

- costs of unimproved facilities
- 4. impacts on total mobility of society

Author's comments on energy implications:

1. Same as IV.

Author's comments on research needs:

1. Same as IV.

VIII. Transportation, Land Use Control, and City Forms

- A. Transportation system influences social and economic development of urban society
 1. short run: shifts in trip making
 2. long run: choices of residences and work places
- B. Systems analysis to coordinate land use, urban development, transportation, and well-being
- C. Construction has massive impacts for good or bad
- D. Urban center is mass of complex relations among people, functions, and subareas
 1. desires and needs of families and individuals
 2. mechanics of functioning of urban complexes
- E. Research in human and social sciences and urban design and living

Author's comments on energy implications:

1. Both short- and long-run changes to increase energy efficiency.

Author's comments on research needs:

1. Research on energy and other consequences of substitutes for transportation, such as telecommunications and land use changes.
2. Behavioral research on responses to energy conservation measures.

IX. Transportation and the Environment

- A. Air pollution from the automobile is a health problem
 1. design improvements and traffic restraints to reduce pollution
 2. develop inexpensive, effective clean engine
- B. Construction of new facilities
- C. Noise
 1. health and physical standards for exposure
 - a. highway construction
 - b. highway facilities in use
 - c. airports
 - d. railroads
 - e. other
 2. measure noise levels
 3. design barriers to alleviate noise

Author's comments on energy implications:

1. Design improvements and traffic constraints generally conserve energy as well as increase air quality.
2. In some cases, need trade-offs between energy conservation and air quality.

Author's comments on research needs:

1. Research on complementarities and trade-offs between energy conservation and air quality.

X. Transportation Safety

- A. Highway travel has highest accident and fatality rates
 1. safer designs
 2. safer methods of operation
- B. Other modes much better but could and should be improved

Author's comments on energy implications:

1. 55 mph speed limit has saved lives and conserved energy.
2. In other cases, need trade-offs between energy conservation and safety improvements.

Author's comments on research needs:

1. Evaluation of the energy conservation and safety benefits of the 55 mph speed limit.
2. Research on complementarities and trade-offs between energy conservation and safety.

HOW A SHIPPER SEES SOCIAL, ECONOMIC, AND ENVIRONMENTAL RESEARCH NEEDS

William K. Smith

Vice President, Transportation, General Mills, Inc.

Before I get started, why don't you all stand up for a minute. And while you are standing, I would like to ask some questions. How many of you are from state or local transportation agencies---just raise your hand. How many of you are from federal transportation agencies? How many from universities? Private consultants? None of the above? Okay.

I represent a group of people---I shouldn't say represent---I am a part of a group of people who seldom appear before this type of audience. You don't know them, and they don't know you. That is a generality, but I think it would be fairly applicable, and that is the so-called "shipper." Some people refer to the buyer of transportation services from the railroads, airlines, truck lines, whatever, as a shipper. Some people refer to us as the "users" of for-hire transportation services, regardless of the mode. Along with being users of for-hire truck lines, railroads, airlines, and so forth, many of us operate transportation systems. Most of the large barge lines are operated by private companies; they are private barge lines. Most of the domestic ships on the Great Lakes are privately owned and operated. Many of the truck fleets are private truck fleets; they are not common carrier operations. All of the railroads basically are common carriers, but there are several hundred small railroads that are owned by companies such as paper companies, steel mills, coal companies, and so forth, and some of those railroads are not very small. The Bessimer and Lake Erie, for example, is a fairly large railroad and it is one of many railroads owned by U. S. Steel. So the "shipper" or the "user" of transportation is involved in just about everything except building highways, and they do build pipelines. Many of the pipelines are private pipelines, and the company that operates them is a "shipper" or "user," as well as being a private pipeline.

There is a directory in the field that publishes the names and positions of people who have jobs such as mine. And I think in that directory there are about 11,000 companies identified, and there are about 30,000 people who have some such title as Director of Transportation or Private Truck Manager or Director of Traffic. That word "traffic" is different from the meaning that a lot of you give it, if you are in highway administration. To a highway administrator, "traffic" is an entirely different world from "traffic" in a company such as General Mills where it involves economic aspects of transportation such as the pricing of transportation.

But there are about 30,000 of my peers floating around in the country, and very, very few of them have anything to do with transportation research and development and long-range planning, other than those who are involved in the long-range planning elements of their employers. But almost none is to be found in the National Research Council or any aspect of it or in any parts of the Academy of Engineering. I am on the Executive Committee of the Transportation Research Board, and I suspect I am the first of my peers who has ever been there so we are probably a strange breed to most of you, perhaps in more ways than one. Therefore, I am going to take a few minutes to describe what "shippers" do and then get into some issues that may be of interest as future research and planning possibilities in the areas of society, economics, and environment.

One of my responsibilities is to buy transportation. I buy it from the common carrier modes of transportation---almost all modes of transportation. Sometimes, if for various reasons we do not find that the common carrier has the service or price that we are looking for, we establish our own truck line or barge line. Or sometimes we will affiliate with other companies and set up some sort of association, of which there are various types that can combine their interests and become involved in transportation services.

Our transportation procurement is not just for freight; it also is for people. This is not true of all these particular jobs, but it is still a fairly common thing to have a responsibility for the transportation of people in your company. It might be the salesman's automobile, of which there can be many thousands in some of these companies. It might be paratransit, such as the "commute van." The commute van began in Minneapolis-St. Paul at the Minnesota Mining and Manufacturing Company, and the idea was quickly copied by General Mills and Honeywell and other people in that area, and then was picked up around the rest of the country. That is a people transportation kind of thing that managers in my kind of work become involved with.

We are interested in the safety of people in transportation. It may surprise you to know that one of the more frequent things I do in my government contacts is to work with the Federal Aviation Administration on safety of commercial transportation, and not for my own hide. I am on an airplane two or three times a week, but my safety concern also is for the many thousands of other people in our company who are traveling on airplanes. And there have been times in the past when we have said you can't fly on that particular airplane or you can't fly with that airline.

We, the kind of company that I represent, are nontransportation companies as distinguished from the railroads and truck lines. Our primary business is not transportation. Our primary business is doing something else, and transportation is something we use to facilitate a nontransportation business.

There are some companies who are transportation

users who also are transportation suppliers, such as General Motors. General Motors is probably the largest user---other than the federal government---of transportation in this country. I think they buy more than \$2 billion a year worth of transportation services from the railroads and truck lines. And at the same time, though, they are a supplier to the carriers. Their whole business is supplying transportation except for their appliance business. They are either supplying automobiles, or they are supplying trucks, or they are supplying electro-diesel locomotives, or they are supplying turbine engines for the aircraft industry. That is a unique kind of company---in that most shippers are not major suppliers to the transportation companies. The context in which I speak to you is that of the non-transportation company buying from, rather than selling to, the transportation systems. And that context flavors my comments.

My comments also are flavored by the fact that for the last three years I have been working with an organization called the United States Railway Association, which was the planning group for restructuring the bankrupt railroads in the northeast, which set up what is called Conrail, and which is now a banker to Conrail as well as to a couple of other railroads. That flavors some of my thinking.

So with those things in my background, how do I as a shipper see some of the future research needs in social, economic, and environmental areas?

I look not so much at new things as how to make better use of the things we now have. There are major elements within the transportation system that are very, very poorly utilized, and not many elements that are well utilized. There are degrees of utilization, and when you look at something like United Parcel Service, you can put that on the high end of the spectrum on efficiency and utilization of their resources. And you can look at some elements of the railroad industry and can put them down at the other end of the spectrum on efficiency and productivity.

In how well we do things in transportation, I am going to throw out a word that you probably haven't run into too much and that is "reliability." I think the most critical factor in transportation from a freight viewpoint in this country right now is lack of reliability within many elements of the system. I am not going to get into all the details of the measures of reliability. But in generalities, to some people "reality" is being there on time. To some people it is having the vehicle available to start the cycle to be there on time. Reliability to the Association of American Railroads includes "freight car productivity." Over the last several years, the Association of American Railroads has been conducting a major research effort with substantial funds from their suppliers and from the Federal Railroad Administration in DOT. That research program is keyed into reliability.

Dr. Harris, who came from outside of the railroad industry and who now heads up the Association of American Railroads' research and test activities, did not know much about the railroads. So one of the first things he did was to find out something about the needs of the railroads' customers. His customer contacts suggested that a lack of reliability in the railroad system was the greatest weakness of the system. Harris has begun a lot of programs, with support from people outside the industry and from the federal government, which are designed to improve reliability. Improving reliability is not only the fairly obvious on-time arrival at destination of the freight car, but it ties into another word that was mentioned a moment ago---"utilization."

There is probably no asset in this country poorer utilized than the railroads' freight car investment. There are something like \$15 billion in freight cars in this country, which is up about 700 percent over what it was 20 years ago. Part of that is inflation, but a large part of it is also more complex and more specialized freight cars. The approximately \$15 billion invested in freight cars is about the biggest single asset element of the railroad industry. And it is a very, very poorly utilized piece of change. Until it is better utilized, the railroads (as an industry) are going to be the financial disaster that you keep reading about in the media.

So there is and must continue to be research for the railroad industry on "reliability" and on "improving utilization of the freight car."

There was a recent study made for the Association of American Railroads, which study I don't think has been released yet, on reliability. Actually the study was not of reliability; but it was a study of the literature pertaining to railroad reliability: what has been in the universities on this subject of reliability, what has been done in the institutes on reliability, and what has been done in the railroad industry itself. And thus the study's report is largely a bibliography on everything that has been published on "reliability." And from the bibliography, there is a conclusion, and I am paraphrasing---that it is almost negligent as to how little railroads know about the importance of reliability to their customers.

"Reliability" also applies to other modes of transportation---but within different performance measures. The railroads might talk about good reliability, if the shipment arrives within a day or two of a specified date. To the truck line, arrival is probably measured against the day, or it might be the hour. With Federal Express on United Parcel Service, the measure of arrival could be the hour. So you have different levels of performance measure for different modes.

The reliability of railroad transportation is jeopardized by the complexities of the "train-operations system": the track (and roadbed), the freight car, the locomotive, the train, the train crew, the geography and climate.

The railroads have known much about each of those elements of the train-operations system. But they have found that they do not know enough about the relationships and interactions between these elements.

The Association of American Railroads' Track/Train Dynamics Research Project is directed at learning more about the interactions between the elements of track, car, locomotive, train, crew, and environment. The project is being assisted by FAST, Facility for Accelerated Systems Testing, at the Federal DOT Research Center in Pueblo, Colorado.

The FAST program includes the operation of a freight train hundreds of miles each day, in a controlled situation, using a variety of track and freight car components.

In one year they will duplicate 10 years of very high level usage, and this is in many respects similar to the highway tests in Maryland, Illinois, Idaho during the 40's and 50's and the early 60's. The railroads are quantifying like the highway builders a couple of decades back, what is going on inside of that roadbed, those ties, and that steel. Again the research is tied into reliability; it is tied into safety; and it is tied into economics. And shippers, if they have any interest in research and development and use the railroads, are pushing those programs very heavily because we are interested in such things as keeping the train on the track. We are interested in avoiding paying for the trains that go off the

track. We pay for such accidents in our freight rate.

Our company has a plant in Lodi, California, which is a fairly large plant, and it has shipped a lot of business over the Southern Pacific Railroad. In a year, we will pay the Southern Pacific about \$3 million for rail services to and from that plant, a major piece of money. That also is big income to the Southern Pacific. A year ago, in one Southern Pacific freight train derailment (it didn't involve any of our freight) a train with almost new locomotives, with freight cars all of one kind (mechanically refrigerated cars), on beautiful track (some of the best maintained track in this country) with about 80 or 90 cars in the train, most of them ended up in the ditch, and there was something like \$2 1/2 million damage to the train and the roadway, and God knows what the damage was to the merchandise. That derailment cost that railroad as much as (if not more than) we paid the railroad for one year's services at a major shipping facility. And it was a derailment with "suspected" but not conclusively identified cause. The railroad is going to get the cost of the derailment back from everybody that uses that railroad, and we can't afford any railroad having those kinds of accidents, so we are very much interested in research programs directed at identifying and preventing whatever caused such "mysterious" derailment.

As a shipper and user of transportation, I am very much concerned about the lack of good data in transportation. I am very much concerned about the lack of good costing techniques in transportation. Improvements are being made---Congress has passed legislation which requires the Interstate Commerce Commission, for example, to improve its costing techniques, which techniques have been part of the problem. I am not certain that sufficient improvement is going to come forth, but at least an effort is being made. Transportation Research Board---or the National Research Council---recently held a meeting in Washington on transportation data: what is needed; how do you get it; how do you maintain it?

When you get down to the decision making that I have to make and my peers have to make; when you get down to some of the decision making that Congress has to make on "railroad versus truck" issues pertaining to the allocation of federal money to the transportation system, the data is almost irrelevant, and it is not timely.

Studies that have been made by the highway departments gathering up data on what goes from A to B is too gross, and it is almost of no use to the kinds of questions that are before the shipper, before the common carrier truck line, and before the ICC. "Data" (availability, storage, retrieval, timeliness, etc.) is an area for research.

I am very much worried about the maintenance of the transportation infrastructures we have in this country. One of the previous speakers referred to the fact that we built the system. We have the legs from A to B to C, and I agree. But there are parts of it rapidly wearing out, and even if the Federal Highway Administration is wrong, or the Minnesota Department of Transportation is wrong on some of their estimates of needed maintenance and rebuilding, even if they are only half right, or only one-third right, I am very much concerned about the seriousness of the deterioration of the highways and railways. My concern comes from my recent experience with the railroad in the northeast. For years I have prided myself on being better informed than most of my peers, but I completely overlooked, during the 1950's and 1960's, a fact that I had thrown at me in 1974

when I was put on my railroad job at the United States Railway Association. This is not a very glamorous subject, but it is pretty basic. Up until 1955 the railroads---and I am talking about railroad ties which are comparable to concrete in the highways and the surface under the concrete---up until about 1955 railroads had been putting 50 million new ties a year into the railroad system. Then the replacement rate started to go down, and it got down to about 15 to 20 million through almost 20 years, and I didn't pay any attention to that, and I don't think many others paid any attention to it. Now the tie replacement rate is going back up. It is up to 20 or 25 million ties a year, but the basic physical foundation of the railroad system, the ties, except for some railroads, has gone to rot. And now it is going to be replaced with 1977 prices, in which ties cost \$12, \$14 apiece, and if they had been properly replaced during all of those years, there wouldn't be so many to replace at today's inflated prices.

I think the same invisibility is happening in the highways and the bridges. In Minnesota, our highway department said we should spend \$100 million a year for the next 10 years just to repair bridges. The legislature gave them \$50 million. I believe it would be absolutely criminal if the physical condition of our highway system ends up the same way the railroads did. Remember that almost no one that I can recall during 1960, 1965, 1970, 1975, was really saying---look at railroad tie maintenance; they are not putting 50 million ties a year in. They are down to 15 million per year. You can probably defer that maintenance for a few years and it doesn't make much difference, but it happened for 20 years with the railroads. Is it also now happening with the highways?

There are a couple of books that I think you ought to get hold of, because as a shipper I think they contain more information on future transportation research than most other publications. One is a Transportation Research Board book of about two years ago that publishes all the papers at a Woods Hole conference in 1975. (Railroad Research Study, Background Papers, July 1965) There is a summary that is coming out, a condensation rewrite of all those papers. I think you ought to get ahold of the original book, the papers that were presented. It is oriented mostly to railroads but there are chapters on trucks and barges and economics, you name it, all subjects that relate to transportation. The bankers are talking about financing, labor is talking about labor, the professors are talking about education. It is all in there, and I think you ought to have that book.

Another book (that you probably can't get) pertaining to future transportation research is National Transportation Trends and Choices which the Democratic Administration doesn't like. They have banned this January 1977 Federal DOT book, but there are a few copies around. This book is not the end result, but it is a good first step to what might have been a fairly broad base planning effort in this country on transportation, but you can't get it right now.

So the shipper in transportation is very, very much interested in research programs oriented toward improving reliability of transportation modes which, in turn, permits improving the utilization of the modes, which in turn is better productivity, which in turn may help us not pay quite so much money, or give us a better transportation result, a better payback from transportation. And I think we recognize that data and costing weaknesses in this area are going to be detrimental to some of the decision making on what do we research and develop. And

finally, you all have a Transportation Research Board handout called the Ten Most Critical Issues in Transportation. (The Ten Most Critical Issues in Transportation are discussed in Carl Rappaport's paper in this circular.) I worked pretty hard on this one. There is a lot of stuff in here that I put in as a shipper. So if you want the broad brush thing on what one shipper thinks, there is a lot of it here, which is an Executive Committee publication. Thank you.

SOME SOCIAL, ECONOMIC, AND ENVIRONMENTAL RESEARCH NEEDS

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I would like to just raise a couple of propositions with the hope of opening a conversation with you about them. It is my thesis that we are at a turning point in the history of transportation developments in these decades. And I think we can identify at least four major shifts that seem to be long-term in character and that are probably going to be shaping our research and policy agendas through the 1980's. Let me just enumerate those four and then make a few comments about each of them.

First, despite the backlog in highway developments we have been hearing about, I think that job is nearly done. After a century-long effort to bridge this continent, we have now nearly finished the job. The big civil engineering projects to build initially a rail network and then a road network across the country has now connected every place to every other place, or nearly so. And so, having completed that job, we are now groping for ways of making that transportation network work better. Engineering styles of design and construction are having to be supplemented by other styles, and so we are seeing the introduction of new kinds of people into the transportation planning and management business---economists, lawyers, environmentalists, and sociologists, peculiar types.

Second, the concern for efficiency, which has dominated the transportation planning and management business for so long, is now being supplemented by a concern for equity. And we have been hearing some of the echoes of that in these last two comments.

Third, the powerful role that transport has always played in shaping land use patterns and in locating cities may now be ending. I will have more to say about that in a moment.

And fourth, the decline in public transit services is leaving a large gap, and we don't know quite how to fill it. We have been groping to find a successor to the old public transit systems, and we haven't known where it is. For awhile, we thought the successor was likely to be rail rapid transit systems, and so far at least the experiences in San Francisco and Washington are not encouraging. For awhile we thought it was going to be personal rapid transit (PRT) and/or dual mode. Now it looks as though PRT and dual mode are somewhere down the line sometime later. Some of us are optimistic about the prospects for paratransit, particularly for using automobiles as public transit vehicles, and some experiments are underway in those realms, as you know. Others are optimistic that pricing