ident of the highly successful Southern Railway, expects rail-freight ton miles to increase 143 percent by 1990 and rail market shares to increase 24 percent.

Take an east-west railroad like the Milwaukee, the Chicago and North Western, or the Burlington Northern. To reach the grain export markets in the Gulf of Mexico, they must agree with another railroad on divisions of an overall rate. Such an all-rail movement is subject to competition from the river, which is fed by trucks over long distances. There is a competitive ceiling on the all-rail rate. It is very likely, even certain, that the railroad can get a higher rate division by connecting with the barge line than by connecting with another railroad. Such a connecting railroad benefits from the efficiency of river service. Part of the saving is passed on to the shipper, but part is shared by the railroad in higher divisions.

The railroad also makes a higher profit per trip more frequently. Instead of the freight car going all the way to the Gulf and possibly waiting at congested terminals for unloading, it stays on the tracks of the originating line at all times. Use of the freight car is thus under far better control. The car may be loaded four or five times as often, at a higher division, by using the barge connection than by using the all-rail connection. Even when the originating railroad has authority for the entire trip to the south, the same economics of car use make it advantageous to interline with barge lines. Significantly higher use is, of course, the cheapest way to expand capacity.

Just last year, a coal terminal in St. Louis began shipping to a utility in Louisiana western coal that was transported to the river by rail from Wyoming. Federal Barge Lines, Inc., is constructing a similar facility 80 miles south of St. Louis at Cora, Illinois. When completed in 1980, it will be capable of handling 15 million tons of Illinois and western coal. It is certain that this would not have been possible if we had not had the cooperation of some progressive, economically realistic railroad executives.

Most rail-water movements of coal on the Ohio River and from the West to the Mississippi are voluntary within the present basic legal framework, which is intended to encourage rail-water coordination. But there have been situations in which a railroad would refuse outright to join with a water carrier. On those occasions, the railroad saw an opportunity to raise its rate to the port in order to force the traffic to go all rail at a higher cost to the consumer.

Although the law is clear enough and the Supreme Court has said often enough that the railroad has no right, by exploiting its monopoly of the services to the port, to deprive the inland shipper of the competitive rail-water alternative to an all-rail service, we think any new legislation should clarify and solidify this point. A current proposal to the Congress clearly prohibits the practice of squeezing out the water carrier by the artificial manipulation of the rate to the port. It has been suggested that a treble damage penalty be introduced for such tactics. This proposal simply preserves a shipper's right to a competitive alternative. The public is always better off when a competitive alternative is not artificially suppressed.

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Forecasts of Key Commodity Flows at a Regional Port

LONNIE E. HAEFNER, DONALD E. LANG, AND TOM CRONIN

Some practical aspects of forecasting key commodity flows for the Port of Metropolitan St. Louis are heuristically examined. Scenarios of regional economic growth are developed, detailed industrial market studies are assessed, and regressions are adjusted from baseline output to reflect the impact of intermodal opportunities, the needs and demands of target industries, and the unique position of the port below Locks and Dam 26. Key forecasts of flows of cash grains and grain products, coal, petroleum and petroleum products, chemicals, and fabricated metals are examined. Operational problems resulting from growth in commodity flows at the port are identified. Finally, the need for port studies to identify and capitalize on the unique locational and industrial assets of individual regions is discussed.

The objective of this paper is to examine the flows of key commodities into the Port of Metropolitan St. Louis during the current period of shifting energy policy, more intensive import-export programs, and inflationary pressures on industrial expansion. It is important to examine national movements of key commodities such as coal and petroleum in the context of a regional port. Furthermore, it is particularly important to examine them in the context of the St. Louis port because of its strategic location on the national inland waterway system.

The unique characteristics of the Port of Metropolitan St. Louis that are relevant are the following:

1. In terms of tonnage, it is the largest inland port on the system.
2. It is crucially placed just below Locks and Dam 26 at Alton, Illinois, and thus acts as a nodal point on the river for tow sorting and makeup.
3. It interacts with a large midwest rail network and so is capable of acting as a test-bed for potential rail-water cooperation.
4. It lies at the edge of the midwest corn and wheat belt and acts as the metropolitan starting point for much of the agricultural movement of products destined for international distribution.

In light of the above, altered construction at Locks and Dam 26, user-charge mechanics, and trade policies will be felt in commodity flows and interchanges at the St. Louis port. The balance of this paper presents a detailed and regionally refined set of commodity-flow forecasts and a discussion prepared for a local port district study now under way.

REGIONAL SCENARIOS

To facilitate the understanding of origin-destination and commodity-flow levels in the St. Louis bi-state region, a set of regional scenarios was

Table 1. Projections of waterborne commodity flows for St. Louis bi-state region: 1976-2000.

Commodity	High-Growth State		Normal-Growth State		Low-Growth State	
	Increase (%)	Tons	Increase (%)	Tons	Increase (%)	Tons
Cash grains	100	6 275 904	68	4 267 397	55	3 420 086
Iron ore	50	13 608	42	11 431	38	10 342
Metal ores	54	71 618	44	58 356	40	53 050
Coal	372	27 215 541	319	23 338 056	218	15 948 892
Petroleum and petroleum products	66	13 257 291	54	10 846 875	41	8 235 590
Sugar	35	199 581	29	165 366	23	131 153
Grain mill products	45	2 392 246	39	2 073 280	34	1 807 475
Lumber products	90	4 763	80	4 234	68	3 599
Paper products	90	65 317	85	61 689	79	57 334
Chemicals	160	3 109 339	109	2 118 237	90	1 749 003
Iron and steel products	102	1 350 798	85	1 125 665	76	1 006 477
Nonferrous products	84	70 760	78	65 706	68	57 281
Fabricated metal	114	67 132	91	53 587	60	35 332
Mining products	108	5 346 947	90	4 455 788	66	3 267 579
Nondurable manufacturing goods	60	173 851	48	139 080	36	104 311
Durable manufacturing goods	100	5 493 003	72	3 954 962	54	2 966 222
Total		65 107 699		52 739 709		38 853 726

Notes: 1 t = 1.1 tons.
High is 23 percent higher than norm; norm is 36 percent higher than low.

constructed. Waterborne commodity flows are strongly tied to the demand for raw-material inputs to basic industry. Thus, an initial examination of regional economic parameters that are often tied to basic industry provides a logical starting point from which to refine macroscale commodity-flow forecast model output.

Conditions termed economic "growth states" are related to these regional parameters in the table below:

Parameter	Growth State	Increase (%) 1980-1990	Increase (%) 1990-2000
Population	Ideal	17.0	13.0
	High	14.0	10.0
	Normal	11.3	7.3
	Low	8.0	6.0
Total employment	Ideal	28.0	24.0
	High	21.9	17.9
	Normal	15.6	14.1
	Low	11.5	10.5
Manufacturing employment	Ideal	34.1	26.7
	High	25.1	15.2
	Normal	13.3	11.0
	Low	12.6	9.4
Personal income	Ideal	143.3	124.0
	High	119.9	110.0
	Normal	98.6	89.5
	Low	62.9	55.3

It can be seen that the ideal, or "economic boom", state shows relatively great increases in regional population, total employment, manufacturing employment, and personal income over a two-decade future period. The high-growth state shows significant, but more realistically attainable, levels of these parameters, whereas the normal-growth state represents a status quo without meaningful growth in economic indicators and the low-growth state depicts the region in decline relative to other national and midwest economic centers.

FORECASTS OF REGIONAL COMMODITY FLOWS

A set of refined St. Louis bi-state regional commodity flows based on the above regional economic scenarios was developed as follows:

1. Bureau of Economic Analysis Region (BEAR) regression forecasts of previous St. Louis port studies were reviewed for levels of original data aggregation, commodity classification, and statistical quality of variance.
2. Detailed reviews of industrial and port-related market studies and surveys were made to accurately assess target industries of the St. Louis region that have an impact on waterborne commodity movement on the river and respond in a predictable manner to national economic and trade developments.
3. Detailed interviews were conducted with barge operators, railroads, truckers, basic industries, and agricultural interests that make use of the river and unique intermodal linkages and unit-train/unit-tow combinations along the St. Louis riverfront.
4. The baseline commodity flows from step 1 were then adjusted to reflect regional wealth and marketing impacts. Adjustments were made to yield output for three of the four economic states (see Table 1).
5. At the request of community industrial interests, the high-growth state was studied in detail as a basis for the design of particular port facilities and the development of an industrial incentives strategy.

A review of Table 1 in light of these steps exhibits several results worthy of note:

1. No forecast was made for the ideal, or "economic boom", state. It was felt that to assume the number of simultaneous economic-inflation, energy, and international political and trade factors required to be in harmony to achieve such a state was unrealistic and would yield no real meaning.
2. Forecasts for the other three states exhibit the difference between high and declining regional economic activity and its relation to port development and waterborne commodity flows. The gross total of flows for the high-growth state, 65 107 699 t (71 768 956 tons), is 23 percent higher than the normal (status quo) state of 52 739 709 t (58 135 580 tons), which is 36 percent higher than the tonnage of the low-growth (regional decline) state [38 853 726 t (42 828 903 tons)].
3. Key commodities can be identified from the table that represent response to the unique intermodal-agricultural hinterland location of St. Louis, and/or its strategic position below Locks and Dam 26, or response to regional market study indicators. These are cash grains and grain products, coal, petroleum and petroleum products, chemicals, and fabricated metals.

HIGH-GROWTH-STATE DESIGN FOR KEY COMMODITIES

For the purposes of port district facility design and future interaction with potential growth industries likely to be attracted to the region, achievement of the high-growth-state economic target and port development was stated as the planning goal by the analysts over the 20-year development horizon. The following comments are relevant to the key commodities mentioned above as forecast for the high-growth state.

Grain

The public does not realize that a crisis in the movement of grain from the farmer to the export port has been building since 1973. The energy crisis has overshadowed the crisis in the transportation and storage of grain. National attention has been focused on the negative balance of payments, and little attention has been directed toward the dramatic growth of grain exports that occurred in the same time period as the escalation of oil prices.

Grain marketers generally agree that 1979 exports of midwest grains will be twice the 1973 quantities. Some indicate that the total may be as much as three times the 1973 level. It is this dynamic growth in the demand for transportation of grain from the farmer to the seaport that has caused the crisis. The national transportation capability, whether it be truck, rail, or water, has been overwhelmed by such growth.

In an effort to meet the demand, the transportation industry has overloaded the builders of covered hopper cars and the shipyards with orders for new equipment. The entire equipment-producing industry has been working at full capacity for several years, yet their effort has done little more than blunt the severity of the crisis. Today the lead time for delivery of a covered hopper barge suitable for carrying grain is at least a year and may be as much as 18 months.

Five years ago there was a market in equipment and power for the transportation of grain. Today every barge has long since been contracted for, and the new barges being built are snapped up six months before they are delivered. The demand for transportation far exceeds the equipment supply, as shown by the recent tradings in barge freight at rates between 300 and 400 percent of base.

Each mode has, in its own way, made a commendable effort to accommodate the extremely rapid increase in the demand for transportation equipment to carry grain from the farmer to the port. Since very little of the grain from the upper Midwest moves to the Gulf Coast by truck, the greater part of this burden has fallen on the railroads and the water carriers.

For some time, leaders in the grain and transportation industries have been speaking out publicly in an effort to attract attention to the crisis in the movement of grain. One of their strongest points is the preeminence of grain in countering the pattern of a negative balance of payments. These leaders are consistently urging that the grain marketers, the transportation industry, and governments join in a united effort to implement the movement of grain to the ports for export. Provincial differences, many regulations, and proprietary interests will have to yield in the interest of achieving the common objective if the crisis is to be overcome.

Coal

The most phenomenal increase in commodity tonnage is in western coal: One to three 100-car unit trains interchange with a daily 10-barge unit tow bound for power plants in Louisiana. This break-bulk occurs at the coal terminal of the Burlington Northern and American Commercial Barge Lines, Inc., in the north St. Louis riverfront area. Two more such terminals are in the planning and preconstruction stages in the bi-state region and will be capable of efficiently servicing Illinois soft coal if the demand and environmental restrictions allow it.

Petroleum

Increases in petroleum and petroleum products represent some interregional short-distance movements that complement the pipeline confluence in and north of the St Louis region. The potential of grain-related fuels is currently under investigation in the region, and "energy centers" of port industrial land use are envisioned at key riverside locations. Land options are currently being considered for gasohol plants surrounded by grain-product-related land uses. Thus, the increase in the tonnage of petroleum products is largely seen to service such energy-center concepts and yield a variety of petroleum haulages (such as raw gasoline, alcohols, and glycols).

Chemicals

Continued regional increase in chemical flows correlates with detailed regional market analyses that show St. Louis' continued growth as a center of chemical manufacturing, research, and education. The sunk cost of the facilities and highly trained personnel for the chemicals industry available in St. Louis, as well as the presence of good surface transportation for shipment of small packaged finished products, causes its growth inertia to increase.

Fabricated Metals

The growth in fabricated metals represents a regional economic demand for more labor-intensive basic industry identified in marketing studies. It is felt that the St. Louis region could absorb two or three new major fabricated-metal plants--at least one near the Central Harbor area. The presence of available raw and redevelopable land north of the Central Harbor and the pressure to reduce unemployment are behind the drive to establish this industry in the port zone. The result is the forecast of increased tonnage.

IMPACTS OF INCREASED COMMODITY FLOWS ON RIVER OPERATIONS

The above increases in regional commodity flows into and out of the Port of Metropolitan St. Louis, considered in addition to through traffic, will have several impacts on port operations that deserve careful monitoring:

1. Studies being performed for a district of the port region indicate that achieving the high-growth state discussed above will cause some 85 600 barges to be handled in a towing season in the St. Louis area. This, in conjunction with through traffic, produces the potential for congestion.
2. Fleeting in St. Louis is currently at a premium. In view of forecast growth, a fleeting management effort must be developed. A U.S. Maritime Administration university research effort is in the initial phases of addressing this problem.
3. Given the forecast potential for growth in commodity flows of coal and grain and increased use

of the St. Louis public terminals, it will be imperative to achieve maximum efficiencies in unit-train/unit-tow and joint rail-water through rates. If modes are slow to opt for cooperation, they will impede a geographic and "facilities-in-place" locational advantage for the region for the key cargoes discussed above.

CONCLUSIONS

This paper has attempted to heuristically examine some practical aspects of forecasts of key commodity flows for a regional port. Data and forecasts are taken from an ongoing port district study in the Port of Metropolitan St. Louis. The study is oriented to matching commodity flows with detailed market study and regional economic forecasts. In the current national processes of inflation, economic scarcity, altered energy use and growth incentives, and the onset of new national financial policies for water transportation, it is pertinent for individual ports to reexamine their role in the total transportation context and refine their growth strategy around unique geographic, engineering, operational, and industrial features.

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Federal Interest in Effective Transportation Use of Major River Navigation Systems

WAYNE E. CALDWELL

The essential elements of major river navigation systems and the federal interests that have an impact on their effective use are discussed. Optimal use of these systems is stressed as a national goal in these energy-conscious times. The public and federal regime in which the waterways industry must operate and specific federal programs of interest are discussed. These include channel design and maintenance, water resources management, navigational aids, alteration of obstructive bridges, regulation of movable bridges, and bridge construction permits. The commercial vessel safety program of the U.S. Coast Guard and waterways improvement efforts of the U.S. Army Corps of Engineers are outlined. Coast Guard experience in preventing and responding to incidents of oil pollution and the growing concern about hazardous-materials accidents are examined.

In the summer of 1979, I returned to Washington after serving three years as Commander of the Second Coast Guard District. This inland empire, with headquarters in St. Louis, comprises all or part of 22 states and includes all of that major inland waterway system commonly referred to as the "western rivers". The Second Coast Guard District serves all who are associated with the great rivers; however, the towboat and barge industry is its most important, and sometimes noisiest, customer.

While serving as commander of the district, I became one of the local river rats and, like my predecessors, learned a good deal about the rivers, the people who make their living on them, and the unique language of the profession, and I became more convinced than ever of the important role the rivers play in our national economy. I departed with a clearer vision of the mutually supportive roles that the industry and the U.S. Coast Guard play in this vital area and with a deep respect for the professional in this interesting industry.

Although the basic aim of the Coast Guard is to facilitate commerce on the rivers, from time to time it seems to be accused of hindering it. Perhaps this occasional opposition can be placed in a better perspective if its aim is redefined by adding a word. The aim of the Coast Guard is to facilitate "safe" commerce. Sometimes its views of what is required for safe commerce vary a bit from the views of the industry, in terms of actual need, expected results, and above all the cost to the industry in both time and money. In spite of these minor variances, the Coast Guard shares with the industry a deep concern for safety.

Perhaps, before discussing what I mean by the effective use of a major river navigation system, I should first define my terms. The dictionary says that effective means "adequate to accomplish a purpose"; however, I doubt whether any of us would be satisfied with simple adequacy. Adequacy seems, more often than not, to imply marginal performance.

I support the premise that we must demand more than simple adequacy from our river systems. To my mind, effective use implies efficient use or perhaps could even be stretched a bit to mean optimal use. This should be the goal in the management of the river systems.

Optimal use of the river transportation system is of vital importance to the nation in the present energy crisis and will be in the coming decades of energy conservation. The river system has always provided a means for energy-efficient transportation, but never before has it had such an overriding advantage. The river system is a national asset that must be exploited and optimized. We must, as a national goal, do everything possible to strengthen this system and ensure that simple adequacy is replaced by optimal use.

How is the optimum to be achieved? What are the necessary elements in providing this kind of river navigation system, and who should be involved in this optimization effort? These are the subjects discussed in this paper.

THE RIVER NAVIGATION SYSTEM

The river navigation system is made up of many items, all tied closely together: (a) towboats and barges, (b) their crews, (c) the confines of the waterway and the water in it, (d) navigation aids, (e) obstructive or hindering elements such as bridges and locks, (f) terminals, (g) the cargoes transported or available to be transported, and (h) the interface with other transportation modes. This complex system must operate in an environment of legal constraints, public concerns, and competition that affect its every move. These consist of ever-expanding laws and regulations and