809 kg (26,000 lbs) gross vehicle weight. Truck and trailer sales increased significantly in 1993, generating $89.5 million in sales tax collections, a 34 percent increase from 1992.

Tire Tax

No changes were made in the tire tax rates for 1993. They continue to be 33¢/kg (15¢/lb) from 18 to 32 kg (40 to 70 lbs); $4.50 plus 66¢/kg (30¢/lb) from 32 to 41 kg (71 to 90 lbs); and $10.50 plus $1.10/kg (50¢/pound) over 41 kg (90 lbs). Tire weights under 18 kg (40 lbs) are exempt. Additionally, buses with fixed route service, including school buses, are excluded from the tax. Tire tax collections increased 16 percent from 1992 to 1993, totaling $22.7 million.

Heavy Use Tax

There were no changes in the federal heavy use tax rates for motor vehicles over 24,970 kg (55,000 lbs) in 1993. The fee rates continue at $100 plus $22 per 454 kg (1,000 lbs) over 24,970 kg (55,000 lbs) for vehicles with gross weights from 24,970 to 34,050 kg (55,000 to 75,000 lbs); and $550 for vehicles over 34,050 kg (75,000 lbs) gross weight. There are a few minor exemptions for logging trucks and farm vehicles traveling less than 12,068 km (7,500 miles) per year. Collections in 1993 decreased slightly from $47.282 million in 1992 to $47.021 million.

Total Federal User Taxes and Fees

The distribution of federal user taxes and fees is shown in Table 3-7. The gasoline and diesel taxes are distributed on the basis of vehicle fuel consumption and distance traveled. The heavy use tax is distributed on the basis of gross vehicle weights, similarly to the state registration fee. The truck and trailer sales taxes are allocated to the vehicle groupings in proportion to the dollar sales per vehicle. The new vehicle sales price and the percent of new vehicles are forecast values from the federal highway cost allocation study (Reno, 1981) adjusted for inflation. The tire tax is allocated in a similar manner.

TOTAL HIGHWAY USER TAXES AND FEES

As shown in Table 3-8, $3.5 billion was paid by vehicle operators on Texas roads and highways in 1993. Based on the vehicle classification in Section 2, this amounts to an average of $264 per vehicle, a 1.3 percent increase from 1992. Motorcycles contributed the smallest amount ($44 per vehicle), and the 5-axle tractor-semitrailer-trailer combination contributed the most per vehicle ($7,711). Overall, passenger vehicles (automobiles and pickups) accounted for 73 percent of total highway user taxes and fees. Combination trucks, which account for 1 percent of the Texas registered vehicles, contributed 18 percent of total highway user taxes and fees.

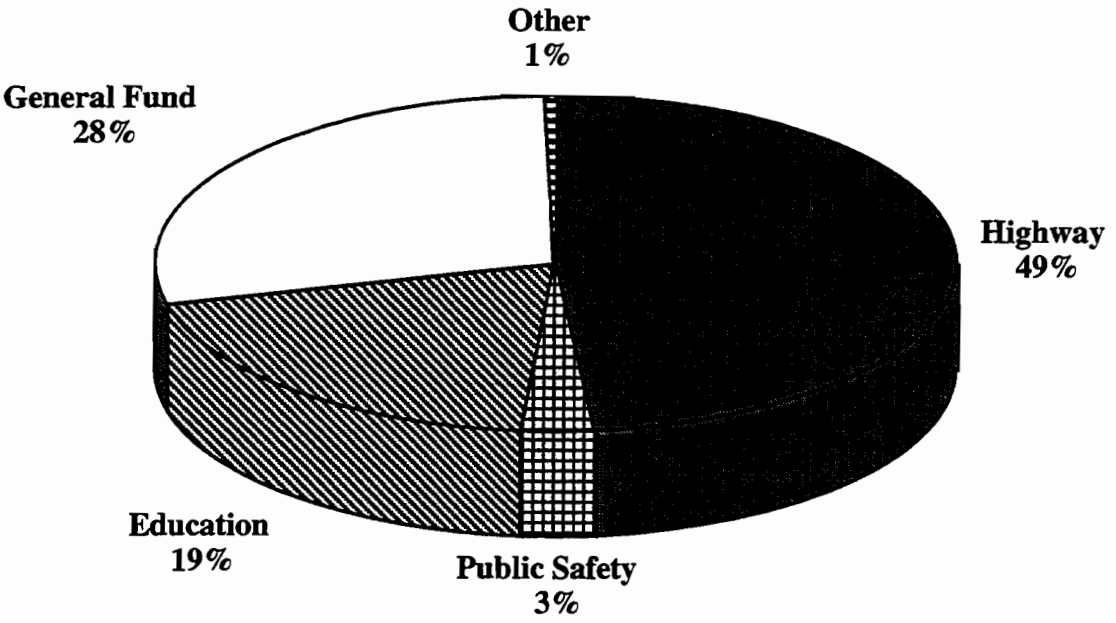

Figure 3-1
Appropriation of Texas Highway-Related Taxes and Fees, 1993

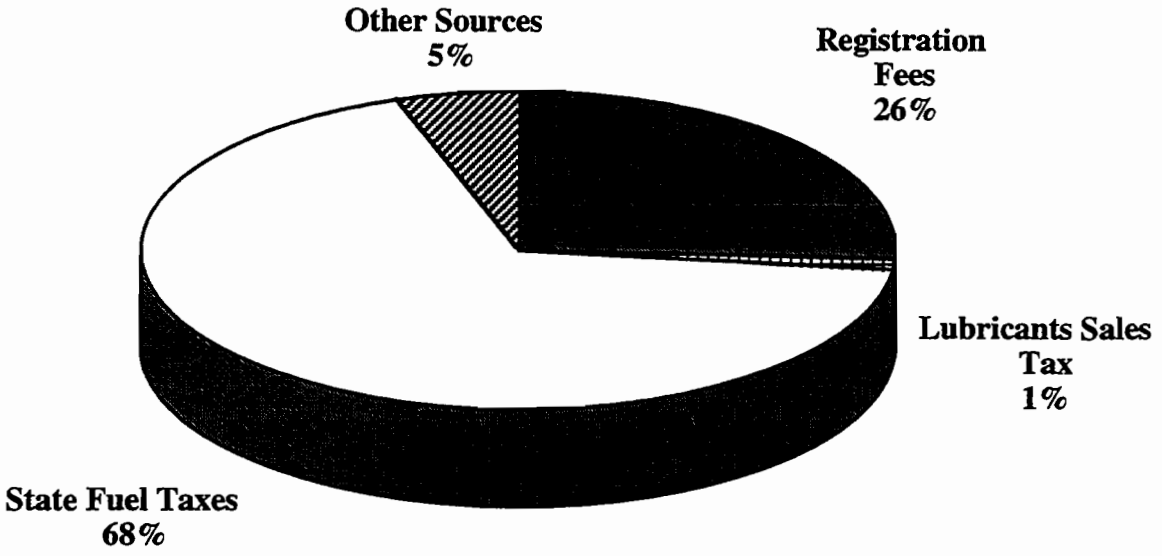

Figure 3-2
Distribution of 1993 State Highway User Taxes and Fees

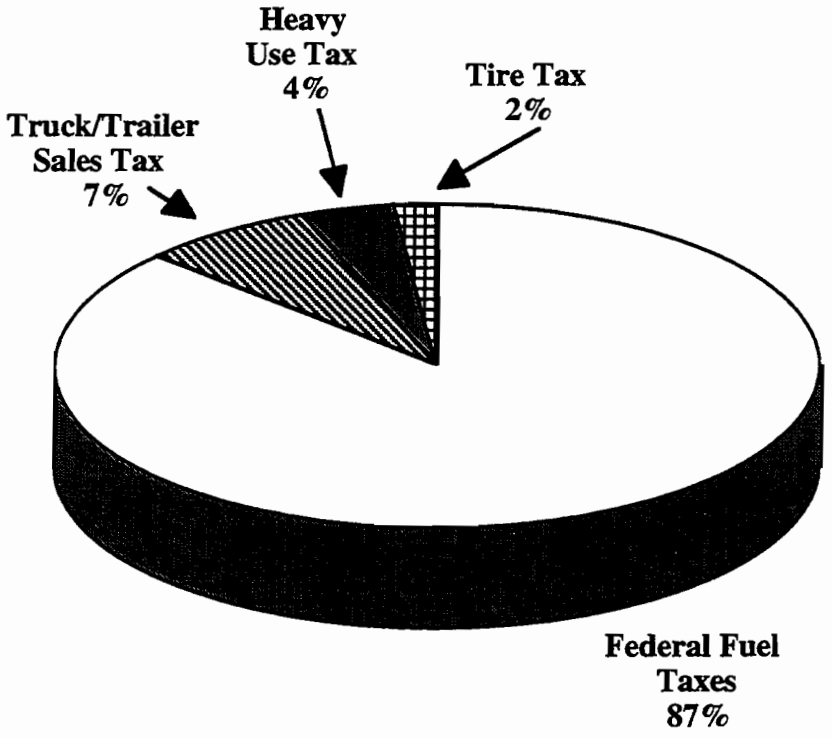

Figure 3-3
Distribution of 1993 Federal Highway User Taxes and Fees

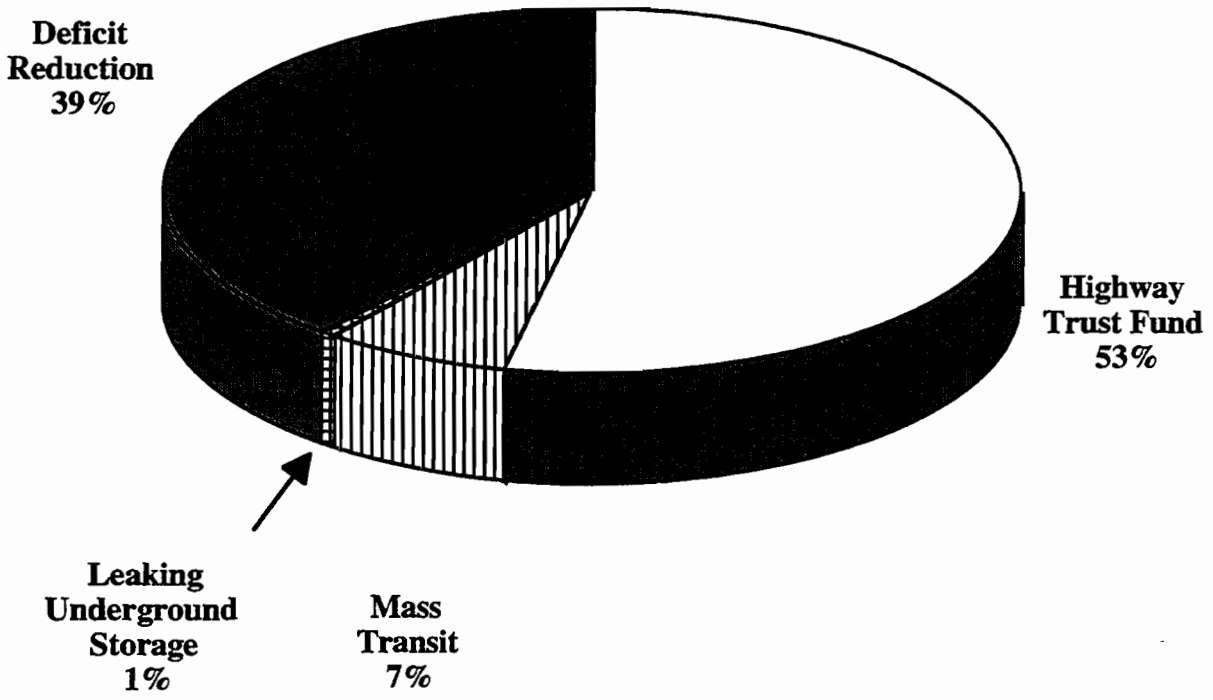

Figure 3-4
Appropriation of Federal Fuel Taxes

Table 3-1
Texas Highway-Related Taxes and Fees, 1993

Revenue Source	Highway	Public Safety*	Education	General Fund	Other	Total
Motor Vehicle Sales & Use Tax - Motor Carriers			$4,147,190	$12,441,571		$16,588,761
Motor Vehicle Sales & Use Tax			$326,524,524	$979,573,572		$1,306,098,096
Motor Vehicle Rental Tax			$21,976,716	$65,930,149		$87,906,866
Motor Vehicle Use Tax - Direct			$1,575	$4,725		$6,300
Gasoline Tax	$1,266,644,656		$426,268,635	$40,512,250	$17,557,238	$1,750,982,779
Diesel Fuel Tax	$246,054,750		$82,018,250		$3,633,959	$331,706,959
Liquefied Gas Tax	$2,103,791		$701,264		$28,790	$2,833,845
Motor Fuel Lubricants Sales Tax	$19,824,000					$19,824,000
Motor Vehicle Certificates	$14,027,289			$20,147,635		$34,174,924
Motor Vehicle Sales Tax Permit				$123		$123
Motor Vehicle Registration Fees	$586,068,536	$5,004		$2,457,059	$1,001,756	$589,532,355
Tow Truck Registration				$573,231		$573,231
Special Vehicle Registrations	$8,788,387			$9,811,652		$18,600,039
Motor Vehicle Inspection Fees		$66,950,177	($168)			$66,950,009
Assigned Vehicle Identification Number Fees	$7,585					$7,585
Driver License Fees		$1,008,198		$68,735,210		$69,743,408
Driver Record Information Fees		$267,901		$48,428,824		$48,696,725
Driver Information Symbols				$287		$287
Commercial Driver Training School Fees		$50		$1,640		$1,690
Automobile Clubs Registration				$32,755		$32,755
LPG Delivery Fees					$2,162,222	$2,162,222
Commercial Transportation Fees	$192,860	$2,203,313		$5,024,805	$212,468	$7,633,445
Travel for Inspection of Motor Carrier Records				$1,958		$1,958
Motor Carrier - Proof of Insurance Filing Fee		$1,196,747		$598,700		$1,795,447
Trucker Lease Agreement Act Fees		$300,017				$300,017
Antifreeze Registration Fees				$5,040		$5,040
Abandoned Motor Vehicles	$11,205					$11,205
Excess Fines From Speeding Violations				$17,660		$17,660
Motor Vehicle Safety Responsibility Violations		$3,848,443				$3,848,443
Motor Carrier Act Fines		$866,905		$111,480		$978,385
Turnpike Policing	$1,042,881					$1,042,881
Petroleum Product Delivery Fees		$64,991,445		$1,410,070		$66,401,515
ALL REVENUE SOURCES	$2,144,765,939	$141,638,200	$861,637,987	$1,255,820,397	$24,596,433	$4,428,458,956

* Public safety includes funds administered by the Department of Public Safety and funds designated for other commercial regulatory purposes.

Source: Texas 1993 Annual Cash Report: Volume II Revenues and Expenditures of State Funds for the Year Ended August 31, 1993, Texas Comptroller of Public Accounts; and Comptroller Manual of Accounts Volume II, Comptroller of Public Accounts, Reissued September 1, 1993.

Table 3-2
1993 State Fuel Tax Rates

Vehicle (Fuel) Type	¢/liter	¢/gallon
Non-exempt gasoline-powered vehicle	5.3	20.0
Non-exempt diesel-powered vehicle	5.3	20.0
Transit (gasoline-powered)	5.2	19.0
Transit (diesel-powered)	5.2	19.5
Gasohol-powered vehicle	4.2	16.0
LPG- or natural gas-powered vehicles	see below	
Federal vehicles	exempt	
School district vehicles	exempt	
County government LPG-powered	exempt	

Non-exempt LPG- or natural gas-powered vehicles

	Less than 8,045 km (5,000 miles)	8,045 - 16,090 km (10,000 miles)	16,090 - 24,133 km (15,000 miles)	Over 24,133 km (15,000 miles)
Less than 1,814 kg (4,000 lbs)	$30	$60	$90	$120
1,814 - 4,536 kg (4,000 - 10,000 lbs)	$42	$84	$126	$168
4,536 - 6,804 kg (10,001 - 15,000 lbs)	$48	$96	$144	$192
6,804 - 12,474 kg (15,001 - 27,500 lbs)	$84	$168	$252	$336
12,474 - 19,732 kg (27,501 - 43,500 lbs)	$126	$252	$378	$504
Over 19,732 kg (43,501 lbs)	$186	$372	$558	$744
Transit Vehicle	$444	$444	$444	$444

Table 3-3
1993 Distribution of Exempt Vehicles

	Number of Exempt Vehicles	Percent of Total Vehicles
PASSENGER CARS	155,581	38.71696%
0-3 years old	32,084	7.98414%
4-6 years old	34,512	8.58856%
More than 6 years old	87,867	21.86596%
Over 2,724 kg	1,118	0.27830%
MOTORCYCLES	3,973	0.98870%
BUSES	52,710	13.11710%
2 Axle	52,710	13.11710%
Transit	5,010	1.24676%
Private	0	0.00000%
School	47,700	11.87034%
3 Axle	0	0.00000%
SINGLE UNIT TRUCKS	186,955	46.52450%
Pickup	161,604	40.21587%
0 - 2,724 kg	157,294	39.14333%
2,724 - 3,632 kg	3,746	0.93213%
3,632 - 4,540 kg	546	0.13589%
4,540 - 7,718 kg	18	0.00453%
7,718 - 10,896 kg	0	0.00000%
10,896 - 14,674 kg	0	0.00000%
Over 14,674 kg	0	0.00000%
Other 2 axle	19,716	4.90647%
0 - 2,724 kg	3,598	0.89529%
2,724 - 3,632 kg	12,668	3.15253%
3,632 - 4,540 kg	1,935	0.48143%
4,540 - 7,718 kg	1,018	0.25337%
7,718 - 10,896 kg	314	0.07823%
10,896 - 14,674 kg	171	0.04266%
Over 14,674 kg	12	0.00298%
3 or more axle	5,634	1.40217%
0 - 2,724 kg	0	0.00000%
2,724 - 3,632 kg	0	0.00000%
3,632 - 4,540 kg	391	0.09739%
4,540 - 7,718 kg	1,203	0.29945%
7,718 - 10,896 kg	1,258	0.31313%
10,896 - 14,674 kg	1,253	0.31189%
Over 14,674 kg	1,528	0.38030%

	Number of Exempt Vehicles	Percent of Total Vehicles
COMBINATION TRUCKS	2,623	0.65274%
3 axle, Single Trailer	86	0.02128%
0 - 8,172 kg	55	0.01374%
8,172 - 16,344	28	0.00699%
16,344 - 19,068 kg	1	0.00035%
19,068 - 28,148 kg	1	0.00020%
Over 28,148 kg	0	0.00000%
4 axle, Single Trailer	161	0.04014%
0 - 8,172 kg	79	0.01972%
8,172 - 16,344	61	0.01506%
16,344 - 19,068 kg	7	0.00170%
19,068 - 28,148 kg	12	0.00301%
Over 28,148 kg	3	0.00066%
5 Axle, Single Trailer	2,211	0.55033%
0 - 8,172 kg	54	0.01338%
8,172 - 16,344	353	0.08773%
16,344 - 19,068 kg	72	0.01789%
19,068 - 28,148 kg	295	0.07336%
Over 28,148 kg	1,439	0.35798%
6 or More Axle, Single Trailer	58	0.01449%
0 - 8,172 kg	1	0.00014%
8,172 - 16,344	5	0.00122%
16,344 - 19,068 kg	2	0.00038%
19,068 - 28,148 kg	7	0.00186%
Over 28,148 kg	44	0.01089%
5 Axle, Twin Trailer	89	0.02213%
0 - 8,172 kg	2	0.00061%
8,172 - 16,344	8	0.00189%
16,344 - 19,068 kg	3	0.00070%
19,068 - 28,148 kg	23	0.00582%
Over 28,148 kg	53	0.01311%
6 or More Axle, Twin Trailer	18	0.00437%
0 - 8,172 kg	0	0.00012%
8,172 - 16,344	1	0.00019%
16,344 - 19,068 kg	1	0.00016%
19,068 - 28,148 kg	5	0.00126%
Over 28,148 kg	11	0.00265%
TOTAL VEHICLES	401,842	100.00000%

Table 3-4
1993 Distribution of Farm Trucks

	Number of Farm Vehicles	Percent of Total Vehicles
SINGLE UNIT TRUCKS	197,105	98.41816%
Pickup	170,378	85.07283%
0 - 2,724 kg	129,530	64.67647%
2,724 - 3,632 kg	34,746	17.34934%
3,632 - 4,540 kg	4,313	2.15335%
4,540 - 7,718 kg	1,790	0.89367%
7,718 - 10,896 kg	0	0.00000%
10,896 - 14,674 kg	0	0.00000%
Over 14,674 kg	0	0.00000%
Other 2 axle	20,787	10.37918%
0 - 2,724 kg	210	0.10494%
2,724 - 3,632 kg	8,337	4.16257%
3,632 - 4,540 kg	1,084	0.54121%
4,540 - 7,718 kg	7,109	3.54947%
7,718 - 10,896 kg	2,835	1.41578%
10,896 - 14,674 kg	1,128	0.56339%
Over 14,674 kg	84	0.04180%
3 or more axle	5,940	2.96615%
0 - 2,724 kg	0	0.00000%
2,724 - 3,632 kg	0	0.00000%
3,632 - 4,540 kg	33	0.01671%
4,540 - 7,718 kg	1,282	0.64037%
7,718 - 10,896 kg	1,733	0.86508%
10,896 - 14,674 kg	1,259	0.62872%
Over 14,674 kg	1,633	0.81527%

	Number of Farm Vehicles	Percent of Total Vehicles
COMBINATION TRUCKS	3,168	1.58184%
3 axle, Single Trailer	103	0.05157%
0 - 8,172 kg	82	0.04086%
8,172 - 16,344	20	0.00993%
16,344 - 19,068 kg	1	0.00045%
19,068 - 28,148 kg	1	0.00033%
Over 28,148 kg	0	0.00000%
4 axle, Single Trailer	195	0.09728%
0 - 8,172 kg	131	0.06534%
8,172 - 16,344	48	0.02382%
16,344 - 19,068 kg	5	0.00242%
19,068 - 28,148 kg	11	0.00562%
Over 28,148 kg	0	0.00008%
5 Axle, Single Trailer	2,671	1.33365%
0 - 8,172 kg	303	0.15126%
8,172 - 16,344	948	0.47354%
16,344 - 19,068 kg	173	0.08658%
19,068 - 28,148 kg	937	0.46781%
Over 28,148 kg	309	0.15446%
6 or More Axle, Single Trailer	70	0.03512%
0 - 8,172 kg	4	0.00204%
8,172 - 16,344	17	0.00872%
16,344 - 19,068 kg	5	0.00246%
19,068 - 28,148 kg	31	0.01568%
Over 28,148 kg	12	0.00622%
5 Axle, Twin Trailer	107	0.05362%
0 - 8,172 kg	12	0.00587%
8,172 - 16,344	17	0.00863%
16,344 - 19,068 kg	6	0.00287%
19,068 - 28,148 kg	63	0.03145%
Over 28,148 kg	10	0.00480%
6 or More Axle, Twin Trailer	21	0.01060%
0 - 8,172 kg	2	0.00114%
8,172 - 16,344	2	0.00091%
16,344 - 19,068 kg	1	0.00066%
19,068 - 28,148 kg	14	0.00691%
Over 28,148 kg	2	0.00099%
TOTAL VEHICLES	200,273	100.00000%

Table 3-5
1993 State Highway User Tax and Fee Allocations

	State Gasoline Tax	State Diesel Tax	State Reg. Fee	State Oil Lub Tax	Total State	% of Total	Tax Per Vehicle
PASSENGER CARS	$756,906,463	$5,831,086	$407,969,430	$8,988,753	$1,179,695,732	52.124718%	$132.93
0-3 years old	$185,028,212	$118,516	$64,336,290	$2,306,913	$251,789,931	11.125309%	$137.58
4-6 years old	$188,422,472	$142,301	$86,169,147	$2,395,788	$277,129,708	12.244944%	$140.77
More than 6 years old	$376,290,466	$5,512,660	$253,929,825	$4,221,443	$639,954,395	28.276310%	$127.68
Over 2,724 kg	$7,165,313	$57,609	$3,534,168	$64,610	$10,821,699	0.478156%	$169.64
MOTORCYCLES	$1,271,536	$0	$4,217,472	$52,783	$5,541,792	0.244863%	$38.55
BUSES	$1,698,594	$11,286,580	$1,146,760	$343,171	$14,475,105	0.639581%	$228.54
2 Axle	$1,698,594	$9,361,716	$735,836	$305,006	$12,101,151	0.534688%	$196.50
Transit	$0	$8,927,111	$40,477	$182,546	$9,150,134	0.404298%	$1,728.07
Private	$1,698,594	$434,604	$695,359	$16,202	$2,844,760	0.125695%	$331.17
School	$0	$0	$0	$106,258	$106,258	0.004695%	$2.23
3 Axle	$0	$1,924,864	$410,924	$38,166	$2,373,954	0.104893%	$1,355.00
SINGLE UNIT TRUCKS	$494,890,263	$43,314,961	$204,390,105	$6,760,361	$749,355,689	33.110193%	$186.92
Commercial	$482,092,857	$42,146,293	$198,268,046	$6,585,295	$729,092,491	32.214866%	$191.27
Pickup	$394,224,821	$7,045,191	$150,059,866	$4,880,115	$556,209,995	24.576073%	$168.80
0 - 2,724 kg	$381,945,138	$6,825,741	$144,781,274	$4,734,479	$538,286,632	23.784132%	$167.84
2,724 - 3,632 kg	$10,669,282	$190,671	$4,292,732	$126,542	$15,279,226	0.675111%	$200.06
3,632 - 4,540 kg	$1,555,363	$27,796	$934,703	$18,447	$2,536,309	0.112067%	$227.81
4,540 - 7,718 kg	$55,039	$984	$51,157	$647	$107,827	0.004764%	$290.81
7,718 - 10,896 kg	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
10,896 - 14,674 kg	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
Over 14,674 kg	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
Other 2 axle	$75,963,498	$11,677,063	$26,931,181	$1,154,947	$115,726,690	5.113370%	$287.88
0 - 2,724 kg	$13,922,936	$2,044,165	$3,361,512	$209,021	$19,537,634	0.863268%	$266.35
2,724 - 3,632 kg	$49,026,144	$7,198,017	$14,737,884	$736,016	$71,698,062	3.167970%	$277.58
3,632 - 4,540 kg	$7,486,854	$1,099,220	$3,361,630	$112,398	$12,060,102	0.532874%	$305.75
4,540 - 7,718 kg	$3,940,192	$578,499	$2,907,488	$59,153	$7,485,332	0.330739%	$360.58
7,718 - 10,896 kg	$1,196,830	$274,293	$1,227,851	$20,562	$2,719,536	0.120162%	$424.30
10,896 - 14,674 kg	$365,073	$451,379	$1,317,890	$16,636	$2,150,978	0.095041%	$615.36
Over 14,674 kg	$25,469	$31,490	$16,925	$1,161	$75,045	0.003316%	$307.74
3 or more axle	$11,904,537	$23,424,039	$21,276,999	$550,233	$57,155,807	2.525423%	$497.51
0 - 2,724 kg	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
2,724 - 3,632 kg	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
3,632 - 4,540 kg	$918,743	$1,085,218	$712,816	$26,378	$2,743,156	0.121206%	$343.76
4,540 - 7,718 kg	$2,824,810	$3,336,661	$3,601,826	$81,104	$9,844,402	0.434974%	$401.24
7,718 - 10,896 kg	$2,953,877	$3,489,115	$5,113,302	$84,809	$11,641,104	0.514361%	$453.74
10,896 - 14,674 kg	$3,334,036	$3,970,693	$9,625,816	$103,430	$17,033,975	0.752644%	$666.58
Over 14,674 kg	$1,873,070	$11,542,352	$2,223,238	$254,511	$15,893,171	0.702238%	$510.07
Farm	$12,797,406	$1,168,668	$6,122,059	$175,065	$20,263,198	0.895327%	$102.80
Pickup	$10,574,076	$188,969	$4,289,700	$129,529	$15,182,275	0.670827%	$89.11
0 - 2,724 kg	$7,712,975	$137,839	$2,982,726	$95,608	$10,929,147	0.482903%	$84.38
2,724 - 3,632 kg	$2,427,029	$43,373	$996,216	$28,785	$3,495,405	0.154444%	$100.60
3,632 - 4,540 kg	$301,235	$5,383	$187,065	$3,573	$497,257	0.021971%	$115.30
4,540 - 7,718 kg	$132,837	$2,374	$123,692	$1,563	$260,466	0.011509%	$145.53
7,718 - 10,896 kg	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
10,896 - 14,674 kg	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
Over 14,674 kg	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
Other 2 axle	$1,916,622	$372,166	$1,271,817	$31,282	$3,591,887	0.158707%	$172.80
0 - 2,724 kg	$19,946	$2,928	$4,913	$299	$28,086	0.001241%	$133.64
2,724 - 3,632 kg	$791,158	$116,158	$242,633	$11,877	$1,161,826	0.051335%	$139.37
3,632 - 4,540 kg	$102,865	$15,103	$47,727	$1,544	$167,239	0.007389%	$154.29
4,540 - 7,718 kg	$674,629	$99,049	$498,710	$10,128	$1,282,516	0.056668%	$180.42
7,718 - 10,896 kg	$264,731	$60,672	$275,832	$4,548	$605,783	0.026766%	$213.65
10,896 - 14,674 kg	$58,922	$72,852	$198,616	$2,685	$333,075	0.014717%	$295.19
Over 14,674 kg	$4,372	$5,405	$3,387	$199	$13,362	0.000590%	$159.62
3 or more axle	$306,707	$607,532	$560,541	$14,255	$1,489,036	0.065793%	$250.66
0 - 2,724 kg	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
2,724 - 3,632 kg	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
3,632 - 4,540 kg	$1,927	$2,276	$1,545	$55	$5,803	0.000256%	$173.37
4,540 - 7,718 kg	$73,829	$87,206	$94,306	$2,120	$257,461	0.011376%	$200.75
7,718 - 10,896 kg	$99,736	$117,808	$175,342	$2,864	$395,750	0.017486%	$228.42
10,896 - 14,674 kg	$82,140	$97,825	$221,442	$2,548	$403,956	0.017849%	$320.82
Over 14,674 kg	$49,076	$302,416	$67,906	$6,668	$426,067	0.018826%	$260.95

Table 3-5 continued
1993 State Highway User Tax and Fee Allocations

	State Gasoline Tax	State Diesel Tax	State Reg. Fee	State Oil Lub Tax	Total State	% of Total	Tax Per Vehicle
COMBINATION TRUCKS	$4,068,268	$187,625,509	$118,776,467	$3,678,932	$314,149,176	13.880645%	$2,390.66
Comm./Apport.	$3,954,231	$185,626,230	$116,626,368	$3,638,943	$309,845,772	13.690499%	$2,416.16
3 axle, Single Trailer	$407,229	$1,390,126	$1,354,987	$27,302	$3,179,644	0.140492%	$760.57
0 - 8,172 kg	$261,273	$883,953	$647,542	$17,328	$1,810,095	0.079979%	$670.72
8,172 - 16,344 kg	$132,971	$449,877	$613,064	$8,819	$1,204,731	0.053231%	$877.14
16,344 - 19,068 kg	$8,327	$36,103	$47,616	$741	$92,788	0.004100%	$1,334.96
19,068 - 28,148 kg	$4,658	$20,194	$46,765	$415	$72,031	0.003183%	$1,852.75
Over 28,148 kg	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
4 axle, Single Trailer	$494,754	$3,007,194	$3,328,783	$48,847	$6,879,577	0.303973%	$872.30
0 - 8,172 kg	$274,442	$1,267,440	$929,416	$19,427	$2,490,725	0.110052%	$643.02
8,172 - 16,344 kg	$209,629	$968,117	$1,320,640	$14,839	$2,513,225	0.111047%	$849.43
16,344 - 19,068 kg	$5,262	$180,085	$229,209	$3,281	$417,837	0.018462%	$1,248.85
19,068 - 28,148 kg	$4,974	$458,650	$710,490	$8,660	$1,182,774	0.052261%	$2,002.43
Over 28,148 kg	$447	$132,901	$139,028	$2,640	$275,017	0.012152%	$2,127.43
5 Axle, Single Trailer	$2,974,461	$162,278,110	$103,703,393	$3,177,465	$272,133,429	12.024184%	$2,517.00
0 - 8,172 kg	$1,240,414	$1,623,330	$630,570	$46,811	$3,541,126	0.156464%	$1,347.46
8,172 - 16,344 kg	$538,602	$21,685,080	$7,692,923	$427,713	$30,344,318	1.340760%	$1,760.63
16,344 - 19,068 kg	$109,831	$4,421,983	$2,407,696	$87,218	$7,026,729	0.310475%	$1,999.35
19,068 - 28,148 kg	$283,986	$21,703,190	$17,335,364	$423,796	$39,746,336	1.756187%	$2,757.90
Over 28,148 kg	$801,627	$112,844,526	$75,636,840	$2,191,926	$191,474,921	8.460297%	$2,722.56
6 or More Axle, Single Trailer	$77,787	$5,266,550	$2,905,404	$97,716	$8,347,458	0.368831%	$2,932.12
0 - 8,172 kg	$14,900	$5,905	$6,440	$230	$27,476	0.001214%	$1,023.66
8,172 - 16,344 kg	$15,422	$254,395	$107,110	$4,672	$381,598	0.016861%	$1,590.23
16,344 - 19,068 kg	$4,852	$80,036	$51,720	$1,470	$138,077	0.006101%	$1,828.95
19,068 - 28,148 kg	$15,269	$544,477	$439,124	$9,906	$1,008,776	0.044573%	$2,763.26
Over 28,148 kg	$27,344	$4,381,738	$2,301,011	$81,439	$6,791,531	0.300083%	$3,174.30
5 Axle, Twin Trailer	$0	$11,674,793	$4,433,558	$250,977	$16,359,328	0.722835%	$3,763.10
0 - 8,172 kg	$0	$119,653	$28,872	$1,875	$150,400	0.006645%	$1,249.91
8,172 - 16,344 kg	$0	$637,082	$165,436	$13,352	$815,871	0.036049%	$2,201.27
16,344 - 19,068 kg	$0	$236,449	$94,238	$4,956	$335,642	0.014830%	$2,439.99
19,068 - 28,148 kg	$0	$3,138,854	$1,374,614	$66,284	$4,579,752	0.202356%	$4,007.52
Over 28,148 kg	$0	$7,542,755	$2,770,398	$164,510	$10,477,662	0.462954%	$4,067.44
6 or More Axle, Twin Trailer	$0	$2,009,456	$900,244	$36,636	$2,946,336	0.130184%	$3,429.16
0 - 8,172 kg	$0	$19,338	$5,498	$256	$25,092	0.001109%	$1,095.10
8,172 - 16,344 kg	$0	$55,353	$17,049	$971	$73,374	0.003242%	$1,920.98
16,344 - 19,068 kg	$0	$44,752	$21,155	$785	$66,693	0.002947%	$2,159.69
19,068 - 28,148 kg	$0	$490,974	$296,761	$8,744	$796,479	0.035192%	$3,228.36
Over 28,148 kg	$0	$1,399,039	$559,780	$25,879	$1,984,698	0.087694%	$3,813.07

Table 3-5 continued
1993 State Highway User Tax and Fee Allocations

	State Gasoline Tax	State Diesel Tax	State Reg. Fee	State Oil Lub Tax	Total State	% of Total	Tax Per Vehicle
Farm Combinations	$114,037	$1,999,279	$2,150,099	$39,989	$4,303,404	0.190145%	$1,358.40
3 axle, Single Trailer	$5,017	$17,064	$29,835	$335	$52,251	0.002309%	$505.94
0 - 8,172 kg	$3,961	$13,402	$19,590	$263	$37,215	0.001644%	$454.78
8,172 - 16,344 kg	$962	$3,256	$8,915	$64	$13,197	0.000583%	$663.85
16,344 - 19,068 kg	$54	$234	$573	$5	$866	0.000038%	$959.96
19,068 - 28,148 kg	$40	$173	$757	$4	$973	0.00004301%	$1,464.25
Over 28,148 kg	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
4 axle, Single Trailer	$6,412	$34,972	$68,730	$556	$110,670	0.004890%	$568.03
0 - 8,172 kg	$4,636	$21,409	$31,327	$328	$57,701	0.002549%	$440.93
8,172 - 16,344 kg	$1,690	$7,806	$21,398	$120	$31,014	0.001370%	$650.00
16,344 - 19,068 kg	$38	$1,302	$3,072	$24	$4,436	0.000196%	$916.91
19,068 - 28,148 kg	$47	$4,369	$12,821	$82	$17,320	0.000765%	$1,539.09
Over 28,148 kg	$0	$86	$112	$2	$200	0.00000883%	$1,199.49
5 Axle, Single Trailer	$100,016	$1,752,891	$1,883,694	$35,213	$3,771,814	0.166657%	$1,412.17
0 - 8,172 kg	$71,495	$93,565	$72,522	$2,698	$240,280	0.010617%	$793.15
8,172 - 16,344 kg	$14,819	$596,621	$425,305	$11,768	$1,048,512	0.046328%	$1,105.60
16,344 - 19,068 kg	$2,709	$109,083	$110,108	$2,152	$224,051	0.009900%	$1,292.15
19,068 - 28,148 kg	$9,231	$705,453	$1,067,415	$13,775	$1,795,874	0.079350%	$1,916.83
Over 28,148 kg	$1,763	$248,170	$208,343	$4,821	$463,097	0.020462%	$1,497.06
6 or More Axle, Single Trailer	$2,592	$48,479	$56,094	$898	$108,063	0.004775%	$1,536.52
0 - 8,172 kg	$1,136	$450	$980	$18	$2,584	0.000114%	$631.25
8,172 - 16,344 kg	$561	$9,259	$7,833	$170	$17,823	0.000788%	$1,020.40
16,344 - 19,068 kg	$158	$2,612	$3,129	$48	$5,947	0.000263%	$1,206.95
19,068 - 28,148 kg	$657	$23,411	$35,768	$426	$60,261	0.002663%	$1,919.51
Over 28,148 kg	$80	$12,747	$8,384	$237	$21,448	0.000948%	$1,722.93
5 Axle, Twin Trailer	$0	$126,215	$92,452	$2,640	$221,307	0.009778%	$2,060.68
0 - 8,172 kg	$0	$5,847	$2,815	$92	$8,754	0.000387%	$744.37
8,172 - 16,344 kg	$0	$14,860	$7,754	$311	$22,926	0.001013%	$1,325.92
16,344 - 19,068 kg	$0	$4,945	$3,654	$104	$8,702	0.000385%	$1,512.47
19,068 - 28,148 kg	$0	$86,499	$71,759	$1,827	$160,085	0.007073%	$2,541.63
Over 28,148 kg	$0	$14,064	$6,470	$307	$20,840	0.000921%	$2,169.50
6 or More Axle, Twin Trailer	$0	$19,657	$19,295	$347	$39,299	0.001736%	$1,851.48
0 - 8,172 kg	$0	$962	$546	$13	$1,520	0.000067%	$666.97
8,172 - 16,344 kg	$0	$1,314	$813	$23	$2,151	0.000095%	$1,185.77
16,344 - 19,068 kg	$0	$953	$835	$17	$1,804	0.000080%	$1,372.33
19,068 - 28,148 kg	$0	$13,773	$15,770	$245	$29,788	0.001316%	$2,152.05
Over 28,148 kg	$0	$2,655	$1,331	$49	$4,035	0.000178%	$2,042.32
ALL VEHICLES	$1,258,835,124	$248,058,136	$736,500,234	$19,824,000	$2,263,217,494	100.000000%	$171.17

Table 3-6
Appropriation of Federal Motor Fuel Taxes*

Fuel	Highway Account		Mass Transit		Leaking Underground Storage Tank Fund		Deficit Reduction		Unspecified		Total	
	¢/liter	¢/gallon	¢/liter	¢/gallon	¢/liter	¢/gallon	¢/liter	¢/gallon	¢/liter	¢/gallon	¢/liter	¢/gallon
Gasoline	2.642	10.000	0.396	1.500	0.026	0.100	1.797	6.800			4.861	18.400
Diesel	4.227	16.000	0.396	1.500	0.026	0.100	1.797	6.800			6.446	24.400
LPG	2.642	10.000	0.396	1.500			1.797	6.800			4.835	18.300
Natural Gas**							1.136	4.300			1.136	4.300
Neat Alcohol:												
Ethanol from natural gas	0.832	3.150	0.396	1.500	0.026	0.100	1.598	6.050	0.159	0.600	3.012	11.400
Methanol from natual gas	0.991	3.750	0.396	1.500	0.026	0.100	1.598	6.050			3.012	11.400
Ethanol from other sources	1.057	4.000	0.396	1.500	0.013	0.050	1.797	6.800	0.159	0.600	3.421	12.950
Methanol from other sources	1.057	4.000	0.396	1.500	0.013	0.050	1.797	6.800			3.263	12.350
Gasohol:												
10% Ethanol	1.057	4.000	0.396	1.500	0.026	0.100	1.797	6.800	0.159	0.600	3.435	13.000
10% Methanol	1.057	4.000	0.396	1.500	0.026	0.100	1.797	6.800			3.276	12.400
7.7% Ethanol	1.543	5.842	0.396	1.500	0.026	0.100	1.797	6.800			3.763	14.242
7.7% Methanol	1.421	5.380	0.396	1.500	0.026	0.100	1.797	6.800			3.641	13.780
5.7% Ethanol	1.829	6.922	0.396	1.500	0.026	0.100	1.797	6.800			4.048	15.322
5.7% Methanol	1.738	6.580	0.396	1.500	0.026	0.100	1.797	6.800			3.958	14.980

* Tax rates are as of October 1, 1993.

** The tax on natural gas is 1.48¢ per cubic meter (48.54 cents per thousand cubic feet).

Source: Federal Highway Adminstration, Table FE-21, August 1994, photocopy.

Table 3-7
1993 Federal Highway User Tax and Fee Allocations

	Federal Gasoline Tax	Federal Diesel Tax	Federal Sales Tax	Federal Use Tax	Federal Tire Tax	Total Federal	% of Total	Tax Per Vehicle
PASSENGER CARS	$512,086,745	$5,788,285	$0	$0	$0	$517,875,030	42.321150%	$58.35
0-3 years old	$125,181,247	$117,646	$0	$0	$0	$125,298,893	10.239523%	$68.46
4-6 years old	$127,477,641	$141,256	$0	$0	$0	$127,618,897	10.429116%	$64.82
More than 6 years old	$254,580,149	$5,472,197	$0	$0	$0	$260,052,346	21.251680%	$51.88
Over 2,724 kg	$4,847,708	$57,186	$0	$0	$0	$4,904,894	0.400832%	$76.89
MOTORCYCLES	$851,413	$0	$0	$0	$0	$851,413	0.069578%	$5.92
BUSES	$1,169,693	$2,019,287	$5,557,315	$0	$161,321	$8,907,616	0.727937%	$140.64
2 Axle	$1,169,693	$439,112	$2,894,159	$0	$146,035	$4,648,999	0.379920%	$75.49
Transit	$0	$0	$0	$0	$0	$0	0.000000%	$0.00
Private	$1,169,693	$439,112	$2,894,159	$0	$146,035	$4,648,999	0.379920%	$541.21
School	$0	$0	$0	$0	$0	$0	0.000000%	$0.00
3 Axle	$0	$1,580,175	$2,663,156	$0	$15,286	$4,258,616	0.348017%	$2,430.72
SINGLE UNIT TRUCKS	$315,698,865	$40,494,952	$14,957,882	$1,923,385	$2,119,039	$375,194,124	30.661156%	$93.59
Commercial	$315,698,865	$40,494,952	$14,186,817	$1,881,080	$2,036,340	$374,298,055	30.587928%	$98.19
Pickup	$258,158,417	$6,769,152	$0	$0	$75,830	$265,003,400	21.656284%	$80.43
0 - 2,724 kg	$250,117,057	$6,558,301	$0	$0	$0	$256,675,358	20.975710%	$80.03
2,724 - 3,632 kg	$6,986,787	$183,200	$0	$0	$65,118	$7,235,105	0.591258%	$94.73
3,632 - 4,540 kg	$1,018,531	$26,707	$0	$0	$9,493	$1,054,730	0.086193%	$94.73
4,540 - 7,718 kg	$36,042	$945	$0	$0	$1,219	$38,206	0.003122%	$103.04
7,718 - 10,896 kg	$0	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
10,896 - 14,674 kg	$0	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
Over 14,674 kg	$0	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
Other 2 axle	$49,744,753	$11,219,542	$95,085	$14,608	$462,872	$61,536,860	5.028840%	$153.08
0 - 2,724 kg	$9,117,445	$1,964,072	$0	$0	$0	$11,081,517	0.905590%	$151.07
2,724 - 3,632 kg	$32,104,807	$6,915,991	$0	$0	$299,452	$39,320,250	3.213281%	$152.23
3,632 - 4,540 kg	$4,902,772	$1,056,151	$0	$0	$68,595	$6,027,517	0.492573%	$152.81
4,540 - 7,718 kg	$2,580,238	$555,833	$0	$0	$36,100	$3,172,171	0.259232%	$152.81
7,718 - 10,896 kg	$783,745	$263,546	$0	$0	$33,931	$1,081,222	0.088358%	$168.69
10,896 - 14,674 kg	$239,069	$433,693	$0	$0	$20,764	$693,526	0.056676%	$198.41
Over 14,674 kg	$16,679	$30,256	$95,085	$14,608	$4,030	$160,657	0.013129%	$658.81
3 or more axle	$7,795,695	$22,506,257	$14,091,732	$1,866,473	$1,497,638	$47,757,795	3.902804%	$415.70
0 - 2,724 kg	$0	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
2,724 - 3,632 kg	$0	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
3,632 - 4,540 kg	$601,640	$1,042,698	$0	$0	$21,717	$1,666,054	0.136151%	$208.78
4,540 - 7,718 kg	$1,849,829	$3,205,927	$0	$0	$153,019	$5,208,775	0.425665%	$212.30
7,718 - 10,896 kg	$1,934,349	$3,352,407	$0	$0	$160,011	$5,446,767	0.445114%	$212.30
10,896 - 14,674 kg	$2,183,296	$3,815,116	$0	$0	$201,381	$6,199,793	0.506652%	$242.61
Over 14,674 kg	$1,226,581	$11,090,109	$14,091,732	$1,866,473	$961,510	$29,236,405	2.389222%	$938.30
Farm	$0	$0	$771,064	$42,305	$82,699	$896,068	0.073227%	$4.55
Pickup	$0	$0	$0	$0	$19,594	$19,594	0.001601%	$0.12
0 - 2,724 kg	$0	$0	$0	$0	$0	$0	0.000000%	$0.00
2,724 - 3,632 kg	$0	$0	$0	$0	$14,813	$14,813	0.001211%	$0.43
3,632 - 4,540 kg	$0	$0	$0	$0	$1,839	$1,839	0.000150%	$0.43
4,540 - 7,718 kg	$0	$0	$0	$0	$2,942	$2,942	0.000240%	$1.64
7,718 - 10,896 kg	$0	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
10,896 - 14,674 kg	$0	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
Over 14,674 kg	$0	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
Other 2 axle	$0	$0	$32,641	$2,063	$23,504	$58,209	0.004757%	$2.80
0 - 2,724 kg	$0	$0	$0	$0	$0	$0	0.000000%	$0.00
2,724 - 3,632 kg	$0	$0	$0	$0	$4,832	$4,832	0.000395%	$0.58
3,632 - 4,540 kg	$0	$0	$0	$0	$942	$942	0.000077%	$0.87
4,540 - 7,718 kg	$0	$0	$0	$0	$6,181	$6,181	0.000505%	$0.87
7,718 - 10,896 kg	$0	$0	$0	$0	$7,505	$7,505	0.000613%	$2.65
10,896 - 14,674 kg	$0	$0	$0	$0	$3,351	$3,351	0.000274%	$2.97
Over 14,674 kg	$0	$0	$32,641	$2,063	$692	$35,396	0.002893%	$422.82
3 or more axle	$0	$0	$738,423	$40,242	$39,601	$818,266	0.066869%	$137.75
0 - 2,724 kg	$0	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
2,724 - 3,632 kg	$0	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
3,632 - 4,540 kg	$0	$0	$0	$0	$46	$46	0.000004%	$1.36
4,540 - 7,718 kg	$0	$0	$0	$0	$3,999	$3,999	0.000327%	$3.12
7,718 - 10,896 kg	$0	$0	$0	$0	$5,403	$5,403	0.000442%	$3.12
10,896 - 14,674 kg	$0	$0	$0	$0	$4,961	$4,961	0.000405%	$3.94
Over 14,674 kg	$0	$0	$738,423	$40,242	$25,192	$803,857	0.065692%	$492.33

Table 3-7 continued
1993 Federal Highway User Tax and Fee Allocations

	Federal Gasoline Tax	Federal Diesel Tax	Federal Sales Tax	Federal Use Tax	Federal Tire Tax	Total Federal	% of Total	Tax Per Vehicle
COMBINATION TRUCKS	$2,667,284	$183,715,476	$68,939,804	$45,097,615	$20,430,640	$320,850,818	26.220179%	$2,441.66
Comm./Apport.	$2,667,284	$183,715,476	$67,917,230	$44,902,130	$20,268,580	$319,470,701	26.107394%	$2,491.21
3 axle, Single Trailer	$274,692	$1,375,817	$36,085	$1,452	$70,032	$1,758,078	0.143671%	$420.53
0 - 8,172 kg	$176,239	$874,854	$0	$0	$25,937	$1,077,029	0.088016%	$399.09
8,172 - 16,344 kg	$89,694	$445,246	$0	$0	$37,662	$572,603	0.046794%	$416.90
16,344 - 19,068 kg	$5,617	$35,731	$23,141	$0	$3,046	$67,535	0.005519%	$971.64
19,068 - 28,148 kg	$3,142	$19,986	$12,944	$1,452	$3,387	$40,911	0.003343%	$1,052.30
Over 28,148 kg	$0	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
4 axle, Single Trailer	$333,731	$2,976,239	$520,559	$97,675	$142,245	$4,070,449	0.332640%	$516.12
0 - 8,172 kg	$185,122	$1,254,393	$0	$0	$44,403	$1,483,918	0.121267%	$383.10
8,172 - 16,344 kg	$141,403	$958,152	$0	$0	$33,917	$1,133,472	0.092628%	$383.10
16,344 - 19,068 kg	$3,549	$178,231	$107,741	$0	$6,108	$295,630	0.024159%	$883.59
19,068 - 28,148 kg	$3,355	$453,929	$320,796	$22,062	$43,396	$843,538	0.068935%	$1,428.11
Over 28,148 kg	$302	$131,533	$92,022	$75,613	$14,422	$313,892	0.025651%	$2,428.15
5 Axle, Single Trailer	$2,006,390	$160,607,691	$62,247,720	$41,674,839	$17,993,631	$284,530,273	23.252035%	$2,631.66
0 - 8,172 kg	$836,708	$1,606,620	$0	$0	$94,994	$2,538,322	0.207434%	$965.88
8,172 - 16,344 kg	$363,308	$21,461,863	$0	$0	$839,236	$22,664,407	1.852153%	$1,315.03
16,344 - 19,068 kg	$74,085	$4,376,465	$1,834,155	$0	$171,135	$6,455,841	0.527576%	$1,836.91
19,068 - 28,148 kg	$191,560	$21,479,787	$9,308,776	$538,284	$2,397,239	$33,915,647	2.771613%	$2,353.32
Over 28,148 kg	$540,729	$111,682,955	$51,104,789	$41,136,555	$14,491,027	$218,956,055	17.893259%	$3,113.31
6 or More Axle, Single Trailer	$52,471	$5,212,339	$1,840,427	$1,265,084	$530,006	$8,900,326	0.727342%	$3,126.32
0 - 8,172 kg	$10,051	$5,844	$0	$0	$703	$16,598	0.001356%	$618.40
8,172 - 16,344 kg	$10,403	$251,776	$0	$0	$11,065	$273,244	0.022330%	$1,138.69
16,344 - 19,068 kg	$3,273	$79,212	$43,860	$0	$3,481	$129,826	0.010609%	$1,719.66
19,068 - 28,148 kg	$10,300	$538,873	$242,588	$13,635	$26,891	$832,286	0.068015%	$2,279.82
Over 28,148 kg	$18,444	$4,336,634	$1,553,978	$1,251,449	$487,865	$7,648,371	0.625031%	$3,574.78
5 Axle, Twin Trailer	$0	$11,554,618	$2,710,915	$1,549,418	$1,348,957	$17,163,908	1.402648%	$3,948.17
0 - 8,172 kg	$0	$118,422	$0	$0	$4,692	$123,114	0.010061%	$1,023.14
8,172 - 16,344 kg	$0	$630,524	$0	$0	$26,505	$657,029	0.053693%	$1,772.71
16,344 - 19,068 kg	$0	$234,015	$73,295	$0	$9,837	$317,146	0.025917%	$2,305.53
19,068 - 28,148 kg	$0	$3,106,544	$714,260	$42,683	$371,586	$4,235,073	0.346093%	$3,705.91
Over 28,148 kg	$0	$7,465,113	$1,923,361	$1,506,734	$936,337	$11,831,545	0.966883%	$4,593.01
6 or More Axle, Twin Trailer	$0	$1,988,772	$561,524	$313,662	$183,709	$3,047,667	0.249058%	$3,547.09
0 - 8,172 kg	$0	$19,139	$0	$0	$784	$19,923	0.001628%	$869.49
8,172 - 16,344 kg	$0	$54,783	$0	$0	$2,301	$57,084	0.004665%	$1,494.50
16,344 - 19,068 kg	$0	$44,291	$18,310	$0	$1,860	$64,461	0.005268%	$2,087.42
19,068 - 28,148 kg	$0	$485,920	$164,878	$9,215	$23,738	$683,750	0.055877%	$2,771.43
Over 28,148 kg	$0	$1,384,638	$378,336	$304,447	$155,027	$2,222,450	0.181620%	$4,269.85

Table 3-7 continued
1993 Federal Highway User Tax and Fee Allocations

	Federal Gasoline Tax	Federal Diesel Tax	Federal Sales Tax	Federal Use Tax	Federal Tire Tax	Total Federal	% of Total	Tax Per Vehicle
Farm Combinations	$0	$0	$1,022,574	$195,484	$162,060	$1,380,117	0.112784%	$435.64
3 axle, Single Trailer	$0	$0	$522	$8	$715	$1,244	0.000102%	$12.04
0 - 8,172 kg	$0	$0	$0	$0	$393	$393	0.000032%	$4.81
8,172 - 16,344 kg	$0	$0	$0	$0	$273	$273	0.000022%	$13.71
16,344 - 19,068 kg	$0	$0	$300	$0	$20	$320	0.000026%	$354.85
19,068 - 28,148 kg	$0	$0	$221	$8	$29	$258	0.000021%	$388.03
Over 28,148 kg	$0	$0	$0	$0	$0	$0	0.000000%	#DIV/0!
4 axle, Single Trailer	$0	$0	$7,788	$221	$1,490	$9,500	0.000776%	$48.76
0 - 8,172 kg	$0	$0	$0	$0	$750	$750	0.000061%	$5.73
8,172 - 16,344 kg	$0	$0	$0	$0	$273	$273	0.000022%	$5.73
16,344 - 19,068 kg	$0	$0	$1,558	$0	$44	$1,602	0.000131%	$331.15
19,068 - 28,148 kg	$0	$0	$6,112	$130	$413	$6,655	0.000544%	$591.38
Over 28,148 kg	$0	$0	$119	$92	$9	$219	0.000018%	$1,317.17
5 Axle, Single Trailer	$0	$0	$920,428	$180,801	$142,577	$1,243,806	0.101645%	$465.68
0 - 8,172 kg	$0	$0	$0	$0	$5,475	$5,475	0.000447%	$18.07
8,172 - 16,344 kg	$0	$0	$0	$0	$23,090	$23,090	0.001887%	$24.35
16,344 - 19,068 kg	$0	$0	$90,491	$0	$4,222	$94,712	0.007740%	$546.23
19,068 - 28,148 kg	$0	$0	$605,156	$10,808	$77,921	$693,884	0.056705%	$740.62
Over 28,148 kg	$0	$0	$224,781	$169,993	$31,869	$426,644	0.034866%	$1,379.21
6 or More Axle, Single Trailer	$0	$0	$32,766	$7,203	$3,145	$43,114	0.003523%	$613.03
0 - 8,172 kg	$0	$0	$0	$0	$54	$54	0.000004%	$13.10
8,172 - 16,344 kg	$0	$0	$0	$0	$403	$403	0.000033%	$23.06
16,344 - 19,068 kg	$0	$0	$2,862	$0	$114	$2,976	0.000243%	$604.02
19,068 - 28,148 kg	$0	$0	$20,861	$362	$1,156	$22,380	0.001829%	$712.87
Over 28,148 kg	$0	$0	$9,042	$6,841	$1,419	$17,302	0.001414%	$1,389.87
5 Axle, Twin Trailer	$0	$0	$49,604	$6,005	$13,039	$68,649	0.005610%	$639.22
0 - 8,172 kg	$0	$0	$0	$0	$229	$229	0.000019%	$19.50
8,172 - 16,344 kg	$0	$0	$0	$0	$618	$618	0.000051%	$35.76
16,344 - 19,068 kg	$0	$0	$3,066	$0	$206	$3,271	0.000267%	$568.58
19,068 - 28,148 kg	$0	$0	$39,366	$727	$10,240	$50,333	0.004113%	$799.13
Over 28,148 kg	$0	$0	$7,172	$5,279	$1,746	$14,197	0.001160%	$1,477.93
6 or More Axle, Twin Trailer	$0	$0	$11,466	$1,245	$1,093	$13,805	0.001128%	$650.39
0 - 8,172 kg	$0	$0	$0	$0	$39	$39	0.000003%	$17.10
8,172 - 16,344 kg	$0	$0	$0	$0	$55	$55	0.000004%	$30.12
16,344 - 19,068 kg	$0	$0	$780	$0	$40	$819	0.000067%	$623.03
19,068 - 28,148 kg	$0	$0	$9,250	$160	$666	$10,076	0.000823%	$727.94
Over 28,148 kg	$0	$0	$1,436	$1,086	$294	$2,816	0.000230%	$1,425.33
ALL VEHICLES	$832,474,000	$232,018,000	$89,455,000	$47,021,000	$22,711,000	$1,223,679,000	100.000000%	$92.55

Table 3-8
1993 Total Highway User Tax and Fee Allocations

	Federal Revenues	State Revenues	Total State & Federal Rev	% of Total	Revenue Per Vehicle
PASSENGER CARS	$517,875,030	$1,179,695,732	$1,697,570,762	48.684289%	$191.28
0-3 years old	$125,298,893	$251,789,931	$377,088,823	10.814454%	$206.05
4-6 years old	$127,618,897	$277,129,708	$404,748,605	11.607703%	$205.59
More than 6 years old	$260,052,346	$639,954,395	$900,006,740	25.811111%	$179.57
Over 2,724 kg	$4,904,894	$10,821,699	$15,726,593	0.451020%	$246.53
MOTORCYCLES	$851,413	$5,541,792	$6,393,204	0.183349%	$44.47
BUSES	$8,907,616	$14,475,105	$23,382,721	0.670588%	$369.18
2 Axle	$4,648,999	$12,101,151	$16,750,151	0.480374%	$271.98
Transit	$0	$9,150,134	$9,150,134	0.262415%	$1,728.07
Private	$4,648,999	$2,844,760	$7,493,759	0.214912%	$872.38
School	$0	$106,258	$106,258	0.003047%	$2.23
3 Axle	$4,258,616	$2,373,954	$6,632,570	0.190214%	$3,785.71
SINGLE UNIT TRUCKS	$375,194,124	$749,355,689	$1,124,549,813	32.250737%	$280.51
Commercial	$374,298,055	$729,092,491	$1,103,390,546	31.643915%	$289.46
Pickup	$265,003,400	$556,209,995	$821,213,394	23.551413%	$249.23
0 - 2,724 kg	$256,675,358	$538,286,632	$794,961,990	22.798554%	$247.87
2,724 - 3,632 kg	$7,235,105	$15,279,226	$22,514,331	0.645684%	$294.80
3,632 - 4,540 kg	$1,054,730	$2,536,309	$3,591,040	0.102987%	$322.54
4,540 - 7,718 kg	$38,206	$107,827	$146,033	0.004188%	$393.85
7,718 - 10,896 kg	$0	$0	$0	0.000000%	#DIV/0!
10,896 - 14,674 kg	$0	$0	$0	0.000000%	#DIV/0!
Over 14,674 kg	$0	$0	$0	0.000000%	#DIV/0!
Other 2 axle	$61,536,860	$115,726,690	$177,263,550	5.083706%	$440.95
0 - 2,724 kg	$11,081,517	$19,537,634	$30,619,152	0.878120%	$417.42
2,724 - 3,632 kg	$39,320,250	$71,698,062	$111,018,312	3.183872%	$429.81
3,632 - 4,540 kg	$6,027,517	$12,060,102	$18,087,619	0.518731%	$458.55
4,540 - 7,718 kg	$3,172,171	$7,485,332	$10,657,503	0.305644%	$513.39
7,718 - 10,896 kg	$1,081,222	$2,719,536	$3,800,758	0.109001%	$593.00
10,896 - 14,674 kg	$693,526	$2,150,978	$2,844,505	0.081577%	$813.77
Over 14,674 kg	$160,657	$75,045	$235,703	0.006760%	$966.55
3 or more axle	$47,757,795	$57,155,807	$104,913,602	3.008796%	$913.21
0 - 2,724 kg	$0	$0	$0	0.000000%	#DIV/0!
2,724 - 3,632 kg	$0	$0	$0	0.000000%	#DIV/0!
3,632 - 4,540 kg	$1,666,054	$2,743,156	$4,409,210	0.126451%	$552.55
4,540 - 7,718 kg	$5,208,775	$9,844,402	$15,053,177	0.431707%	$613.54
7,718 - 10,896 kg	$5,446,767	$11,641,104	$17,087,870	0.490060%	$666.04
10,896 - 14,674 kg	$6,199,793	$17,033,975	$23,233,768	0.666317%	$909.20
Over 14,674 kg	$29,236,405	$15,893,171	$45,129,577	1.294262%	$1,448.36
Farm	$896,068	$20,263,198	$21,159,266	0.606822%	$107.35
Pickup	$19,594	$15,182,275	$15,201,869	0.435971%	$89.22
0 - 2,724 kg	$0	$10,929,147	$10,929,147	0.313435%	$84.38
2,724 - 3,632 kg	$14,813	$3,495,405	$3,510,217	0.100669%	$101.02
3,632 - 4,540 kg	$1,839	$497,257	$499,095	0.014313%	$115.73
4,540 - 7,718 kg	$2,942	$260,466	$263,408	0.007554%	$147.17
7,718 - 10,896 kg	$0	$0	$0	0.000000%	#DIV/0!
10,896 - 14,674 kg	$0	$0	$0	0.000000%	#DIV/0!
Over 14,674 kg	$0	$0	$0	0.000000%	#DIV/0!
Other 2 axle	$58,209	$3,591,887	$3,650,096	0.104680%	$175.60
0 - 2,724 kg	$0	$28,086	$28,086	0.000805%	$133.64
2,724 - 3,632 kg	$4,832	$1,161,826	$1,166,659	0.033458%	$139.95
3,632 - 4,540 kg	$942	$167,239	$168,182	0.004823%	$155.16
4,540 - 7,718 kg	$6,181	$1,282,516	$1,288,697	0.036958%	$181.29
7,718 - 10,896 kg	$7,505	$605,783	$613,288	0.017588%	$216.29
10,896 - 14,674 kg	$3,351	$333,075	$336,426	0.009648%	$298.16
Over 14,674 kg	$35,396	$13,362	$48,759	0.001398%	$582.45
3 or more axle	$818,266	$1,489,036	$2,307,302	0.066171%	$388.41
0 - 2,724 kg	$0	$0	$0	0.000000%	#DIV/0!
2,724 - 3,632 kg	$0	$0	$0	0.000000%	#DIV/0!
3,632 - 4,540 kg	$46	$5,803	$5,849	0.000168%	$174.73
4,540 - 7,718 kg	$3,999	$257,461	$261,460	0.007498%	$203.87
7,718 - 10,896 kg	$5,403	$395,750	$401,153	0.011505%	$231.54
10,896 - 14,674 kg	$4,961	$403,956	$408,917	0.011727%	$324.76
Over 14,674 kg	$803,857	$426,067	$1,229,924	0.035273%	$753.27

Table 3-8 continued
1993 Total Highway User Tax and Fee Allocations

	Federal Revenues	State Revenues	Total State & Federal Rev	% of Total	Revenue Per Vehicle
COMBINATION TRUCKS	$320,850,818	$314,149,176	$634,999,994	18.211037%	$4,832.31
Comm./Apport.	$319,470,701	$309,845,772	$629,316,472	18.048040%	$4,907.37
3 axle, Single Trailer	$1,758,078	$3,179,644	$4,937,722	0.141608%	$1,181.11
0 - 8,172 kg	$1,077,029	$1,810,095	$2,887,124	0.082799%	$1,069.81
8,172 - 16,344 kg	$572,603	$1,204,731	$1,777,334	0.050972%	$1,294.03
16,344 - 19,068 kg	$67,535	$92,788	$160,322	0.004598%	$2,306.61
19,068 - 28,148 kg	$40,911	$72,031	$112,942	0.003239%	$2,905.04
Over 28,148 kg	$0	$0	$0	0.000000%	#DIV/0!
4 axle, Single Trailer	$4,070,449	$6,879,577	$10,950,026	0.314034%	$1,388.42
0 - 8,172 kg	$1,483,918	$2,490,725	$3,974,643	0.113988%	$1,026.12
8,172 - 16,344 kg	$1,133,472	$2,513,225	$3,646,697	0.104583%	$1,232.53
16,344 - 19,068 kg	$295,630	$417,837	$713,466	0.020461%	$2,132.45
19,068 - 28,148 kg	$843,538	$1,182,774	$2,026,312	0.058112%	$3,430.54
Over 28,148 kg	$313,892	$275,017	$588,909	0.016889%	$4,555.58
5 Axle, Single Trailer	$284,530,273	$272,133,429	$556,663,702	15.964446%	$5,148.65
0 - 8,172 kg	$2,538,322	$3,541,126	$6,079,448	0.174351%	$2,313.34
8,172 - 16,344 kg	$22,664,407	$30,344,318	$53,008,725	1.520227%	$3,075.66
16,344 - 19,068 kg	$6,455,841	$7,026,729	$13,482,570	0.386664%	$3,836.26
19,068 - 28,148 kg	$33,915,647	$39,746,336	$73,661,983	2.112537%	$5,111.22
Over 28,148 kg	$218,956,055	$191,474,921	$410,430,976	11.770667%	$5,835.86
6 or More Axle, Single Trailer	$8,900,326	$8,347,458	$17,247,784	0.494646%	$6,058.43
0 - 8,172 kg	$16,598	$27,476	$44,074	0.001264%	$1,642.06
8,172 - 16,344 kg	$273,244	$381,598	$654,842	0.018780%	$2,728.92
16,344 - 19,068 kg	$129,826	$138,077	$267,903	0.007683%	$3,548.61
19,068 - 28,148 kg	$832,286	$1,008,776	$1,841,062	0.052799%	$5,043.08
Over 28,148 kg	$7,648,371	$6,791,531	$14,439,902	0.414119%	$6,749.07
5 Axle, Twin Trailer	$17,163,908	$16,359,328	$33,523,236	0.961406%	$7,711.27
0 - 8,172 kg	$123,114	$150,400	$273,515	0.007844%	$2,273.05
8,172 - 16,344 kg	$657,029	$815,871	$1,472,900	0.042241%	$3,973.98
16,344 - 19,068 kg	$317,146	$335,642	$652,789	0.018721%	$4,745.51
19,068 - 28,148 kg	$4,235,073	$4,579,752	$8,814,825	0.252799%	$7,713.42
Over 28,148 kg	$11,831,545	$10,477,662	$22,309,207	0.639801%	$8,660.45
6 or More Axle, Twin Trailer	$3,047,667	$2,946,336	$5,994,003	0.171901%	$6,976.25
0 - 8,172 kg	$19,923	$25,092	$45,014	0.001291%	$1,964.59
8,172 - 16,344 kg	$57,084	$73,374	$130,457	0.003741%	$3,415.48
16,344 - 19,068 kg	$64,461	$66,693	$131,153	0.003761%	$4,247.11
19,068 - 28,148 kg	$683,750	$796,479	$1,480,230	0.042451%	$5,999.79
Over 28,148 kg	$2,222,450	$1,984,698	$4,207,148	0.120656%	$8,082.92

Table 3-8 continued
1993 Total Highway User Tax and Fee Allocations

	Federal Revenues	State Revenues	Total State & Federal Rev	% of Total	Revenue Per Vehicle
Farm Combinations	$1,380,117	$4,303,404	$5,683,521	0.162997%	$1,794.04
3 axle, Single Trailer	$1,244	$52,251	$53,495	0.001534%	$517.98
0 - 8,172 kg	$393	$37,215	$37,608	0.001079%	$459.59
8,172 - 16,344 kg	$273	$13,197	$13,470	0.000386%	$677.56
16,344 - 19,068 kg	$320	$866	$1,186	0.000034%	$1,314.81
19,068 - 28,148 kg	$258	$973	$1,231	0.000035%	$1,852.28
Over 28,148 kg	$0	$0	$0	0.000000%	#DIV/0!
4 axle, Single Trailer	$9,500	$110,670	$120,170	0.003446%	$616.79
0 - 8,172 kg	$750	$57,701	$58,451	0.001676%	$446.66
8,172 - 16,344 kg	$273	$31,014	$31,287	0.000897%	$655.73
16,344 - 19,068 kg	$1,602	$4,436	$6,038	0.000173%	$1,248.06
19,068 - 28,148 kg	$6,655	$17,320	$23,975	0.000688%	$2,130.47
Over 28,148 kg	$219	$200	$419	0.0000120%	$2,516.66
5 Axle, Single Trailer	$1,243,806	$3,771,814	$5,015,620	0.143842%	$1,877.85
0 - 8,172 kg	$5,475	$240,280	$245,755	0.007048%	$811.23
8,172 - 16,344 kg	$23,090	$1,048,512	$1,071,602	0.030732%	$1,129.95
16,344 - 19,068 kg	$94,712	$224,051	$318,764	0.009142%	$1,838.38
19,068 - 28,148 kg	$693,884	$1,795,874	$2,489,758	0.071403%	$2,657.44
Over 28,148 kg	$426,644	$463,097	$889,741	0.025517%	$2,876.27
6 or More Axle, Single Trailer	$43,114	$108,063	$151,177	0.004336%	$2,149.55
0 - 8,172 kg	$54	$2,584	$2,637	0.000076%	$644.35
8,172 - 16,344 kg	$403	$17,823	$18,226	0.000523%	$1,043.45
16,344 - 19,068 kg	$2,976	$5,947	$8,923	0.000256%	$1,810.98
19,068 - 28,148 kg	$22,380	$60,261	$82,641	0.002370%	$2,632.37
Over 28,148 kg	$17,302	$21,448	$38,750	0.001111%	$3,112.79
5 Axle, Twin Trailer	$68,649	$221,307	$289,956	0.008316%	$2,699.90
0 - 8,172 kg	$229	$8,754	$8,983	0.000258%	$763.87
8,172 - 16,344 kg	$618	$22,926	$23,544	0.000675%	$1,361.67
16,344 - 19,068 kg	$3,271	$8,702	$11,974	0.000343%	$2,081.05
19,068 - 28,148 kg	$50,333	$160,085	$210,418	0.006035%	$3,340.76
Over 28,148 kg	$14,197	$20,840	$35,037	0.001005%	$3,647.43
6 or More Axle, Twin Trailer	$13,805	$39,299	$53,104	0.001523%	$2,501.86
0 - 8,172 kg	$39	$1,520	$1,559	0.000045%	$684.08
8,172 - 16,344 kg	$55	$2,151	$2,205	0.000063%	$1,215.89
16,344 - 19,068 kg	$819	$1,804	$2,624	0.000075%	$1,995.36
19,068 - 28,148 kg	$10,076	$29,788	$39,864	0.001143%	$2,879.99
Over 28,148 kg	$2,816	$4,035	$6,851	0.000196%	$3,467.65
ALL VEHICLES	$1,223,679,000	$2,263,217,494	$3,486,896,494	100.000000%	$263.71

SECTION 4. COST ANALYSIS

OVERVIEW

Analysis of highway costs, a critical element in user cost responsibility studies, endeavors to answer two basic questions: 1) What level of funding is needed to develop and support a highway system during a specified planning horizon? and 2) What fraction of the total cost should be charged to the vehicles operating on the system? The former question is addressed by identifying and applying procedures to estimate the cost of constructing and maintaining the highway system and is termed cost estimation. The latter question is addressed by cost allocation methodologies, typically incremental or consumption methods. The purpose of the allocation methodologies is to allocate the estimated costs to the various vehicle groups operating on the system.

The Texas method of assigning costs to vehicle classes is unique in two respects. First, it eliminates the theoretical inconsistencies of the traditional Incremental Method, in which outcomes are dependent on the sequence of vehicle class introduction, and it obviates the fairness questions introduced by Proportional methods. Second, the Texas method does not take a line-item by line-item approach in allocating costs, but uses a game-theory approach. With the use of Texas Transportation Institute (TTI)-developed computer software, the evaluation of all highway cost combinations of 12 vehicle classes (i.e., 4,095 combinations) is possible, thereby allowing more precise determinations of joint and marginal vehicle class cost responsibilities.

COST RESPONSIBILITY RESULTS FOR THE YEARS 1993-1995

With the addition of the flexible pavement construction cost equation,[2] the Texas highway cost allocation study recognizes five categories of costs: 1) flexible pavement construction, 2) rigid pavement construction, 3) rehabilitation and maintenance, 4) common, and 5) bridge. The overall cost responsibility for each vehicle class is determined by multiplying these costs by the estimated percentages expended in these categories for the relevant year. Thus, the cost responsibility is the weighted-average percentage. These "weights" are derived from the SF series tables of Highway Statistics 1993. For 1993, these "weights" are:

[2] See Appendix A for a complete discussion of the flexible pavement construction cost equation.

Flexible construction costs	0.423
Rigid construction costs	0.097
Rehabilitation and maintenance costs	0.283
Common costs	0.152
Bridge costs	0.045

These weights are also used to calculate the 1994 and 1995 cost responsibility estimates.

Table 4-1 summarizes the cost responsibilities of the 12 vehicle classes for the years 1993 through 1995. For comparative purposes, the actual 1992 and forecast 1993 results are also included. Four vehicle group categories are depicted: passenger cars, buses, single-unit trucks, and combination trucks. The cost responsibility allocated to passenger cars decreased from 41.72 percent in 1992 to 38.22 percent in 1993. Likewise, it decreased for buses and single-unit trucks. Within the single-unit truck group, it decreased for pickup trucks (from 13.84 percent in 1992 to 12.42 percent in 1993), but increased for the other single-unit trucks (from 7.82 percent in 1992 to 8.44 percent in 1993). The largest increase occurred in the combination truck group, where cost responsibility increased from 34.47 percent to 39.22 percent for the same period. These shifts in cost responsibility can be attributed to three factors:

1. Load Equivalent Factors (LEFs) increased by an average of 9.5 percent for all non-passenger vehicles.

2. Manual count data indicate that combination vehicle traffic increased by 32 percent over 1992.

3. The current study utilizes a new flexible pavement construction cost component.

Forecasts were calculated using linear trend analysis. LEFs for each vehicle class were estimated by regression analysis to forecast vehicle weight trends. Traffic forecasts were also based on simple linear regression to forecast average daily traffic (ADT) trends. A total of 132 regressions were used to project ADT for each vehicle class operating in each climatic region and on each Texas highway system. The 1994 estimate and 1995 forecast both show higher levels of vehicle cost responsibility attributed to both single-unit trucks and combination trucks.

Table 4-2 presents a sensitivity analysis for 1993 representing various changes in the weighting factor. The shaded boxes denote vehicle class values that are the maximum for each weighting factor scenario, while bold numbers are the minimum values for each

scenario. As can be seen, passenger cars and pickup trucks have the highest cost responsibilities when flexible construction costs have the highest weights and rehabilitation and maintenance costs have the lowest weight. Note that under these conditions, minimal cost responsibilities occur for combination trucks. The reverse, high weights on rehabilitation and maintenance, low weights on construction, produces just the opposite effects on the vehicle classes: single-unit trucks, other than pickup trucks, and combination trucks experience their maximum cost responsibility, while passenger cars and pickup trucks experience their lowest cost responsibility. It is expected that future Texas Department of Transportation (TxDOT) expenditures will place more emphasis on rehabilitation and maintenance; therefore, higher cost responsibilities would be attributed to other single-unit trucks and combination trucks.

Table 4-1
Cost Responsibilities, 1992 - 1995

Vehicle Type	No Recognition of Flexible Pavement Construction Costs		Inclusion of Flexible Pavement Contruction Costs		
	Actual 1992	Forecast 1993	Actual 1993	Estimate 1994	Forecast 1995
PASSENGER CARS	41.72%	41.18%	38.22%	36.71%	38.10%
BUSES	2.14%	2.11%	1.69%	2.14%	2.17%
2 Axle	1.14%	1.14%	0.88%	1.11%	1.12%
3 Axle	1.00%	0.97%	0.81%	1.03%	1.05%
SINGLE UNIT TRUCKS	21.66%	22.28%	20.87%	18.20%	16.87%
Pickup & Panel	13.84%	13.87%	12.42%	9.96%	8.86%
Other 2 Axle	5.41%	5.88%	5.81%	5.61%	5.35%
3 or more Axle	2.41%	2.53%	2.63%	2.63%	2.65%
COMBINATIONS	34.47%	34.43%	39.22%	42.96%	42.86%
3 Axle, Single Trailer	1.46%	1.34%	1.24%	1.49%	1.52%
4 Axle, Single Trailer	2.40%	2.53%	2.33%	2.04%	1.79%
5 Axle, Single Trailer	26.06%	25.91%	31.47%	33.83%	33.55%
6 Axle, Single Trailer	1.49%	1.63%	1.36%	1.58%	1.83%
5 Axle, Twin Trailer	1.97%	1.97%	1.97%	2.86%	2.97%
6 Axle, Twin Trailer	1.10%	1.04%	0.84%	1.16%	1.20%
TOTAL	99.99%*	100.00%	100.00%	100.00%	100.00%

* Does not total 100% due to rounding.

Table 4-2
Cost Responsibility Sensitivity Analyses

	1993	Scenario											
	Results	1	2	3	4	5	6	7	8	9	10	11	12
COST CATEGORIES													
Flexible Pavement Construction Cost	42.3%	47%	37%	47%	42%	47%	42%	47%	42%	37%	42%	42%	42%
Rigid Pavement Construction Cost	9.7%	5%	15%	10%	15%	10%	15%	10%	15%	10%	5%	10%	10%
Rehabilitation and Maintenance Costs	28.3%	28%	28%	23%	23%	28%	28%	28%	28%	33%	33%	33%	33%
Common Costs	15.2%	15%	15%	15%	15%	10%	10%	15%	15%	15%	15%	10%	15%
Bridge Costs	4.5%	5%	5%	5%	5%	5%	5%	0%	0%	5%	5%	5%	0%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
ALLOCATED COSTS													
PASSENGER CAR	38.22%	38.52%	38.12%	40.64%	40.44%	37.43%	37.23%	38.28%	38.08%	36.00%	36.19%	**35.11%**	35.96%
BUSES	1.69%	1.67%	1.67%	1.42%	**1.42%**	1.68%	1.67%	1.66%	1.66%	1.92%	1.92%	1.92%	1.91%
2 Axle	0.88%	0.87%	0.87%	0.74%	**0.74%**	0.87%	0.87%	0.86%	0.86%	1.00%	1.00%	1.00%	0.99%
3 Axle	0.81%	0.80%	0.80%	**0.68%**	0.68%	0.81%	0.81%	0.80%	0.80%	0.92%	0.92%	0.93%	0.92%
SINGLE UNIT TRUCKS	20.87%	21.13%	20.61%	20.97%	20.70%	20.61%	**20.35%**	20.68%	20.42%	20.77%	21.03%	20.51%	20.58%
Pickup & Panel	12.42%	12.65%	12.23%	13.08%	12.87%	12.08%	11.87%	12.33%	12.12%	11.80%	12.02%	**11.44%**	11.70%
Other 2 Axle	5.81%	5.84%	5.77%	5.51%	**5.47%**	5.88%	5.84%	5.75%	5.71%	6.10%	6.13%	6.17%	6.05%
3 or more Axle	2.63%	2.64%	2.61%	2.38%	**2.37%**	2.65%	2.64%	2.60%	2.59%	2.86%	2.88%	2.89%	2.84%
COMBINATION TRUCKS	39.22%	38.68%	39.60%	**36.97%**	37.43%	40.29%	40.75%	39.37%	39.83%	41.32%	40.86%	42.46%	41.55%
3 Axle, Single Trailer	1.24%	1.24%	1.23%	1.08%	**1.08%**	1.24%	1.24%	1.23%	1.22%	1.38%	1.39%	1.39%	1.38%
4 Axle, Single Trailer	2.33%	2.33%	2.31%	2.08%	**2.07%**	2.35%	2.34%	2.30%	2.29%	2.56%	2.56%	2.58%	2.54%
5 Axle, Single Trailer	31.47%	31.00%	31.88%	**30.15%**	30.59%	32.49%	32.93%	31.69%	32.13%	32.73%	32.29%	33.78%	32.98%
6 Axle, Single Trailer	1.36%	1.36%	1.35%	1.18%	**1.17%**	1.37%	1.36%	1.34%	1.33%	1.53%	1.54%	1.54%	1.51%
5 Axle, Twin Trailer	1.97%	1.93%	1.99%	**1.78%**	1.81%	2.00%	2.03%	1.99%	2.02%	2.15%	2.12%	2.19%	2.17%
6 Axle, Twin Trailer	0.84%	0.83%	0.84%	**0.71%**	0.72%	0.84%	0.85%	0.84%	0.84%	0.96%	0.96%	0.97%	0.96%
TOTAL	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Note: shaded numbers represent maximum values, bold numbers represent minimum values.

SECTION 5. EQUITY ANALYSIS

OVERVIEW

As indicated in Section 1, one of the principal objectives of the Texas cost responsibility study is to determine whether classes of vehicles contribute equitably to the highway system. A revenue/cost ratio is used for this purpose and is defined as the ratio between revenue contributed by a vehicle to the cost responsibility associated with its operation. An equitable highway user fee structure requires that revenue contributions match cost responsibility. A revenue/cost ratio with a value greater than one indicates that a vehicle is contributing more dollars to the highway system than its assigned costs, and a ratio of less than one indicates that a vehicle is contributing less than its assigned costs. When this inequity occurs, it amounts to a subsidy from one vehicle class to another.

In order to develop a truly equitable taxing structure, the amount of revenue generated by each vehicle and its related highway cost responsibility should be known. However, given that efficiency is also an important objective of the highway system, this ideal becomes unrealistic. A more practical approach involves the grouping of similar vehicles. This approach does raise questions, however, with respect to both horizontal equity (within the same vehicle group) and vertical equity (between different vehicle groups). Although it is possible for a tax structure to provide equitable distribution of taxes among the various groups, there can be inequity within the vehicle group itself. This is particularly significant for vehicles in the same class with different weights.

The analysis of equity is performed at two levels: the state system with federal aid included and the state system without federal aid. From the user's perspective, this makes little difference; i.e., users are more concerned about the level of taxation and not the source. For example, few persons know what percentage of their fuel tax is state-levied versus federal-levied. From the state perspective, the separation of state and federal revenues is important. In addition to correcting for any inequities in the state tax structure, the state must also be sensitive to changes in federal tax rates. It is possible for state-generated user taxes and fees to be equitably distributed among the different vehicle groups. Inequity may occur in the federal tax rates, which are outside the domain of state policy. The development of state tax strategies to correct for inequity may be a frustrating process if the federal government alters or changes its taxes.

The analysis of funding for the state portion of the highway system provides useful information to state decision-makers. Analysis of user revenues is a very straightforward process, since highway user taxes are accounted for by separate legal entities. An analysis

of costs, however, is much more difficult. Separation of the federal-supported costs from state costs requires an assumption that may or may not be accurate. It is assumed that the construction and operation of the highway system would be identical under a state-only-funded strategy, an assumption that may not be entirely accurate. State decisions regarding the construction and operation of highways are influenced by the availability of federal aid. Federal highway aid is designed to meet national transportation priorities as reflected in the types of system assistance — primary, interstate, secondary, and urban. The removal of federal dollars from the cost/expenditure side of the cost/revenue allocation equation assumes the state would continue to support or develop the same highway system that is supported or designated by federal authorities. Assuming the state-funded portion of the highways reflects the state transportation policy, then an analysis of state revenues and costs is a valuable exercise for determining the level of support by various user classes.

EQUITY ANALYSIS – STATE FUNDS ONLY

Table 5-1 presents a summary of the revenue/cost equity ratios using state funds only. The automobile, as shown in the table, contributes nearly 37 percent more than it costs the highway system. Pickup trucks contribute more than twice their assigned cost responsibility, while other single-unit trucks contribute about 7 percent less than their assigned costs. Buses and combination trucks contribute significantly less than their assigned costs.

EQUITY ANALYSIS – COMBINED STATE AND FEDERAL FUNDS

When federal user taxes and fees are included in the analysis of equity, there are some important changes, as shown in Table 5-2. The ratios for automobiles and pickup trucks are adjusted downward from 1.370 to 1.278 and from 2.032 to 1.931, respectively. The ratio for other single-unit trucks increases from 0.931 to 0.979. The ratios for combination trucks and buses also increase from 0.354 to 0.464 and from 0.378 to 0.397, respectively. Federal user taxes and fees improve the equity ratios, i.e., move them towards a value of one, for the heavier vehicles.

CURRENT ESTIMATES/FORECASTS

In an effort to keep abreast with policy changes, estimates for 1994 and 1995 have been developed. Simple trend analysis is used to adjust vehicle descriptors and parameters.

Table 5-3 presents a summary of revenue/cost equity ratios for various periods. The estimates for 1994 and 1995 reverse the direction of the 1991-1993 trend. The reason for this change is that the trend analysis used to estimate the various transportation descriptor data are based on a longer period (mid-1980s to the present). This longer trend period reduced the impact of the growth experienced from 1992 to 1993. If the 1992-1993 trend continues, then the 1994 and 1995 figures will be closer to the 1993 figures.

SUMMARY

Based on the analysis of costs and revenues for Texas vehicles, and on various sensitivity tests, one can conclude that combination trucks and buses operating on Texas highways are not paying their fair share of highway costs.[3] These vehicles are being subsidized by lighter vehicles, principally pickup trucks and automobiles. These results have important implications for evaluating future changes in financing highway improvements. If equity is an important goal for financing highway improvements, then structural changes in the financing of highways will be necessary.

The highway cost allocation study is an important tool to assist policy-makers. The models developed by the Center for Transportation Research and the Texas Transportation Institute can be calibrated to evaluate a variety of scenarios in a timely manner.[4]

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[3] Buses are exempt from many of the user charges and fees. Previous analysis indicates that, accounting for exemptions, buses pay about 60 percent of their assigned costs (Research Report 1937-1F).

[4] See Appendix B for a discussion of the updating capability of the cost models.

Table 5-1
1993 Revenue/Cost Equity Analysis -- State Revenues

Vehicle Type	Number of Vehicles	% of Revenues	% of Costs	Rev/Cost Ratio	Revenue Per Vehicle
Passenger Car	9,018,478	52.37%	38.23%	1.370	$131
Pickups	3,465,394	25.25%	12.42%	2.032	$165
Buses	63,337	0.64%	1.69%	0.378	$229
2 Axle	61,585	0.53%	0.88%	0.607	$196
3 Axle	1,752	0.10%	0.81%	0.129	$1,355
Single Unit Trucks	543,614	7.86%	8.44%	0.931	$327
2 Axle	422,790	5.27%	5.81%	0.907	$282
3 or more Axle	120,824	2.59%	2.63%	0.985	$485
Combinations	131,407	13.88%	39.22%	0.354	$2,391
3 Axle	4,284	0.14%	1.24%	0.115	$754
4 Axle	8,082	0.31%	2.33%	0.133	$865
5 Axle	110,789	12.19%	31.48%	0.387	$2,490
6 Axle	2,917	0.37%	1.36%	0.275	$2,898
5 Axle Twin	4,455	0.73%	1.97%	0.372	$3,722
6 Axle Twin	880	0.13%	0.84%	0.157	$3,391
TOTAL	13,222,230	100.00%	100.00%	1.000	$171

Table 5-2
1993 Revenue/Cost Equity Analysis -- State and Federal Revenues

Vehicle Type	Number of Vehicles	% of Revenues	% of Costs	Rev/Cost Ratio	Revenue Per Vehicle
Passenger Car	9,018,478	48.87%	38.23%	1.278	$189
Pickups	3,465,394	23.99%	12.42%	1.931	$241
Buses	63,337	0.67%	1.69%	0.397	$369
2 Axle	61,585	0.48%	0.88%	0.546	$272
3 Axle	1,752	0.19%	0.81%	0.235	$3,786
Single Unit Trucks	543,614	8.26%	8.44%	0.979	$530
2 Axle	422,790	5.19%	5.81%	0.893	$428
3 or more Axle	120,824	3.07%	2.63%	1.169	$887
Combinations	131,407	18.21%	39.22%	0.464	$4,832
3 Axle	4,284	0.14%	1.24%	0.115	$1,165
4 Axle	8,082	0.32%	2.33%	0.136	$1,370
5 Axle	110,789	16.11%	31.48%	0.512	$5,070
6 Axle	2,917	0.50%	1.36%	0.367	$5,964
5 Axle Twin	4,455	0.97%	1.97%	0.492	$7,590
6 Axle Twin	880	0.17%	0.84%	0.206	$6,868
TOTAL	13,222,230	100.00%	100.00%	1.000	$264

Table 5-3
Revenue/Cost Equity Ratios, 1991 - 1995

Vehicle Class	1991 Actual	1992 Actual	1993 Preliminary	1994 Estimate	1995 Forecast
Passenger Car	1.217	1.192	1.278	1.207	1.180
Pickups	1.561	1.672	1.931	1.679	1.766
Buses	0.267	0.303	0.397	0.339	0.342
2 Axle	0.363	0.414	0.546	0.450	0.449
3 Axle	0.155	0.177	0.235	0.208	0.215
Single Unit Trucks	1.039	1.110	0.979	0.985	0.976
2 Axle	0.933	0.997	0.893	0.856	0.850
3 or more Axle	1.270	1.363	1.169	1.284	1.266
Combinations	0.534	0.516	0.464	0.522	0.528
3 Axle	0.098	0.092	0.115	0.097	0.095
4 Axle	0.155	0.126	0.136	0.104	0.102
5 Axle	0.628	0.613	0.512	0.626	0.641
6 Axle	0.268	0.198	0.367	0.258	0.252
5 Axle Twin	0.503	0.457	0.492	0.413	0.396
6 Axle Twin	0.231	0.170	0.206	0.135	0.128

SECTION 6. CONCLUSIONS

The principal goal of the Texas Highway Cost Responsibility Study is to determine whether vehicle users are paying their fair share of highway system costs. The costs of the highway system are typically assigned to vehicle operators in cost allocation studies. However, since both highway users and non-users benefit from the transportation road system, the allocation of highway costs can assume a larger audience. There are a variety of approaches for determining an appropriate level of highway cost responsibility for users and non-users. In practice, however, the distinction generally relates to the jurisdictional level of the system. The costs of constructing and maintaining the state's primary roads, arterials, and collectors, are generally the responsibility of users through registration fees, fuel taxes, vehicle excise taxes, tolls, and other user charges. Non-users are generally responsible for local roads supported through property taxes and other general revenue sources. A problem with including non-user costs in cost allocation is that it complicates the question of equity. The cost-occasioned approach to cost allocation (costs are assigned on the basis of system use) are considered appropriate for allocating highway facility costs to highway system users. Other approaches, particularly the benefit approach (costs are assigned on the basis of benefits received from the system) and the ability-to-pay approach (costs are assigned on the basis of need, merit, or ability to pay), may be more appropriate when attempting to allocate costs to non-users as well. Nearly all recent highway cost allocation studies use a cost-occasioned approach. This is the method used for the Texas study.

On the basis of the cost-occasioned approach, combination trucks and buses "consume" more of the highway system on a per-vehicle basis. This becomes a problem only if user taxes and fees are below the level of highway system costs. This is the case for Texas, where combination trucks pay 18.2 percent of the highway user taxes and fees but are responsible for 39.2 percent of the highway system costs. Automobiles, on the other hand, contribute nearly 48.9 percent of the state's user taxes and fees and are responsible for only 38.2 percent of the highway system costs. Likewise, pickup trucks account for 24.0 percent of highway user taxes and fees but are responsible for only 12.4 percent of the highway costs.

The Texas highway cost allocation study is an important tool for the state. It provides a basis for:

- examining the fairness of existing road user taxes,
- identifying subsidies between different vehicle groups,
- evaluating the impacts of various changes in highway user tax rates, and

- evaluating the efficiency of current road prices and highway system use.

Moreover, the federal government is beginning to organize the start of a new federal cost allocation study. The implications of the new federal study need to be explored.

The cost allocation study is also the first step in developing a program of cost recovery. This is particularly important given the adoption of the free trade agreement with Mexico and Canada and possible changes in vehicle size and weights. Without a highway cost recovery program, Texas infrastructure could deteriorate even more rapidly, undermining future economic growth. The cost allocation study provides the necessary information to begin a full, or systems, cost analysis of Texas transportation. A systems cost approach provides policy-makers with information to assist them in efficiently allocating limited state funds among the competing transportation needs.

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APPENDIX A. DEVELOPMENT OF A FLEXIBLE PAVEMENT COST EQUATION

Before the current study, the Modified Incremental Approach (MIA) used a pavement cost equation based on a rigid pavement design. Villareal (1988) explains this rationale:

> [The assumption] that the cost ratio between a light traffic stream and a heavy one under a rigid design is the same as that under a flexible design (p.8).

The validity of this assumption is questionable. Therefore, this study develops construction cost equations that relate Equivalent Single Axle Loads (ESALs) to the cost of constructing a flexible pavement and incorporates these equations in the MIA software.

The development of flexible cost equations is a five-step procedure as described in the following sections.

Step 1. Obtain Representative Costs of Flexible Base and Asphalt Concrete Pavement (ACP).

The Texas Department of Transportation (TxDOT) supplied twelve-month moving-average bid prices for the 1993 calendar year for specified districts representing each climatic region. Districts with the heaviest traffic in each climatic region served as the representative district. Table A-1 depicts flexible base and ACP costs in dollars per square meter (and dollars per square yard).

Step 2. Determine the Cost of Flexible Pavement Construction Associated with ESALs.

Predetermined levels of ESALs, along with the appropriate flexible base and ACP costs for each applicable climatic region and highway system, were input into the Flexible Pavement System (FPS) software to obtain construction cost per square meter. The FPS software is the product of research performed in Study 2-8-62-32, "A Systems Approach to the Flexible Pavement Design Problem" (Scrivener, 1968). The purpose of Study 2-8-62-32 was:

> ... to make available ... a recommended procedure for the design of flexible pavements that accounted for both physical and cost variables, and provided

> a [method] for making design decisions based on probable overall costs, rather than initial construction costs alone (p.1).

The FPS software designs minimum-cost flexible pavements for a given level of serviceability and a specified period of performance, typically twenty years. This software uses elastic layer theory and has default values for temperature and swelling clay properties of each district. It produces pavement designs that specify layer thickness, overlay period, initial construction costs per square meter, and overall costs per square meter.

Step 3. Develop Flexible Pavement Cost Equations.

Regression analysis was employed to determine flexible pavement cost equations for each applicable climatic region and highway system. Table A-2 presents regression equations for each representative region and highway system that relates dollars per square meter to ESALs. The regression equations that manifested the "best-fit" were of the form:

$$Y = a + b\sqrt{X} \qquad (1)$$

where

Y = dollars per square meter (dollars per square yard)
a, b = regression coefficients
X = total ESALs (in millions) experienced by the flexible pavement over a 20-year period

An R-square value of 1 indicates that the model perfectly explains the dependent variable under study, while a value of 0 indicates the regression model has absolutely no explanatory power. In this study, each of the equations explained over 94 percent of the total variation, as shown by the R-square values.

Step 4. Account for Costs Not Included in Bid Prices.

The bid prices obtained from TxDOT did not include mobilization costs, right-of-way costs, or excavation costs. Therefore, these costs were taken from the rigid cost equation and included in the final flexible cost equation.

Step 5. Incorporate the flexible cost equations in the MIA software.

The final flexible cost equations were incorporated in the MIA software, which uses the equations to estimate marginal and joint construction cost responsibilities associated with each vehicle class.

Table A-1
TxDOT 12-Month Moving Average Bid

Climatic Region	District	Flexible Base		ACP	
		($/sq. yard)	($/sq. meter)	($/sq. yard)	($/sq. meter)
A	10	11.81	14.12	30.13	36.04
A	12	10.58	12.65	32.69	39.10
B	6	9.55	11.42	15.91	19.03
B	24	12.36	14.78	18.64	22.29
C	15	9.46	11.31	12.20	14.59
C	21	8.92	10.67	15.38	18.39
D	2,18	28.16	33.68	53.63	64.14
D	14	9.17	10.97	14.14	16.91

Table A-2
Flexible Pavement Cost Equations

$$Y = a + b\sqrt{X}$$

Climatic Region	District	Highway System	*a*		*b*		R-square value (Goodness of Fit)
			($/sq. yard)	($/sq. meter)	($/sq. yard)	($/sq. meter)	
A	10	FM, SH	3.713	4.441	6.303	7.538	0.985
A	12	Rural IH	2.809	3.360	6.994	8.365	0.984
B	6	FM, SH	2.902	3.471	3.439	4.113	0.983
B	24	Rural IH	2.274	2.720	6.031	7.213	0.941
C	15	Rural IH	2.378	2.844	3.027	3.620	0.987
C	21	FM, SH	3.004	3.593	2.607	3.118	0.987
D	2,18	Rural IH	0.493	0.590	8.721	10.430	0.967
D	14	FM, SH	2.151	2.573	2.837	3.393	0.979

APPENDIX B. ENHANCING UPDATING CAPABILITY OF COST ANALYSIS

The objective of this task is to improve the highway cost allocation (HCA) procedure to respond to different scenario conditions and time constraints. This task includes:

A. Investigation of areas, such as information and data collection, in which time can be reduced;

B. Investigation of areas in which mechanization would be effective; and

C. The incorporation of time savings, if any, into the Texas HCA methodology.

INVESTIGATION OF AREAS AMENABLE TO TIME REDUCTION OR MECHANIZATION

The information needed to perform the cost analysis portion of the Texas Highway Cost Allocation Study involves four data bases: weigh-in-motion (WIM) data from the Texas Department of Transportation (TxDOT); manual count data from TxDOT; and Tables SF-12 (State Highway Agency Capital and Maintenance, Classified by Functional Systems) and SF-12A (State Highway Agency Capital Outlay, Classified by improvement area), both from the FHWA's *Highway Statistics* annual publication. Typically, TxDOT has WIM and Manual Count data for the prior year available by June 30 of the current year. This year was apparently an anomaly, and the data was not available until early August. However, prior year data from the Federal Highway Administration (FHWA) usually is not available until late September, and sometimes as late as mid-October. The following discusses the analysis of this task.

Figure B-1 depicts a Gannt Chart analysis of this activity. Items 1, 3, and 6 pertain to WIM data, Manual Count data, and the two Highway Statistics tables, respectively. Items 2, 4, 5, and 7 depict operations required to estimate vehicle class cost responsibilities.

The chart graphically shows that the information flow and timing most critical to developing timely HCA results concern the *Highway Statistics* data, whose arrival is not certain until mid-October.

The chart also depicts that Item 4, "Calculating and Forecasting," is the most likely candidate for mechanization activity, since it takes 6 days to complete.

ANALYSIS OF MECHANIZATION EFFORT AND EFFICIENCY

Consultation with the Texas Transportation Institute's (TTI) Software Development Initiative reveals that mechanization of this task would take 2 person-months at a cost of $6,000. This cost must be contrasted with the current cost of $400 to calculate and forecast average daily traffic (ADT).

In this case, the payback period is 13.5 years (i.e., $6,000/$400). On a benefit/cost basis, the mechanization of Item 4, Calculating and Forecasting, cannot be justified on economic grounds. According to Table B-1, the benefit/cost ratio of mechanizing this task is at most 0.89, indicating that the benefits of mechanization of this task do not cover the costs.

CONCLUSION

Even though there is no economic justification for the mechanization of the above task, the analysis does reveal that cost responsibilities for different scenarios can be supplied to TxDOT for presentation to the Texas State Legislature in a timely manner. Each different scenario would take approximately 4 hours to complete. Therefore, ten scenarios could be completed within one work week. Ten scenarios should be more than sufficient to cover a number of likely ADT and weight events experienced on Texas highways, and they could be generated well before the legislature convenes in January.

Item	Task	Information Source	Duration (days)	August 15	17	19	21	23	25	27	29	31	September 1-30	October 2	4	6	8
1	Obtain WIM data tape	TxDOT	7	X	X	X	X										
2	Calculate & Forecast LEFs		1					X									
3	Obtain Manual Count Data	TxDOT	7	X	X	X	X						No				
4	Calculate & Forecast ADT		6					X	X	X			Activity				
5	Calculate allocations		2								X						
6	Obtain Highway Statistics data	FHWA	3											X			
7	Determine final allocations		0.5												X		

Figure B-1
Gannt Chart of Cost Analysis Tasks

Table B-1
Benefit/Cost Analysis of Mechanization

[1]	[2]	[3]*	[4]	[5] = [3] ÷ [4]
Yearly Savings	Discount Rate	Total Benefits	Initial Cost	Benefit/Cost Ratio
$400	10.00%	$4,000	$6,000	0.67
$400	7.50%	$5,333	$6,000	0.89

* Total Benefits = Yearly Savings/Discount Rate

APPENDIX C. HIGHWAY COST ALLOCATION (HCA) DEVELOPMENTS IN OTHER STATES

ARIZONA DEPARTMENT OF TRANSPORTATION (DOT) 1993-97 PROJECTED COST RESPONSIBILITIES

Projection of vehicle class cost responsibilities for Arizona was performed by SYDEC, Inc. (1993) for the 1993-97 construction period based on past trends in traffic. The study looked at three cases. Case A was restricted to only revenues into and from the Arizona Highway Users Fund (HURF). Case B limited the analysis to all highway users' revenues and highway expenditures by all levels of government, exclusive of direct Federal funds earmarked for construction, while Case C considered all highway users' revenue collected by the State and all highway expenditures by the State from State sources.

For comparative purposes, the study employed two common methodologies: the Federal Recommended Approach and the Incremental Approach. However, the Federal Approach was the primary basis for conclusions and recommendations because it was believed to be more reflective of current highway research and design practices.

Cost responsibilities were assigned to 5 vehicle groups from the following basic cost categories: new pavements, pavement rehabilitation, new bridges, bridge replacement, bridge repair, grading for new facilities, preliminary and construction engineering, maintenance, and other costs depicted as common costs.

The projected cost responsibilities for the 5 major groups for the 1993-97 construction period were as follows (vehicle miles of travel [VMT] percentages in parentheses): automobile 51.6 percent (60.4 percent), pickup trucks 23.5 percent (31.1 percent), buses 0.6 percent (0.4 percent), single-unit trucks 5.2 percent (2.0 percent), and combination trucks 19.1 percent (6.1 percent).

KENTUCKY 1991 COST RESPONSIBILITIES

The Kentucky HCA was performed by the Kentucky Transportation Cabinet and the Kentucky Transportation Center (Deacon, 1992) for the base year FY 1991. Kentucky uses a mixed approach for cost allocation utilizing 17 vehicle classes. For capital expenditures, the following methods of allocation were used:

1. Relative VMT on each specific class of state-maintained highway for preliminary design and engineering, rights-of-way, and utilities;

2. Passenger car equivalent miles (PCE-miles) on each specific class of state-maintained highway for grading and drainage, and for new bridges; and,

3. Equivalent single-axle load miles (ESAL-miles) on each specific class of state-maintained highway for pavement and shoulder expenditures.

The allocation methods for maintenance and traffic service costs were:

1. 80 percent to all classes by relative axle-miles and 20 percent to 6 or more axle trucks for roadway maintenance;

2. Relative axle-miles for miscellaneous expenditures;

3. Relative VMT to all classes for traffic services, administration, and non-motor carrier enforcement;

4. PCE-miles on all state maintained structures; and,

5. Relative VMT to 6 or more axle trucks for motor carrier traffic enforcement.

The following cost responsibility percentages were estimated in the Kentucky HCA (VMT percentages in parentheses): cars 44.16 percent (62.22 percent), buses 1.34 percent (0.37 percent), pickup trucks//vans 20.40 percent (26.63 percent), light trucks 2.53 percent (1.77 percent), medium trucks 6.93 percent (1.89 percent), and heavy trucks 24.64 percent (7.12 percent).

OREGON 1993-95 COST RESPONSIBILITY PROJECTIONS

Oregon has conducted highway cost allocation studies since 1937. A prospective view is used when applying cost allocation: the expenditures to be allocated are those that are anticipated for a specific time period. For example, the 1990 Oregon cost allocation study (Merris, 1993) used expected 1991-93 expenditures, and the 1992 study relied on expenditure predictions for the years 1993-95. Also, the expenditures that are used in the study are funded from state road user revenue only.

The methodology used by the Oregon Department of Transportation (ODOT) is a cost-occasioned approach that employs the recommended Federal Incremental Method (also known as the minimum thickness method). In this method, the cost of constructing a basic facility is compared with the cost of constructing a full facility designed to carry the anticipated mix of traffic. All vehicle classes share in the cost of the basic facility based on

either VMT or PCE, but the additional cost is allocated to each vehicle class predicated on the number of relative ESALs contributed by each vehicle class.

There are two major groups of vehicles in the ODOT study: basic vehicles, which are vehicles that weigh less than or equal to 3,629 kg (8,000 lbs), and heavy vehicles that weigh more than 3,629 kg (8,000 lbs). Within the heavy vehicle grouping there are 50 vehicle classes; however, the basic vehicle group contains only one class.

In the 1992 Oregon cost allocation study, basic vehicles were responsible for 61.3 percent of the state highway costs, while heavy vehicles were responsible for the remaining 38.7 percent.

HCA COMPARISONS

Table C-1 compares the percent of cost responsibilities and VMT for the major vehicle groups under study in Arizona, Kentucky, and Texas. There is a wide variation among the three studies, even though there is a similarity in the distribution of vehicle group VMT. This variation is due primarily to the difference in methodology used in allocating vehicle class cost responsibility.

Table C-1
Cost Responsibility and VMT Comparison

Vehicle Group	1993-95 Arizona HCA		1991 Kentucky HCA		1993 Texas HCA	
	Cost Responsibility	VMT	Cost Responsibility	VMT	Cost Responsibility	VMT
Passenger Vehicles	75.1%	91.5%	64.6%	88.9%	50.6%	89.3%
Single Unit Trucks*	5.8%	2.4%	7.3%	3.0%	10.2%	3.9%
Combination Trucks	19.1%	6.1%	28.1%	8.1%	39.2%	6.8%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

* includes buses