FINANCING WATERWAY DEVELOPMENT: THE USER CHARGE DEBATE

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FINANCING WATERWAY DEVELOPMENT: THE USER CHARGE DEBATE

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PREFACE

The Congress is once again debating the issue of user charges for the network of inland waterways developed and operated by the federal government. This report examines a number of the issues that are central to this debate: a comparison of the federal waterway aid to assistance for the other forms of transportation; a review of the effectiveness of the existing waterway aid in achieving stated program goals; and estimates of the possible disruption caused by imposing user fees on a system that, for so long, has been free of charge.

Financing Waterway Development was written by Craig Roach of CBO's Natural Resources and Commerce Division under the general direction of Raymond C. Scheppach and Damian Kulash. Mary Richardson Boo edited the manuscript; Cheryl Miller typed it for publication. The report was prepared for the Senate Committee on Public Works and Environment and the Senate Committee on the Budget. A draft was made available to staff members of both Committees in the late spring. In accordance with CBO's mandate to provide objective and nonpartisan analysis, the paper contains no recommendations.

Alice M. Rivlin
Director

June 1977

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TABLES

The federal government builds, operates, and maintains a network of inland waterways that are used by barge operators to carry about 11 percent of domestic freight. There is general agreement that federal development and operation of waterways should continue, but there has been recurring debate in the Congress of how these activities should be financed. Currently, federal expenditures for waterways are financed from general revenues. A frequently proposed alternative would require waterway users to pay at least part of the federal costs. User fees could be paid through a fuel tax, a tonnage fee, or a similar mechanism.

In the 94th Congress, the debate on the authorization for a U.S. Army Corps of Engineers project near Alton, Illinois, rekindled interest in the issue of how to finance inland waterways. As a result, in this session of Congress the Senate Committee on Environment and Public Works reported a bill that combined authorization for a single-lock project at Alton with the establishment of a system of user fees (S. 790). The Carter Administration also supports user charge proposals. Finally, on June 22, 1977, the Senate approved an Alton/user charge package that was offered as an amendment to the Omnibus Rivers and Harbors bill.

Major Issues

Resolution of the question of waterway user charges requires examination of several key issues. The Congressional Budget Office (CBO) has analyzed the available studies, including two recent investigations of the likely impact of user charges on the barge industry. The major issues and the CBO findings include:

ISSUE: Do domestic waterway carriers now receive special treatment, particularly when compared with their competitors -- railroads, trucks and pipelines?

FINDING: Barge operators are the only domestic freight carriers who pay no part of the expense of building or maintaining their rights of way. Federal subsidies are equal to

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about 42 percent of all barge revenues, compared with 3 percent for railroads, 1 percent for trucking companies, and no subsidy at all for pipelines.

ISSUE: Would reducing the existing subsidy through introduction of user charges severely damage the financial position of waterway carriers?

FINDING: A unique aspect of this year's debate on waterway user charges is that, for the first time, detailed studies are available on the impact of user charges on barge companies. One study concludes that the barge industry would lose 10 percent of its current traffic to competitors if varying fees were charged for access to specific segments of a waterway according to the cost of operating and maintaining that segment. If fees were uniform for all segments, the study concludes that traffic losses could reach 12 to 15 percent. A second study estimates that the diversion of cargo would range from 7.1 percent to 9.5 percent. Both studies assume fee levels that would cover all costs of operation and maintenance but none of the costs of construction. Both studies also assume that railroads and other competing carriers would not raise their rates by amounts equal to the increases in barge rates.

The converse of these findings is, of course, that the waterway subsidy makes it possible for barge operators to hold rates at levels low enough to divert between 10 to 15 percent of cargo that might otherwise move by rail, truck, or pipeline.

ISSUE: Can the subsidy that gives barge operators a competitive edge over rail, truck, and pipeline be justified on such secondary grounds as energy efficiency or economic development?

FINDING: Opponents of waterway user charges argue that barge transportation should be encouraged by a subsidy because it is more energy-efficient than competitive methods of transportation. Relative energy use varies greatly in specific circumstances because of differences in size, speed, and type of shipments for barges, railroads, pipelines, and trucks. When reasonable estimates vary so widely one can only conclude that blanket statements on energy efficiency are unwarranted. In 11 reports surveyed by CBO, estimates of energy use for domestic water transportation generally fall in the range of 500 to 700 BTUs per ton-mile (the movement of one ton of freight a distance of one mile) while the usual range for rail freight

was 300 to 700 BTUs and 400 to 500 BTUs for oil pipelines. Estimated fuel use by truck transport is significantly greater than that for other modes.

Opponents of user charges also argue that subsidized barge transportation serves as a magnet for industrial location and therefore as a stimulus for economic development. A flaw in this argument is that the subsidized waterways are located along some 15,000 to 25,000 miles of waterside areas in both large and small, rich and poor communities and cannot precisely lure industry to areas most in need of economic development. At best, the subsidy can be viewed as providing a locational advantage to all water-served areas. If areas are generally depressed, the subsidy could serve as a developmental tool by attracting industries from other sections of the country. Unless regional economic development is the goal, however, other policy tools such as business loans and public work grants are obviously more precise than a nationwide subsidy.

CHAPTER I. AN OVERVIEW OF THE WATERWAY INDUSTRY

INTRODUCTION

The federal government builds, operates, and maintains the waterways used for inland water transportation, financing these expenditures out of general revenues. Waterway user charges are frequently proposed as an alternative to total federal financing. User fees could be collected in the form of a fuel tax, a tonnage fee, or a similar mechanism.

There are three categories of domestic waterborne freight carriers: inland, intercoastal, and Great Lakes. 1/ Carriers in all of these categories benefit from federal expenditures, and all of them compete with landbased systems. The user charges considered in this paper, however, would apply only to inland freight carriers.

Recent Legislative Activity

Renewed interest in the issue of how to finance the federal role in inland waterways developed in the 94th Congress during debate on the authorization for a U.S. Army Corps of Engineers waterway construction project near Alton, Illinois. 2/ In the debate, the Alton authorization and a user charge proposal became legislatively linked, and the Senate Committee on Environment and Public Works reported an Alton authorization and user charge package introduced by Senator Domenici. The Carter administration has also signalled its support of the user charge principal. Finally, on June 22, 1977, the Senate approved an Alton/user charge package that was offered as an amendment to the Omnibus Rivers and Harbors Act.

1/ Intercoastal trade includes shipments on the ocean, along and between the U.S. coasts and to Hawaii and other noncontiguous ports of the U.S.

2/ For a detailed discussion of the Alton project, see Alton Locks and Dam: A Review of the Evidence, CBO Staff Working Paper, August 1976.

Table 1. COMMODITY COMPOSITION OF MISSISSIPPI RIVER SYSTEM TRAFFIC, 1972

Commodity	Ton-Miles (Millions)	Percent of Total
Coal	32,081	17.8
Crude Oil	19,823	11.0
Corn	19,903	11.0
Chemicals	17,858	9.9
Gasoline	13,280	7.4
Other Dry Bulks	11,157	6.2
Soybeans	8,625	4.8
Residual Oil	8,232	4.6
Iron and Steel	7,181	4.0
Salt	5,680	3.1
Distillate Fuel	5,241	2.9
Procesed Agricultural Goods	5,039	2.8
Fertilizer	3,829	2.1
Sand and Gravel	3,285	1.8
Phosphate Rock	1,929	1.1
All Other	17,451	9.6
Total	180,594	100.0

SOURCE: U.S. Department of Transportation, Modal Traffic Impacts of Waterway User Charges, Volume II, p. IX-2.

Structure of the Report

This chapter provides a brief overview of the inland barge industry. Chapter II discusses in detail the major issues involved in the user charge debate. Two major studies of the potential impact of user charges are analyzed in Chapter III. Chapter IV examines alternative methods for structuring a schedule of user charges.

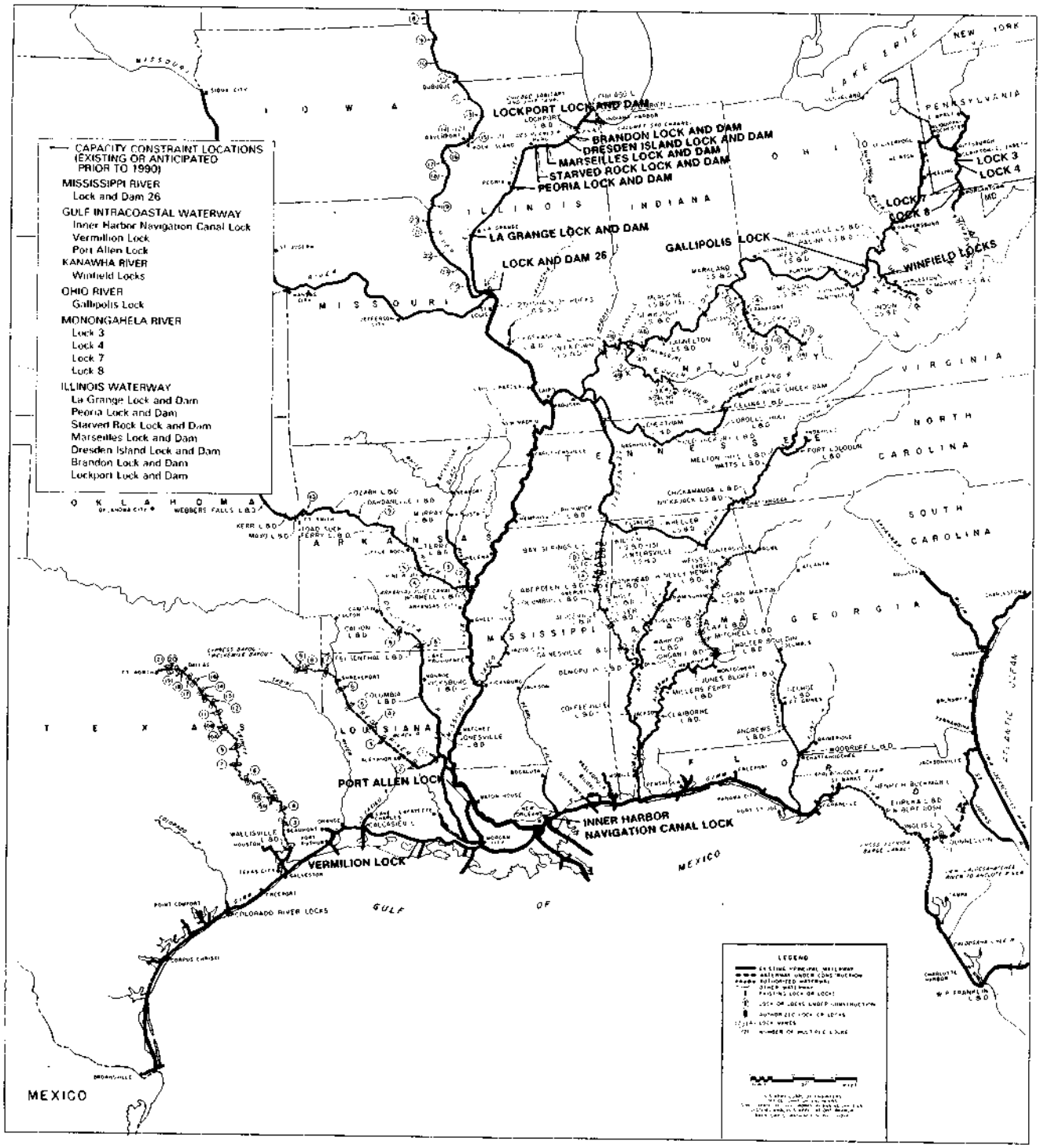
THE INLAND WATERWAY NETWORK

There are more than 15,000 miles of inland waterways in the United States that are at least nine feet deep--deep enough to accommodate most modern barges and towboats. In many cases, these waterways are navigable only because the federal government has invested billions of dollars over several decades in locks, dams, and dredging designed to raise water levels in rivers and channels. In addition to construction and maintenance performed by the Corps of Engineers, the federal government supports U.S. Coast Guard operations that install and maintain channel buoys and warning markers in hazardous areas. Barges and towboats move on this network free of charge.

Freight moves on inland rivers and canals in barges assembled into "tows" that are pushed or pulled by towboats. Barge transportation is one of the least expensive means of transporting bulk commodities in volume. Cargo usually moves more slowly by barge than it does by rail or truck, and barge cargo usually must be moved to and from docks by rail or truck. Coal, grain, and petroleum are the principal waterborne commodities. Commodity traffic statistics for the Mississippi River System are shown in Table 1.

Barge commerce has grown more than ten-fold since 1940, as shown in Table 2. The ability of the waterway network to absorb future increases is limited by the dimensions of dams and locks and by the depth and width of channels. The Corps of Engineers expects several capacity constraints to develop during the next decade, particularly on the largest waterway, the Mississippi River and its tributaries. Figure 1 shows the areas where demand for expanded facilities is expected -- areas that are now the focal point for the debate over methods of financing expansion of the system.

FIGURE 1. MISSISSIPPI RIVER AREAS WITH EXISTING OR ANTICIPATED CAPACITY CONSTRAINTS



SOURCE: U.S. Department of Transportation, National Transportation Trends and Choices, January 1977, p. 257.

Table 2. TRAFFIC ON THE INLAND WATERWAYS: SELECTED YEARS 1940-1974

Year	Millions of Tons	Billions of Ton-Miles
1940	183	22
1960	395	121
1970	554	204
1974	599	247

SOURCE: American Waterways Operators, Inc., 1974 Inland Waterborne Commerce Statistics (Arlington, Virginia).

Table 3. SHARE OF INTERCITY FREIGHT BY MODES: SELECTED YEARS 1940-1974; AS PERCENT OF TOTAL TON-MILES

Year	Rail	Truck	Oil Pipeline	Great Lakes	River & Canals	Air
1940	61.3	10.0	9.5	15.5	3.6	.02
1950	56.2	16.3	12.1	10.5	4.9	.03
1960	44.1	21.8	17.4	7.5	9.2	.07
1970	39.7	21.3	22.3	5.9	10.6	.17
1974	38.8	22.3	22.8	4.8	11.1	.18

SOURCE: Transportation Association of American, Transportation Facts and Trends July, 1976, Washington, D.C.

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STRUCTURE OF THE BARGE INDUSTRY

Most of the 1,850 barge companies in the United States are relatively small enterprises; in 1970, only 24 percent had more than nine vessels in their fleet. Some of these firms were closely affiliated, however, because they were divisions of a larger, central organization.

Financial information about barge companies is not readily available, and studies of the degree of competition and the levels of profit in the industry are based on very small samples. One study for the Maritime Administration, drawing on data from five regulated and eleven unregulated inland waterway carriers, suggests that barge companies are more profitable than railroads and as profitable as trucking. Another small sample of data, recently analyzed by the Department of Transportation (DOT) indicated a similar pattern. 3/ Because of the scarcity of data, however, such conclusions must be regarded as tentative.

Less than 10 percent of the nation's barge firms are regulated as common carriers, largely because the Transportation Act of 1940 exempted dry bulk cargoes from regulation. Another large share of barge traffic--liquid bulks carried in tankers--is also exempt. Table 4 shows the portion of each type of waterborne commodity that was regulated in 1973. Table 5 shows the number of firms that were regulated.

HISTORY OF FEDERAL POLICY

Eighteenth century laws prohibited waterway tolls, largely to discourage states from imposing restrictions on interstate commerce. Later laws against fees were designed to protect canal operators against railroad competition. Notable among the laws was the Rivers and Harbors Act of 1882, which prohibited tolls on federally-owned river improvements.

3/ A.T. Kearney, Inc., Domestic Waterborne Shipping Market Analysis, Executive Summary and the volume entitled "Financial Analysis of Inland Waterway Carriers." The sample firms showed net income equal on average to 6.6 percent of revenue. This compares to 3.9 percent for rail and 2.1 percent for trucks. Return on equity was 10.6 percent for water carriers, 12.9 percent for truck, and 2.7 percent for rail carriers. (Truck and rail data are for 1970).

Table 4. TOTAL TON-MILES OF WATERBORNE COMMODITIES AND PERCENT REGULATED BY INTERSTATE COMMERCE COMMISSION: 1973, IN BILLIONS

Commodity	Total Ton-Miles	Percent Regulated	Percent Exempt	Percent Private
Petroleum and Petroleum Products	46	(0.77) a/	(80.8)	(18.6)
Coal & Coke	31	(21.5)	(74.4)	(4.1)
Iron Ore & Iron and Steel	9	(80.7)	(18.8)	(0.5)
Sand, Gravel, Stone	4	(9.1)	(34.0)	(56.9)
Grains	29	(17.6)	(79.4)	(3.0)
Logs and Lumber	1	(11.8)	(66.3)	(21.9)
Chemicals and Related Products	22	(2.4)	(87.6)	(10.0)
Shells	2	(0.0)	(4.7)	(95.3)
Others	27	(23.6)	(69.8)	(6.6)
Totals	172	(15.8)	(72.9)	(11.3)

SOURCE: L. Shabman, User Charges For Inland Waterways, Virginia Water Resources Research Center (Blacksburgh, Virginia).

a/ Numbers in parentheses are percentages of total commodity carried by carrier type; unlike Table 2, ton-mile figures include only internal traffic where the entire movement takes place on inland waterways in shallow-draft vessels.

Table 5. DISTRIBUTION OF INLAND WATERWAY TRANSPORTATION FIRMS BY WHETHER SERVICE IS REGULATED BY THE INTERSTATE COMMERCE COMMISSION: 1970

Mississippi River System and the Gulf Intracoastal Waterway	
Regulated by the Interstate Commerce Commission	35
Exempt, for hire	764
Private	123
Total	922
Atlantic and Gulf Coasts	
Regulated by the Interstate Commerce Commission	55
Exempt, for hire	538
Private	68
Total	661
Pacific Coast a/	
Regulated by the Interstate Commerce Commission	51
Exempt, for hire	180
Private	35
Total	266

SOURCE: Dwight Blood, Inland Waterway Transport Policy in the U.S. Wyoming, February 1972.

a/ Excludes Hawaii

Federal policy for inland waterways, as expressed in the 1920 Transportation Act, was " ... to promote, encourage and develop water transportation service and facilities." In that same year the government established the Inland Waterways Corporation, which provided service on the Mississippi, Illinois, Missouri, and Warrior Rivers to demonstrate the feasibility of large-scale barge operations. Assets of the Corporation were sold to private users in 1953.

CHAPTER II. WATERWAY USER CHARGES: ISSUES FOR DEBATE

The executive branch of the federal government has been advocating waterway user charges since 1940, and the policy question before the Congress today is essentially the same as it was then: should operation of the inland waterways network continue to be financed out of general revenues or should waterway users be required to pay all or part of the program costs?

This chapter discusses the major issues that the Congress must address in making decisions on waterway financing. It compares methods of financing waterways with methods of financing other freight modes, examines the competitive position of barge firms under existing policies, and discusses the issue of subsidies for barge operators in the context of national goals other than transportation goals.

FINANCING FEDERAL TRANSPORTATION PROGRAMS

Waterway Freight

Three agencies--the Corps of Engineers, the Coast Guard, and the Maritime Administration--provide aid to inland waterway operators.

The Corps builds, operates and repairs some 255 locks and dams and dredges river channels to maintain rights-of-way for barges and twoboats. (The Corps also assists Great Lakes and intercoastal carriers by dredging harbors and screening out proposed projects that might obstruct navigation.) Table 6 shows a Corps estimate of its expenditures, none of which are reimbursed by direct charges on waterway users.

The Coast Guard is responsible for aids to navigation, such as buoys and warning markers in hazardous areas. It also promotes vessel safety programs and operates a search and rescue force; both programs are financed from general revenue.

The Maritime Administration guarantees loans for the purchase of ships to be used in any form of water transportation.

Railroad Freight

Federal assistance to the railroad industry is growing rapidly. Most of the federal funds that support freight operations go to ConRail, a public corporation that succeeded the Penn Central and five other bankrupt Eastern railroads. Between now and 1980, ConRail is scheduled to receive some $2.1 billion in federal funds in the form of investment in debentures and preferred stock, to be used for rehabilitation, maintenance, and capital. Unlike the emergency grants made to Eastern railroads before they declared bankruptcy, the financing schedule for ConRail stipulates that the money will be repaid if the company becomes profitable. Because repayment will be made at lower rates of interest than are available in the open market, there will be a net interest subsidy for ConRail.

In 1976 the Congress authorized $600 million in security purchases plus a $1 billion loan guarantee program through 1980 to help solvent railroads rehabilitate their systems. This money is also to be repaid, but like ConRail the private companies will benefit from a interest subsidy.

Under the 1976 legislation, $360 million in rail service continuation grants to states will also be available through 1980. 1/ This temporary grant program was designed to ease the transition for shippers as the rail network is "trimmed to an economically viable size." 2/ The grants can be used for continuation of rail service that would otherwise be abandoned, for acquisiton and/or rehabilitation of lines so that service can continue on sections that would have been abandoned, and for substitution of alternative modes of transportation.

Federal payments to the Railroad Retirement Fund represent another form of rail subsidy. These payments are an attempt to resolve the so-called dual benefit problem that arises when a railroad employee is eligible for retirement benefits under

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1/ The grants will be distributed to the states according to their share of the total eligible track mileage. The federal share of these grants will fall from 100 percent in 1976 to 70 percent in 1979.

2/ U.S. DOT, Study of Federal Aid to Rail Transportation (January 1977, Chapter VII).

Table 6. CORPS OF ENGINEERS NAVIGATION EXPENDITURES: FISCAL YEARS 1974-1976; IN MILLIONS OF CURRENT DOLLARS

	1974		1975		1976	
	O&M a/	Construction	O&M	Construction	O&M	Construction
Shallow Draft Inland and Intracoastal Waterways	136	257	137	282	146	240
Shallow Draft Harbors and Channels	17	12	13	9	17	11
Great Lakes Harbors	25	8	58	6	47	3
Deep Draft Harbors and Channels	105	34	124	39	134	43
Small Boat Harbors	11	--	7	1	8	--
Total	295	311	339	338	352	297

SOURCE: Corps of Engineers, Construction-Operations Division--Civil Works. This information was supplied by the Corps at CBO's request. Decisions on how to define each class and which expenditures to include were made by the Corps. It should be noted that construction expenditures include a portion of the costs of multi-purpose projects; the allocation is based on the Corps' experience with its official method of allocating the joint costs of such projects.

a/ Operations and Maintenance

both social security and Railroad Retirement. The social security benefit formula heavily favors persons with short periods of service, so persons acuiring eligibility under both systems generally receive a higher return for their payroll taxes; this happens because social security-covered employment is often supplementary to railroad employment. Under financial arrangements between these two federal retirement systems, Railroad Retirement has in the past paid the excess costs resulting from these higher returns. The higher return is now being phased out; during the phaseout period the costs will be financed by general fund appropriations. 3/ The annual payments will be at least $250 million through the year 2000. 4/

Highway Transportation

The federal government, through the Federal Highway Administration, assists in the development of highways through construction grants to states. Since 1956, dedicated or earmarked excise taxes paid by direct highway users have been used to finance expenditures for the biggest grant program, the Federal-aid Highway System that includes interstate highways. Highway expenditures represent by far the largest federal transportation program, but most of the program costs are financed by a gasoline tax--a form of user charge--so the resulting subsidy is small.

While highway users as a group pay the cost of federal highway programs, it is not clear whether each subgroup pays its full share. In 1969, DOT reported that large cargo-carrying trucks underpaid, although they generally paid more than 50 percent of the costs allocated to them. A 1975 DOT study, less detailed and less comprehensive than the 1969 study, concluded that all but the heaviest trucks actually overpay slightly, and that the heaviest trucks pay about 70 percent of their allocated

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3/ See Railroad Retirement Act of 1974, a Summary of its Provisions, Financing, Background (Office of Director of Research, U.S. Railroad Retirement Board, January, 1975).

4/ The Regional Rail Reorganization Act of 1973 also provides various benefits to protected employees adversely affected by the establishment of the Midwest and Northeast rail systems provided by that Act. Although these benefits have been small in recent years, they could total the $250 million now authorized.

costs. While these studies indicate that current highway user fees may not result in precise cost recovery, it is clear the users of highway freight transportation pay a large share of their federal right-of-way costs.

Other Modes

Since 1970, user charges in the form of taxes on tickets and fuel have been paid by passengers, airlines, and private pilots who use the federally assisted airport and airway system. In the first six years of the program, revenue from user fees was generally used only for facility and equipment costs. 5/ Starting in fiscal year 1977, a limited portion of operation and maintenance expenditures is also being financed with user fees.

Federal financial assistance to pipeline transportation is negligible. During World War II, the federal government financed some pipeline construction, but these lines were later sold to private industry and the federal investment recovered. 6/

IMPORTANCE OF SUBSIDIES TO EACH MODE

A common measure of net assistance to federal transportation programs is the amount of subsidy. As used here, a subsidy is a payment from general revenues of a cost of providing commercial transportation service. The subsidy is calculated by deducting user charges, earmarked excise taxes, or expected repayment of loans from aggregate expenditures.

Subsidies affect the transportation system by influencing freight rates. Where a subsidy exists, the taxpayers share the costs, and rates charged by a private carrier may not reflect the full transportation cost. Lower rates, in turn, influence a shipper's choice of transportation mode.

5/ Three programs were financed: airport grants, FAA's facility and equipment account, and FAA's research and development account.

6/ U.S. DOT, Study of Federal Aid to Rail Transportation (January 1977, Chapter III).

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The actual amount of a subsidy does not reflect its importance to each mode. A $1 million subsidy means much less to highway transportation, for which users spend hundreds of billions of dollars, than to waterway transportation, in which user expenditures are only about $1 billion. To illustrate this, Table 7 shows estimated subsidies as a percent of revenue collected by carriers or, in the case of private autos and aircraft, as a percent of operating costs plus equipment expenditures. 7/

As Table 7 shows, the federal subsidy to waterways is substantially more important to the industry than the subsidies received by waterways' closest competitors, railroads and pipelines. These statistics indicate that the waterway subsidy does, in fact, give inland water transportation a competitive advantage, although other modes also receive important subsidies from the federal government.

Appendix A presents some of the details behind the subsidy estimates in Table 7; others are presented in the footnotes to this table.

THE EFFECT OF THE INLAND WATERWAY SUBSIDY ON COMPETING MODES

One way to determine whether the waterway subsidy has affected competing modes is to estimate the impact of eliminating the subsidy by establishing user charges. Two recent studies indicate that about 10 percent of waterway traffic would switch to other modes if user fees were imposed to recover federal waterway operating costs, specifically Corps of Engineers and Coast Guard operations and maintenance costs. These studies are summarized in detail in Chapter IV.

One important assumtion underlying the studies was that competitors would not increase their rates in response to the higher barge rates that may result with user fees. If competitors were to key their rates to those of barge operators, relative rates would not change and shippers would be less likely to switch to competing modes.

7/ In Table 7, the total subsidy to domestic water transportation is compared to revenue collected for all domestic trade; then the Corps' shallow-draft inland subsidy is compared to only inland freight revenue.

TABLE 7. IMPORTANCE OF TRANSPORTATION SUBSIDIES: SUBSIDIES AS A PERCENT OF EXPENDITURES BY USERS; BY FISCAL YEARS

	1974	1975	1975
Air Transportation			
Air Carrier [a]	1	1	1
General Aviation [b]	12	13	14
Highway Transportation: [c]	--	--	1
Railroad Transportation:			
Passenger [d]	54	82	113
Freight [e]	1	2	3
Water Transportation			
International Freight [f]	8	10	11
- U.S. Flag Only	29	37	41
Domestic Freight [g]	21	22	21
- Inland Only	47	44	41
Mass Transportation [h]	49	54	73

[a] The subsidy includes a portion of Federal Aviation Administration's expenditures plus the subsidy to local service air carriers administered by the Civil Aeronautics Board. FAA expenditures and excise tax revenue were allocated between air carriers and general aviation on the basis of DOT's

(notes continued on page 16)

1973 cost allocation study. Air Carrier revenue data for 1974 is from U.S. DOT, Summary of National Transportation Statistics, June 1976 (hereafter, DOT-Statistics); 1975 revenue is from U.S. DOT, National Transportation Trends and Choices, January, 1977 (hereafter, DOT-Trends).

b/ Includes allocated FAA expenditures. General aviator expenditure data are from DOT-Statistics in 1974 and DOT-Trends in 1975.

c/ There was a negative subsidy in 1974 and 1975, since revenues exceeded expenditures.

d/ Includes grants to Amtrak as well as the principal of federally guaranteed loans. Revenue data are from American Association of Railroads, Yearbook of Railroad Facts, 1976.

e/ ConRail security purchases are not included; they were $309 million in fiscal year 1976. Revenue data source is same as in footnote d.

f/ Includes the various subsidies from the Maritime Administration plus a portion of Corps expenditures for deep draft channels and harbors. Revenue data are from discussions with the Bureau of Economic Analysis, U.S. Department of Commerce.

g/ Revenue data are from DOT-Statistics in 1974 and DOT-Trends in 1975.

h/ Includes the various subsidies from the Urban Mass Transportation Administration plus federal aid to Washington, D.C. subway. Revenue data are from American Public Transit Association, Transit Fact Book (1975-1976 edition).

SOURCE: The Use of Subsidies As a Federal Transportation Policy, Congressional Budget Office, Forthcoming in July, 1977.

JUSTIFICATIONS FOR THE CURRENT SUBSIDY

Inland waterway transportation is the only domestic intercity freight mode whose entire right-of-way is financed by general revenues. It is also the only domestic intercity freight mode that does not reimburse the federal government for at least part of the expenditures made on its behalf. Because the inland water transportation subsidy is so much larger relative to revenues than the subsidies of competing modes, the waterway subsidy has contributed to a loss of traffic and revenue for waterway competitors.

Traffic diversion by itself is, however, just one aspect of the policy issue. Subsidies to waterway operators could still be justified if they were effective measures for addressing energy conservation, regional development, or other non-transportation goals. As with any mode, barge transportation, subsidized or not, can have important effects such as the delivery of vital foods and fuels. Indeed, it is the importance of the goods carried that makes consumers willing to pay for the transportation service.

Waterway representatives argue that subsidized barge transportation contributes to the achievement of several national goals. Their most recent claims, examined in the following pages, raise two issues:

- Does waterway transportation serve national goals in ways that other modes cannot match?
- Are there more precise policy tools for achieving these goals?

Energy Use

Waterway interests argue that barges are a more fuel-efficient means of transportation than pipelines or railroads and that the waterway subsidy can be justified on grounds of energy conservation.

Generalizations on the relative energy efficiency of transportation modes are unwarranted. Energy use varies greatly among specific circumstances; any particular mode is rarely more energy-efficient in all cases. The results of some frequently cited energy-intensity studies are shown in Table 8. The esti-

mates vary because of differences in assumptions about such factors as the size, weight, and speed of trains, trucks, and barges. Other studies show that fuel use varies with the type of commodity carried, the grade of the railroad track, the speed of rail switching operations, the water conditions on particular rivers, the congestion at locks, and numerous other factors. Furthermore, complete comparisons of the total amount of fuel used are difficult to make since the estimates in Table 7 do not include fuel used in getting to and from such fixed facilities as rail, water, and pipeline terminals; access to these facilities involves a significant fraction of overall energy use.

The 11 reports summarized in Table 8 reveal at best a marginal fuel advantage for barge over rail. Estimates of barge energy use generally fall in the range of 500 to 700 BTUs per ton-mile; the estimates for rail are usually in the 300 to 700 BTU range, and for oil pipelines, 400 to 500 BTUs.

The fact that relative fuel efficiency varies greatly in specific circumstances implies that a nationwide waterway subsidy is not a precise energy policy tool. A subsidy encourages barge transportation everywhere in the country, whether or not it is the most energy-efficient mode.

There is an existing, more precise means by which shippers are attracted to the waterway when and where it is more fuel efficient than its competitors. Since fuel efficiency results in relatively lower costs, shippers are naturally diverted from less fuel-efficient forms of transportation. An alternative to the subsidy, therefore, is to allow higher fuel prices to attract shippers to fuel-efficient modes.

It should be noted that neither the subsidy nor the alternative policy will assure that the most fuel efficient mode will be used in each case. The freight rates are only one factor considered when a shipper chooses a mode, however, and fuel cost is only one of many factors that determine rates. In addition to fuel use, shippers and policymakers should obviously consider such factors as labor and capital costs, speed, dependability, and flexibility.

Furthermore, it should not be forgotten that a user charge in the form of a fuel tax would encourage fuel conservation in the barge industry. One study, reviewed in Chapter III, estimates a 12 percent reduction in barge fuel use if a fuel tax were imposed to recover federal operation and maintenance costs.

TABLE 8. ENERGY-INTENSITY ESTIMATES FOR INTERCITY FREIGHT MODES
BTUs PER TON-MILE

	Study										
	Hirst [a]	Mooz [a]	Batelle [a]	Rice [a]	Leilich [b]	Sebald [b]	Rebbie Assoc. [b]	Mascy [a]	St. Louis Corps [b]	Oakridge Labs [c]	U.S. DOT [d]
Domestic Waterway	680	500		578	500	785			649	1,404	479
Oil Pipeline	450	1,850		519						565	525
Railroad (Unit Train)	670	750	500	816 (330)	700 (330)	639-711 (226-359)	544	330-550	711	643	649
Truck	2,800	2,400	1,870							8,683	2,811

a/ All referenced in Charles Rivers Associates, Energy Impact of Federal Capital Grant Programs for Transportation, July 1976, p. 334

b/ All referenced in U.S. DOT, The Replacement of Alton Locks and Dam 26, September, 1975, p. 86

c/ Oak Ridge National Laboratory, Transportation Energy Conservation Data Book: Supplement I, p. S1-49

d/ Statement of Chester Davenport, Assistant Secretary of Transportation, before the Senate Committee on Energy and Natural Resources, April 6, 1977.

Basic Materials Transportation

Inland waterway operators are large, low-cost carriers of vital commodities such as coal and petroleum. It is sometimes argued that this fact alone justifies the waterway subsidy. There are three relevant considerations. First, railroads and pipelines are even larger carriers of these vital materials; neither receives as important a subsidy. Second, if inland water transportation actually were the cheapest mode when all government and private costs are considered, the subsidy would not be needed to encourage its use for shipping vital goods; shippers would be attracted naturally by low barge rates. Third, if the subsidy is viewed as a means of lowering final prices for vital goods, a consistent policy would subsidize all of the modes used for their transportation.

Competing Transportation Rates

It is sometimes argued that railroad, pipeline, and truck rates are lower on routes along which waterway transportation is also available. These lower rates are cited as positive benefits of the inland waterway subsidy. The Interstate Commerce Commission is, however, already charged with the responsibility for ensuring just and reasonable rates for all railroad transportation and for a substantial portion of pipeline and truck transportation, so a waterway subsidy would be an indirect and imprecise mechanism for rate control in other modes.

Local Economic Development

New highways, waterways, or other transort facilities can stimulate local economies by helping their export industries grow. These developmental benefits offer another potential justification for the waterway subsidy. In evaluating such benefits, it is useful to distinguish between two types of communities.

First, if an area has an untapped natural resource, government may want to play its traditional role of helping to provide transportation access; the federal role in development of a pipeline serving the Alaskan oil fields is an example. If private interests hesitate to develop a resource, governments may subsidize transportation as an inducements. However, the

market value of a mineral, agricultural, or recreational resource should provide a sufficient reward for development once access is provided.

Second, if a community has no significant natural resources, subsidized transportation might attract new industry. Obviously, a blanket nationwide subsidy can not be a precise tool for the economic development of a particular community. Subsidized transportation is offered along 15,000 to 25,000 miles of waterfront in large, small, rich, and poor communities. At best, the subsidy can be viewed as providing a locational advantage to all water-served areas. If particular areas are economically depressed, the subsidy might attract industries to them from other sections of the country, but business loans and public grants are probably more precise policy tools for this purpose.

Consumer Benefits

Opponents of water user fees argue that the water transportation subsidy has the effect of lowering transportation costs on many materials and products and, therefore, on the final price of commodities to consumers. Since consumers are also taxpayers, so the argument goes, the concept of user charges is satisfied by the current practice of financing waterway projects out of general revenues. Carried to its logical end, this argument implies that all freight transportation of materials used for the production of any widely consumed good should be provided at no charge, since the lower costs would be reflected in lower consumer prices. Such a policy is not consistent with Congressional intent as expressed by past transport financing decisions.

Multipurpose Projects

Some Corps of Engineers projects serve multiple purposes, such as navigation, flood control, hydroelectric power, etc. While portions of total project costs can be easily separated and allocated to one purpose, there are often joint costs that cannot easily be allocated. For example, a dam can be used both to generate hydroelectric power and to ensure water deep enough for navigation.

The allocation of joint costs is always difficult, and the imposition of user charges to fully recover navigation-

related costs would require such an allocation. However, the Corps already has a method of allocating costs among purposes. 8/ For example, costs for hydroelectric power and water supply are currently recovered. The same method could be used to determine the portion of project costs that should be recovered from navigation users.

8/ This is the separable costs-remaining benefits method. First separable costs are allocated to the various purposes. Second, joint costs are allocated in proportion to figures called "remaining benefits" which equal the cost of providing a facility exclusively for each purpose, less separable costs. Under this allocation method project purposes with high prices for exclusive facilities are charged with the greatest portion of joint costs.

CHAPTER III. THE POTENTIAL IMPACT OF WATERWAY USER CHARGES

The collection of waterway user charges would probably cause increased barge rates and some loss of customers for barge operators. The cost incurred by the barge industry because of this disruption as well as the cost of program administration should be weighed against the benefits of a user charge policy.

Two recent studies of the potential traffic impact of waterway user charges are available, one by the Department of Transportation (DOT) and one commissioned by the Corps of Engineers. The DOT study also examined the potential impact of user charges on consumer prices. The studies are summarized in this chapter.

THE DEPARTMENT OF TRANSPORTATION STUDY 1/

Type of User Charge Studied

For the purposes of its study, DOT assumed that user charges would recover only part of federal program costs: Corps operation and maintenance (but not construction) costs for the inland right-of-way and Coast Guard operation and maintenance costs for aids to navigation in inland rivers.

General DOT Conclusions

Two crucial, stated assumptions underlie the DOT conclusions:

1/ DOT, Modal Traffic Impacts of Waterway User Charges. (March 1977). This study estimates the impact of user charges on inland waterway traffic. DOT will also study user charges for the Great Lakes and ocean domestic trade; these reports are scheduled for publication in June 1977.

- Inland waterway operators would pass the entire user charge on to shippers in the form of higher rates.

- Railroads and other competitors of waterways would not raise their transportation rates in response to higher waterway rates.

The DOT Conclusions Are:

- Under a uniform fee, 12 to 15 percent of waterborne traffic might be diverted. However, if seven rivers with low traffic volume and high maintenance costs were closed (or continued to be subsidized), the uniform fee would drop by about 23 percent and the diversion of cargo would be about 10 percent.

- If a segment fee were imposed, about 10 percent of waterborne traffic would be diverted to other modes.

If less than 100 percent of the user charge was passed on to customers and if the rates of competitors increased, traffic diversion would be lower, according to DOT estimates. Recognizing this, DOT characterizes its diversion estimates as "worst case."

In its study, DOT emphasizes the importance of its assumption that rail and pipeline rates will not be raised in response to the higher barge rates caused by user charges and, in fact, argues that some rail rates probably will be increased. If the DOT assumption is wrong, if the rates of competitors do rise, no traffic diversion will result from the user charges, and shippers will pay higher rail and pipeline as well as higher barge rates.

A railroad's choice between accepting diverted traffic at existing rail rates or responding with higher rates would probably be resolved by the railroads' estimates of profitability. There is no conclusive evidence as to which response is more likely. Two constraints on rate increases should be noted, however: competition from other railroads and the resistance of shippers to higher rates. The elements of competition and shipper resistance can be illustrated in the case of grain movements. Railroads carrying exports from Midwest to Gulf ports must compete with railroads that go to Atlantic coast ports, as well as with barge carriers. Furthermore, grain farmers might sell to alternative buyers such as domestic processors if transportation rates to export areas seem excessive.

DOT Study Methods

Because circumstances vary by product and region, the study of the impact of user charges is very complex. In the DOT study, the appropriate level of fee was calculated by shipment, and alternative barge, rail, pipeline, and truck rates were determined. Diversion by product was then estimated on the basis of competing rates as well as many other factors.

Calculation of Fees for Each River Segment

Corps of Engineers and Coast Guard expenditures were totalled for each of 29 river segments in five consecutive years, 1971 to 1975. For each year, river segment expenditures were divided by segment ton-miles to estimate the segment fee necessary to recover those costs. For each segment, the average of the fee for the five years was used in the analysis.

The uniform systemwide fee was calculated by dividing total operation and maintenance expenditures for all segments by total ton-miles. The fee, .8 mills per ton-mile, compares to average barge rates of 3 to 12 miles per ton mile, depending on the commodity shipped.

User Charges by Type of Shipment

An important task of the DOT study was to convert unit fees for a ton-mile into the total user charge implied for each commodity shipment. Actual origins and destinations were divided into 246 groups; in the Pittsburgh area, for example, 20 separate ports were designated collectively as one of 246 ports. Commodities, which number in the hundreds, were sorted into 24 types. Actual 1972 waterborne traffic was then translated into a list of shipments for 24 different commodities among 246 ports and user charges were calculated for shipments between any two ports. 2/

Railroad, Pipeline, and Waterway Transportation Rates

Waterway user charges would cause a loss of traffic on the inland rivers if they pushed water transportation rates above

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2/ These ports and commodity groupings were designed by the Corps of Engineers prior to the DOT study.

Table 9. ESTIMATED DIVERSION OF WATERBORNE TRAFFIC UNDER SEGMENT-SPECIFIC USER CHARGES: MILLIONS OF TON-MILES

Name of Segment	Abbreviation of Segment Name	Percent of Ton-Miles Diverted
Mississippi River-Cairo to Baton Rouge	CAIROBR	10.5
Mississippi River-Minneapolis to Cairo	MINCAIRO	7.4
Arkansas River	ARK	100.0
White River	WHITE	.1
Ohio River	OHIO	6.8
Monongahela River	MON	2.6
Allegheny River	ALL	100.0
Tennessee River	TENN	6.5
Cumberland River	CUMB	21.3
Kanawha River	KAN	3.0
Green and Barren River	GRBAR	.4
Kentucky River	KENT	100.0
Illinois Waterway	ILL	6.2
Gulf Intercoastal Waterway - West	GIWWW	7.7
Morgan City - Port Allen Route	MORGPA	9.5
Gulf Intercoastal Waterway - East	GIWWE	7.2
Pearl River	PEARL	100.0
Alabama - Coosa River	ALA	43.9
Warrior - Tombigbee - Mobile River	WARTOMMO	.8
Missouri River	MO	100.0
Apalachicola - Chattahoochee River	APCHAPFL	100.0
Atchafalaya River	ATCH	20.0
Red River	RED	--
Black and Ouachita River	OUACHBLK	100.0
Mississippi River - Baton Rouge to Mouth of Passes	BRMOP	11.5

SOURCE: U.S. DOT, Modal Traffic Impacts of Waterway User Charges (Volume 1, p. VIII-9).

those of competing distribution systems. To determine whether this was likely to occur, DOT compared the rates of all transportation modes for shipments of several commodities, including grains, coal, and petroleum.

Because railroad and common-carrier pipeline rates are controlled by the Interstate Commerce Commission, rates for these modes are publicly available. 3/ Only 16 percent of waterway shipments are regulated, however, and information on unregulated rates is closely held by the barge companies. As a result, DOT based its estimates of barge rates on a sample of rates taken for the Corps in 1974. Statistical analysis was used to relate these sample barge rates to length of haul and geographic location. The resulting equations were used to predict barge rates for all shipments identified by DOT. In nearly every product analysis, the estimated rates were supplemented by rate information gathered from shippers.

Details Behind DOT Conclusions on Traffic Diversion

Given its assumptions about rates, DOT estimates that about 10 percent of total waterborne commerce will be diverted to other transportation modes if the segment-specific fee is adopted. Table 9 shows the DOT estimates of traffic diversion by river segment. 4/ A discussion of the details behind these estimates follows.

High-Cost Rivers

The diversion estimate includes traffic losses due to closing seven high-cost rivers. DOT found seven rivers that together contribute only 4.5 percent of waterway ton-miles but, on average, account for about 27 percent of federal operation

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3/ Rates will vary for several reasons. A primary source of disagreement among analysts will be the judgments involved in the selection of rates used in the study.

4/ Each of these estimates is accompanied by several qualifications in the DOT report, Volume II. Volume II should be consulted for details of these very complex calculations.

and maintenance expenditures. Tolls on these rivers would have to be very high to recover these expenses and most traffic would leave. 5/

If the high-cost rivers were no longer maintained, fees on the remaining segments would have to be increased because some carriers now use both the high-cost rivers and other segments. The increases could be as high as 10 percent but would average about 3 percent. A systemwide fee would be about 23 percent lower without the high-cost rivers, or about .6 mills per ton-mile.

Coal for Electric Utilities

Water-served utilities generate large percentages of the electricity in every state through which the Upper Mississippi, Illinois, Tennessee, and Ohio Rivers pass. In 1975, for example, utilities on the Ohio River accounted for 29 percent of the net kilowatt hours in Illinois, Indiana, Ohio, Pennsylvania, and Kentucky, according to the DOT study.

Utilities located on waterways receive most of their coal from barges. DOT estimates that user charges would cause very little, if any, diversion of waterborne coal to rail transportation because the construction of new or expanded rail unloading facilities would cost more than the user charges. 6/ The results are not as conclusive for the relatively small number of utilities not served exclusively by barge.

DOT also expects that user charges will accelerate the shift to alternative sources of coal. Utilities along the Upper Mississippi will buy more coal from Montana and less from eastern states, causing a 16 percent reduction in barge ton-miles and a 14 percent loss of barge coal revenues in the East.

5/ The seven rivers are the Arkansas, Allegheny, Kentucky, Pearl, Missouri, Black and Ouachita, and Apalchicola-Chattahoocke-Flint.

6/ For each utility, DOT compares delivered coal prices (measured in cents per million BTUs) for alternative transportation modes (water and rail) and for alternative sources of coal.

Conversely, utilities along the Tennessee River may switch from high-sulphur to low-sulphur eastern coal, which would increase waterborne coal ton-miles. 7/

Grain for Export

Major waterborne grain cargoes originate along the Upper Mississippi and Illinois Rivers; about 90 percent of it is shipped to ports in the New Orleans area for export. DOT estimated that about 10 percent would be diverted to railroads if a segment toll were imposed and about 15 to 20 percent if a uniform fee were adopted.

Some knowledge of the process by which grain prices are set is helpful in understanding why user charges are likely to cause diversion from water to rail carriers. Farmers ship their grain to elevators where it is sold to the highest bidder. The elevator operator solicits bids at rail and barge terminals from those who want to sell to an exporter, as well as from local grain processors.

A numerical example illustrates this process. If exporters at New Orleans offer $3.50 for a bushel of grain, bidders at barge terminals in the upper Midwest will offer about $3.30 a bushel, knowing that it costs about 20 cents to ship a bushel to New Orleans. If the cost of rail transportation to New Orleans is 30 cents a bushel, the offer at the railhead will be $3.20.

Once sold, the grain must be moved from the elevator to a rail or barge terminal. Since most elevators have direct access to rail lines, rail-access costs are usually zero. The cost of transporting grain to a barge terminal depends on the elevator's distance from the terminal.

In New Orleans, grain is taken to a barge terminal if the cost is less than 10 cents a bushel. If it is more than 10

7/ Strict sulphur emission standards provide the initial impetus for switching to either eastern or western low-sulphur coal. DOT notes that the coal price effect of these standards could be far greater than that of user charges (30 cents compared 1 to 4 cents per million BTUs.)

cents, the grain will go by rail. The barge-access costs, along with the difference between the rail and barge bids, determine the drawing area, or reach, of the river.

Illinois River. Along the Illinois River, there is fierce competition between railroads and barge companies for grain shipments. User charges would add between 1 and 3 cents to the cost of transporting grain for export by waterway. According to the DOT view of the grain market, the user charge would be reflected in a lower bid at barge terminals. DOT estimates that the resulting reduction in the river reach would mean that water carriers would lose about 10 percent of grain ton-miles.

Upper Mississippi River. Competition between rail and barge carriers apparently is not as strong along the Upper Mississippi as it is on the Illinois. According to DOT, barge terminals draw from only a portion of their potential reach. The DOT estimate of 10 percent diversion for this area may be too high. 8/

Impact on Farm Income. The DOT study made three observations about the effect of user charges on farm income. First, the study noted that a 1- to 4-cent per bushel user charge is relatively small compared to the typical $1 to $2 per bushel flucuations in grain prices. Second, price flucuations make it impossible to estimate typical impacts of the user charge. When farm prices are high, the effect is small. If, for example, corn prices are $3 per bushel, user charges would reduce profits by about 1 to 3 percent per bushel. If prices were low, the impact would be much greater.

A third DOT observation is that farm owner-operators would eventually bear the burden of the user charge in the form of lower land values because the value of agricultural land is determined by its income-earning potential. Tenant farmers would not lose income because they would eventually pay lower rents.

8/ According to DOT, rail-barge competition is changing significantly in this area. Some railroads now offer very low "gathering" rates for grain going to barge terminals. These rates significantly increase the reach of the river. In retaliation, other railroads are offering lower multi-car rates to export points. DOT notes that user charges might simply offset the impact of the new rail gathering rates.

Petroleum and Petroleum Products

Many waterborne shipments of crude oil, distillate fuel, and gasoline involve movement of stocks among refineries; others involve longer hauls, often to the Upper Midwest. Transfers from one facility to another are important in the region bordering the Gulf of Mexico. Waterborne cargoes of residual oil used by utilities and some industries are important on the lower Mississippi River.

DOT does not expect diversion of residual fuel oil shipments because residual fuel oil cannot be transported by pipeline and because rail rates are high. DOT concludes that 10 percent of long-haul waterborne crude oil ton-miles and 25 percent of waterborne ton-miles of other petroleum products would be diverted to pipelines if segment fees were imposed.

The DOT diversion estimates reflect both the impact of changes in market conditions and the impact of user charges. Competition between barges and pipelines will increase as production of Gulf crude oil and petroleum products declines. User charges will add further to the current rate disadvantage of barge transportation. 9/

Iron and Steel Industry

Waterway carriers gather raw materials and deliver the finished products of steel-producing areas such as Pittsburgh and the Ohio River area. Table 9 reflects a 10 percent diversion of waterborne iron and steel products to other mopdes. The DOT report concludes that diversion of more than 10 percent of steel products is unlikely because of the "multi-plant production strategies and the nature of the steel distribution system."

9/ DOT's comparison of rates shows that pipelines, when available, are clearly the lowest-cost mode compared to inland barge and rail. When the pipeline is filled to capacity, excess shipments are usually absorbed by barges; when production declines there will be fewer of these. As with grain, the river has a drawing area or reach for petroleum and petroleum products; user charges could also reduce that reach. Small shipments to out-of-the-way places will not be affected, however, because volume is insufficient to justify a pipeline.

Three hauls of steel industry raw materials were identified as having potential for being diverted; these hauls were examined in detail by DOT:

- Two million tons or 3 billion ton-miles (1972 ton-miles) of iron and manganese ore that is hauled by inland waterway from the Gulf to the Pittsburgh/Ohio area. The transportation alternative is to import the ore at Atlantic Coast ports and transfer it to rail carriers.

- A long haul of about 0.5 million tons or 1 billion ton-miles of coal from West Virginia to Houston. The alternative is to use coal from closer sources.

- Three or 4 million tons of iron ore shipped to U.S. Steel's Alabama plant. Although the rail rate is competitive, diversion seems unlikely because the barge line is owned by the ore shipper.

None of these hauls is reflected in the DOT estimate of 10 percent diversion nationwide because DOT does not expect diversion.

Sand and Gravel

Barges on all large rivers carry some sand and gravel. This traffic usually serves nearby customers and generally represents a small percentage of total waterway ton-miles.

DOT expects user charges to provoke large diversions of sand and gravel from water carrier to trucks because of intense competition in the trucking industry for shipments from inland quarries. The expected diversion rates range from 10 percent for the Arkansas River to 100 percent for the Kentucky.

Chemicals

The production of alcohols, benzene, toulene, and other petrochemicals is concentrated in the Gulf area. Most of the waterborne traffic represents shipments between production facilities. Many short hauls of sulphur and sulphuric acid are also made in the Gulf area.

The DOT study concludes that diversion of petrochemical traffic to other modes would be small because competing rail rates are very high. Barges will probably continue to carry sulphur and sulphuric acid because user charges on short haul shipments are low and because these products require expensive special handling equipment that competing modes may not have.

A STUDY OF THE IMPACT OF USER CHARGES FOR THE CORPS OF ENGINEERS 10/

Type of User Charge Studied

User charges studied by CACI, Inc., under contract to the Corps of Engineers, were designed to recover the Corps's operation and maintenance costs for inland rivers and the Coast Guard's operation and maintenance costs for aids to navigation on inland rivers. These are the same costs that the DOT study assumed would be recovered. CACI studied the impacts of recovering 50 percent and 100 percent of these costs. Two types of user charges were studied: a uniform, systemwide fuel tax, and a segment-specific fee that would cover the direct costs on various rivers.

General Conclusions

Several major assumptions underlie CACI's conclusions; the two most important are identical to the assumptions of the DOT study:

- Barge operators would pass on all user charges to customers in the form of higher prices.

- Barge competitors such as railroads and pipelines would not raise their rates in response to the higher waterway rates caused by user charges.

10/ CACI, Inc., Potential Impacts of Selected Waterway User Charges (Washington, D.C., December 1976).

Given these assumptions, and others, CACI found that:

- Imposing a fuel tax to recover 50 percent of operation and maintenance costs would result in a 5.5 percent loss of traffic. A fuel tax designed to recover 100 percent of operation and maintenance costs would reduce traffic by 7.1 percent.

- A fuel tax would reduce barge fuel consumption -- 6 percent for 50 percent recovery and 12 percent for 100 percent recovery.

- Segment-specific fees to recover 50 percent of operation and maintenance costs would reduce waterway traffic 8.6 percent. For 100 percent recovery, segment-specific fees would reduce traffic by 9.5 percent.

CACI Study Methods

Calculation of fees for each river segment. Corps and Coast Guard operation and maintenance costs were totalled for 23 separate river segments in the five years 1971 to 1975. A five-year average cost was calculated and cost was divided by 1972 ton-miles for each segment to yield a list of segment-specific fees. Although the CACI procedure differs slightly from that used in the DOT study, the segment fees arrived at in the two studies are very close.

CACI estimates that a 12.8 cent per gallon fuel tax would recover 50 percent of the operation and maintenance costs; 100 percent recovery would require a 27.8 cent per gallon tax.

The CACI estimate that a uniform, systemwide ton-mile tax of 0.8 mills is required to recover 100 percent of the operation and maintenance costs is identical to the DOT estimate.

Calculation of fees by type of shipment. Like the DOT study, the CACI study simplified the real-world pattern of waterway trade. Actual waterway origins and destinations were grouped and consolidated into 246 parts. Commodities were sorted into 10 types.

Railroad and waterway transportation rates. The methods of CACI in estimating transportation rates differ from those of DOT in two important ways:

- Pipeline alternatives were not considered.

- Estimated railroad and waterway costs--rather than rates--were used to compare modes. The costs were estimated by commodity for each origin and destination.

The total shipment costs have three components:

- Transportation costs. These are fully allocated expenditures for equipment, fuel, supplies, maintenance, repairs, labor, and overhead.

- Inventory costs. Inventory costs are the interest costs to a shipper who has cargoes in transit. As waterways or railroads get more traffic, trips take a longer time and inventory costs increase.

- Access costs. These are the cost of getting cargoes from the production location to a rail or barge terminal.

The CACI Estimates of Traffic Diversion

Table 10 shows the CACI estimate of traffic diversion by river segment. Although the CACI estimates of total traffic diversion are very close to those of DOT, the methods used to predict the rates of diversion were very different.

The CACI study divided the nation into 171 economic regions. 11/ All production was assumed to take place at the center of each region. It was assumed that shippers at each center would choose the least expensive mode--rail or waterway--considering actual transportation costs plus costs for inventory and access. Using actual 1972 production in these regions, CACI estimates the number of shippers who would choose the waterway over rail transportation, with and without user charges. The CACI estimated the potential diversion in ton-miles of cargo that would be switched from water to rail carriers if user charges were imposed.

11/ These are the so-called BEA areas of the Bureau of Economic Analysis.

Table 10. POTENTIAL WATERWAY TRAFFIC LOSSES RESULTING FROM USER CHARGES: BY RIVER SEGMENT

River Segment	Percent Reduction in Ton-Miles			
	50% Recovery		100% Recovery	
	Fuel Tax	Segment Fee	Fuel Tax	Segment Fee
Mississippi River, Cairo to Baton Rouge	2.8	5.7	4.3	5.8
Upper Mississippi River	2.0	4.2	3.8	5.2
Arkansas River	11.7	95.8	24.0	99.2
White River	12.5	37.5	23.2	76.8
Ohio River	4.8	5.4	5.9	6.0
Monongahela River	1.0	1.0	1.0	1.0
Allegheny River	6.0	92.9	14.3	98.8
Tennessee River	3.4	10.0	7.9	10.0
Cumberland River	1.0	1.0	1.0	27.2
Kanawha River	4.8	5.3	5.8	6.0
Green and Barren Rivers	13.2	3.6	24.1	8.4
Kentucky River	9.1	100.0	20.5	100.0
Illinois Waterway	3.6	7.4	4.7	10.4
GIWW West	2.8	5.6	4.3	5.7
GIWW East	2.8	5.6	4.3	5.7
Pearl River	---	---	---	---
Alabama-Coosa Rivers	12.7	99.2	25.4	99.2
Black Warrior-Tombigbee-Mobile Rivers	86.3	91.1 86.6 a/	87.5	92.4 87.7 a/
Missouri River	1.0	37.0	1.0	63.0
Apalachicola-Chattahoochee-Flint Rivers	11.8	99.0	22.5	99.0
Atchafalaya River	1.0	1.9	4.3	2.4
Red River	54.2	58.3	58.3	66.7
Black and Ouachita Rivers	0.8	99.2	23.4	99.2
System Total	5.5	8.6	7.1	9.5

SOURCE: CACI, Inc. Potential Impacts of Selected Waterway User Charges Washington, D.C., December, 1976.

a/ These traffic loss estimates reflect smaller segment fees resulting from revised federal cost estimates.

Estimates of traffic diversion by product are shown in Table 10. Individual commodity estimates of CACI are very different from those of DOT. For example, CACI estimates a 9.4 percent loss of waterborne coal ton-miles under a segment-specific fee; DOT estimates no diversion for coal. There are similar differences for petroleum and grain. CACI estimates a 3.4 percent loss of waterborne grain; DOT says 10 percent. CACI estimates a 4.2 percent loss of waterborne petroleum; DOT predicts 10 percent for long hauls of crude oil and 25 percent for petroleum products (except residual oil).

ESTIMATES OF THE INCREASE IN CONSUMER PRICES RESULTING FROM USER CHARGES

An earlier DOT study estimated the price impacts of a segment-specific fee designed to recover federal operation and maintenance costs. 12/ The DOT report said: "In general, regional market and price impacts were found to be minimal compared to other long-term market forces. Delivered commodity price impacts rarely exceeded 1 or 2 percent . . . and were more commonly a fraction of a percent. 13/ DOT does not expect these one-time price effects to be followed by further increases.

12/ U.S. DOT, Regional Market, Industry, and Transportation Impacts of Waterway User Charges (August 1976).

13/ The more recent DOT study provides some examples. User charges generally add about 1 cent to the price of coal delivered to utilities; this compares to prices that are close to $1 per million BTUs. This would generally result in a fraction of a percent increase in electricity prices. User charges could cut 1 to 4 cents per bushel of grain from the price received by farmers; farm prices are expected by some estimates, to be about $2 per bushel of corn and about $5 per bushel of soybeans over the next few years.

TABLE 11. ESTIMATED POTENTIAL DIVERSION OF WATERBORNE COMMODITIES: IMPACT OF USER CHARGES BY PRODUCT

Product	Percent of Ton Miles Diverted
Coal	9.4
Petroleum	4.2
Chemicals & Fertilizer	6.4
Metals & Products	10.6
Ores & Scrap	39.5
Sand & Gravel & Other	7.0
Agricultural, Marine, and Forestry Products	15.2
Grain	3.4
Manufactured Products	23.0
Miscellaneous	(gain 3.0%)

SOURCE: CACI Inc., Potential Impacts of Selected Waterway User Charges (Washington, D.C., December 1976, based on Table 4-9, p. 49).

CHAPTER IV. THE DESIGN OF A USER CHARGE

TWO BASIC TYPES OF FEES

If the federal government imposes waterway user charges, it must choose between two basic types of fees:

- a uniform, national fee, or
- a segment-specific fee based on the costs of building and maintaining individual waterways.

Fees based on the costs of maintaining specific waterways would vary dramatically from region to region. For example, fees that covered the costs of operating the seven high-cost rivers discussed earlier in this report would exceed 10 mills per ton-mile; this compares to a uniform fee of .8 mills.

Under a regional fee structure, traffic on high-cost rivers would clearly drop sharply. By contrast, segment fees on the high-volume, low-cost Mississippi River (between Cairo and Baton Rouge) and on the Ohio River would be well below the uniform fee--0.2 mills on the Mississippi and 0.4 mills on the Ohio.

Under a uniform fee, traffic losses would probably be spread evenly among the nation's rivers. Segment fees might stop all traffic on some high-cost rivers. However, segment-specific charges may be more fair than a uniform fee. With a uniform fee, users of low-cost rivers must help pay for the higher cost segments they do not use.

OTHER ISSUES

In addition to choosing between the two basic types of fees, the federal government must consider five other issues in the collection of waterway user charges.

Federal Expenditures to be Recovered

A user charge could be designed to recover any portion of the following: Corps of Engineer constructon (past or future) costs and operation and maintenance costs; Coast Guard construction (past or future) costs and operation and maintenance costs; and Corps and Coast Guard safety and environmental regulation costs. If construction costs are to be recovered, a fee schedule must be set in such a way that costs are spread over the lifetime of each facility taking into account the interest costs to the federal government of delayed reimbursement by waterway users.

Who Will Be Charged

Another policy question that must be answered is whether boat owners who use the inland waterways for recreation should share the cost. At some facilities, these boaters have begun to compete with commercial users for scarce space in the locks. 1/ Some lock facilities serve recreational boaters exclusively. 2/

Recreational boaters now pay a 4-cent-per-gallon federal gasoline tax; 2 cents of that tax is rebated to the user and 2 cents is deposited into the Land and Water Conservation Fund administered by the Bureau of Outdoor Recreation.

Basis for the Charge

Four options merit special consideration in deciding how fees should be calculated.

1/ In August 1975, a peak boating period, the eight locks on the Illinois River were very crowded (an average of 72 percent of available locking time was being used); on average, 31 percent of the lockages served recreational craft. On the Ohio River, recreational boats are generally handled by smaller, auxiliary locks.

2/ For example, recreational boaters were almost the only users of the upper four locks on the Allegheny in August 1975.

- Fuel Taxes. A fuel tax is the most frequently proposed form of user charge for water operators. It is popular because it is similar to the fuel taxes that serve as user charges on highways and because it is relatively easy to administer. It could also encourage fuel conservation. It should be noted, however, that only nationally uniform fuel taxes are feasible, since users could probably avoid regional differences.

- License Fees. A license fee could be levied on the equipment of a water operator (barges, towboats, etc.). Once an annual fee was paid, no additional charge would be required. A license fee can be uniform or specific. A potentially important feature of a license fee is that it would probably be viewed as an overhead expense; operators could charge that overhead to the shippers who were least likely to switch modes, thus minimizing diversion.

- Facility Fees. Facility fees are charges for the use of locks, canals, and ports. These fees can be uniform or project-specific. Many port facilities built by state, local, or other public agencies already make charges. These fees can be directly tied to the cost of using a facility and could encourage more efficient usage.

- Cargo-Based Taxes. User fees could also be charged on the basis of tons unloaded at a port, tons carried on waterways, or tons carried and distance traveled on waterways (a ton-mile tax). These taxes could be uniform or segment-specific.

Use of User Charge Revenue

Revenues from a waterway user charge could be treated as general tax revenues, earmarked for future navigation projects, or used to establish a Public Corporation for Inland Waterways, similar to the Panama Canal Company.

Timing of the Cost Recovery

Timing decisions involve three considerations:

- User charges could be increased gradually to ease adjustment to the change.

- Since a facility will benefit users for many years, construction costs could be recovered over the lifetime of the project.

- Some projects will not reach high levels of traffic for several years. User charges could be delayed in such cases. This is especially important for newer waterways that cannot be self-supporting in the early years of their operation.

APPENDIX A. SUBSIDY ESTIMATES

The many details behind the subsidy estimates used as base data for Table 7 are adopted from a separate CBO study. 1/ Because any subsidy estimate is controversial, details underlying the basic estimates are noted in the following pages for the three major domestic freight modes. Other details are provided in the footnotes to Table 7.

Domestic Water Transportation. The subsidy estimates used in Table 6 include all the Corps' expenditures on shallow-draft inland rivers and a portion of their expenditures on Great Lakes and deep draft channels and harbors. 2/

The subsidy estimate does not include U.S. Coast Guard (USCG) expenditures because data limitations preclude an allocation among classes of water transportation. The estimates USCG subsidy to all classes of commercial water transportation (including international) is about $250 million a year; the USCG subsidy to all recreational users is also around $250 million a year.

Data limitations also precluded an estimate of the interest subsidy arising from the federal loan guarantee program. As of September, 1976, MARAD reported a total of $886 million in guaranteed loans outstanding for shallow-draft vessels. 3/

1/ For full details, see Congressional Budget Office, Use of Subsidies as a Federal Transportation Policy. Forthcoming in July 1977.

2/ Great Lakes and deep-draft categories are allocated in proportion to domestic commerce as a percentage of total domestic plus international tonnage shipped in the relevant areas in 1974.

3/ This includes the outstanding principal of guaranteed loans as well as the principal of loans MARAD is committed to guarantee. The types of vessels included are tugs, barges, and drill-service vessels.

By including all Corps shallow-draft expenditures in the subsidy estimate, this paper assumes that, although inland facilities are also used by recreational craft, commercial traffic necessitated and is therefore responsible for these expenditures. An inland system exclusively for recreational use would be much less extensive and costly.

Railroad Freight Transportation. The major portion of the freight subsidy in the three years shown in Table 6 is interim aid to the bankrupt eastern railroads prior to the formation of ConRail. 4/ In the future railroad freight aid will generally be channeled through ConRail and through the security purchase, loan guarantee, and rail continuation grant programs. Except for the continuation grants, the aid is expected to be repaid, although at lower than market interest rates. Clearly, ConRail aid may not be repaid at all because ConRail may never be profitable. The likelihood of repayment is the basis for deciding whether to include this aid in the subsidy estimate; for the purposes of this report it is excluded.

Federal payments to the Railroad Retirement Fund are not included in Table 7 because they were not allocated between freight and passenger service.

Even assuming that all annual federal payments to the railroad retirement fund are attributable to the freight mode and that none of the future railroad aid would be repaid (except the $1 billion of nationwide loan guarantees), and would therefore be a subsidy, the rail freight aid, an average, would still not be significant relative to user expenditures for the rail freight industry as a whole. (about 6 percent or less). Further this level of subsidy should not be viewed as typical of future years since the programs are intended to be temporary.

Highway Transportation. The highway subsidy in Table 7 equals total annual federal expenditures on all highway programs less annual revenue from the dedicated excise tax. In the first two years, revenues actually exceeded expenditures by almost $1 billion; thus there is a "negative" subsidy.

4/ The Federal Railroad Administration's programs for safety, research and development are also included in the subsidy estimate.

APPENDIX B. USER CHARGES AND WATERWAY INVESTMENTS

User charge legislation could change the way the Corps of Engineers selects or justifies its waterway investments. Legislation could stipulate that new or expanded facilities should be built only if projected revenue from user charges exceeded the estimtaed costs of the facility. This could be called a "financial-return" investment criterion. User charges could then be imposed to recover operation and maintenance as well as construction costs.

The Corps now justifies its inland waterway projects on the basis of cost-benefit analyses. The principle benefit for navigation projects is the so-called "rate-savings benefit." This is the saving to freight shippers presumed to result from lower barge rates on the new or expanded waterway--rates that will supposedly be lower than the rates of competing modes, usually railroads. 1/

Because of the particular definition of benefits used be the Corps, the financial-return and the rate-savings criteria should actually yield similar decisions on many investment

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1/ The Corps compares barge rates to rates for competing modes for each type of commodity by origin and destination. If barge rates are lower, the Corps simply multiplies the difference times projected tonnage for that type of shipment to yield the so-called transportation rate-savings benefit. The Corps also likes to include so-called "delay-cost benefits." If an expanded facility lowers average delay times and, thereby, delay cost, the Corps rightfully considers the reduction a benefit of the new facility. Recreational benefits are also added to many navigation projects.

projects, because, if a rate difference exists for a number of shippers, each of them will find it economical to continue to use the waterway as long as the user charge does not erase the rate difference. When the Corps states that rate-savings benefits exceed the costs of the investment, the implication is that rate difference would not be erased if those costs were passed through to the users. 2/

Proponents of a change by the Corps to the financial-return investment criterion argue that the Corps consistently overstates rate differences, thereby overstating rate-savings benefits, and that the inflated benefits are then used to justify unwarranted projects. Under the new criterion, projects would by undertaken only if shippers could be expected to demonstrate how beneficial or valuable projects are by their willingness to pay for them.

If a project has purposes and benefits other than navigation, the Corps, using standard procedure, can allocate costs among them. Only costs attributed to navigaton will be recovered from shippers.

2/ To be strictly valid, the claim that the criteria are similar requires one additional condition: if the rate savings differ by user, the charge must also vary. The reason for this condition is that a uniform charge would erase the rate difference for some users and drive them to other modes. Perhaps the best way to achieve this pricing flexibility is to have a fixed user charge such as a license fee. A fixed charge would probably be viewed as an overhead expense that waterway operators would pass on to the shippers least likely to divert to other modes.

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