

AGENCY FOR INTERNATIONAL DEVELOPMENT  
 WASHINGTON, D. C. 20523  
**BIBLIOGRAPHIC INPUT SHEET**

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*Batch 72*

1. SUBJECT CLASSIFICATION	A. PRIMARY Development and economics	DP00-0000-0000
	B. SECONDARY Transportation	

2. TITLE AND SUBTITLE  
 Transport research program, final report

3. AUTHOR(S)  
 (101) Brookings Institution, Washington, D.C.

4. DOCUMENT DATE 1967	5. NUMBER OF PAGES 19p.	6. ARC NUMBER ARC
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7. REFERENCE ORGANIZATION NAME AND ADDRESS  
 Brookings

8. SUPPLEMENTARY NOTES (*Sponsoring Organization, Publishers, Availability*)  
 (Research summary, 1962-1967)

9. ABSTRACT

10. CONTROL NUMBER PN-RAB-748	11. PRICE OF DOCUMENT
12. DESCRIPTORS Development Economic integration Surveys Investments Models Transferring	13. PROJECT NUMBER
	14. CONTRACT NUMBER Repas-5 Res.
	15. TYPE OF DOCUMENT

PAU  
380.5  
B 872a

Depos-5 P20.  
Brookings  
PN-RAB-948

FINAL REPORT

Transport Research Program

June 12, 1967

The Brookings Institution  
Washington, D. C.

June 12, 1967

The Brookings Transport Research Program

A Final Report

The AID-supported Transport Research Program at Brookings has completed a five-year examination of the role of transport in development.

The impact of transport investments was evaluated in Latin America and Southeast Asia.

Comprehensive country studies of the role of transport were made in India, Colombia, and Ghana.

Regional transport requirements for economic integration were assessed in South America, South Central Africa, and the Middle East.

Specific transport technologies were analyzed, including port facilities, railways, truck transport, and international airline operations.

The relation of transport to other sectors was explored, including food production, urban planning, energy resources policy, and communications.

Experience in developed countries was reviewed, including the United States, Western Europe, and the Soviet Union.

Methods for improving transport operations were developed, including techniques of project preparation, transport system planning, financing, regulation, and other aspects of public policy.

A transport model was created to assist developing countries in estimating transport requirements and in selecting appropriate transport technologies through simulation techniques.

An education program was conducted through the seminars and workshops at Harvard, by the involvement of approximately fifty professionals in the research program, and by direct assistance to individual countries, international organizations, AID contractors, and visitors from developing nations.

A publications program has provided world-wide distribution of books and reports to government agencies, libraries, universities, and public officials.

## The Principal Conclusions

Transport is an essential ingredient of almost every aspect of development, and should be an integral part of investment programs in agriculture, industry, and other sectors. Viewing transport as a separate problem has resulted in costly mistakes in the choice, timing, location, and design of projects. This has often reduced the potential contribution of transport to economic and social progress.

Transport as an input to other sectors is part of a package of things that need to be done to improve living conditions. When these other contributing factors necessary to development are present, as they sometimes are, transport alone can have an effective impact. When they are not already present, transport improvements may induce them. But very often measures to assure the success of transport undertakings will have to be specifically provided for.

The best general rule is always to tie transport projects or programs to specific development objectives, and to use transport as a means to solving other problems. The fact that transport is poor is no reason to improve it. What counts is whether making it better will permit needed accomplishments in agriculture, industry, or elsewhere, and whether the combination of transport and related investments will yield a net contribution to the economy as great as could be achieved by applying the same resources for other purposes.

There are some transport requirements that follow obviously from decisions in other sectors. The building of a pipeline network for the distribution of natural gas is an example. The construction of rail and port facilities capable of handling large volumes of iron ore for export is another. The same obvious relationship between transport and economic activity can be seen when traffic bottlenecks dictate the need for relief. The problem under these circumstances is one of determining priorities, and of making the right technological choices.

Project analysis of transport alternatives in such cases involves a high degree of professionalism and the use of correct analytical techniques. While AID has made improvements in its handling of these problems, much staff training is still required if AID work is to provide a solid underpinning for decisions on loans and grants.

In addition to typical and obvious problems, there are relationships between transport and economic activity that are more complicated and more obscure. These in our judgment are the areas in which more

attention to transport requirements can be expected to make the most significant contributions to the development process. The first of these is the relation between transport and world food supply.

### Transport for Food

Raising more food once involved simply moving to new land, and most food was eaten where it was grown. The picture has now changed. The supply of new land is disappearing in most parts of the world, and the principal way to get more food is to transport fertilizer and other inputs to farms where more can be grown on land already in use. And since increasing numbers of people live in cities, surpluses have to be moved from rural areas to urban consumers. As a result, the extension of commercial agriculture throughout the world will depend on heavier traffic in both directions.

But agricultural productivity will not be increased to an important degree where access roads are impassable or nonexistent, where transport costs are high, and where ability to get to market is uncertain. Under these conditions there are neither the means nor the incentives to produce a surplus.

Transport is an input to agriculture, along with fertilizer, seed, credit, and the other ingredients of food production. This means planning and organizing transport programs jointly with agricultural and rural development programs, including not only roads and vehicles but fertilizer and other inputs, credit, storage, food processing, and technical services. The success of transport proposals in agricultural areas is measured in output and in the realization of community goals.

Nearly everywhere a by-product of improved transport for agriculture is the gradual transformation of rural society itself. Changes in the cropping pattern that raise income per acre introduce a greater variety of consumer goods, more frequent travel to the nearest town, medical and veterinary services, electricity, postal service, newspaper delivery, the extension of bus routes, the improvement of local teaching staffs, and access to more distant high schools. These transport-induced social changes all contribute to the commercialization of agriculture.

The lesson for national planning and foreign assistance efforts is this: that programs to improve access and mobility in rural areas are essential to the modernization of agriculture. For the breakdown

of isolation is essential to the introduction of new techniques and for the conduct of programs to improve health and education, and to change attitudes. Transport improvements provide the regional communications network that links the rural population with progress stemming from the urban-industrial sector.

### Improving Communications

For the large percentage of the world's population that is rural, telecommunications now offer alternative means to achieving many of the goals once entirely dependent on transport. Foreign assistance efforts need to reflect this revolutionary technological breakthrough. A century ago transport and communications were the same thing, because people communicated by transporting messages. With the development of transistor radio and television, however, we have the opportunity to overcome in a very short time-span many of the severest penalties imposed by rural isolation.

Wherever there are radios, people have more awareness of their environment and are more willing to undertake community projects. Instant communications by television provide the added opportunity that people of all ages can be brought into visual relation to the world and its store of knowledge. Satellite repeater systems to reduce the cost and speed the communications revolution make clear that electronics can assume part of the function of the transport system, and that resources invested in overcoming distance and isolation by radio and television promise a high payoff.

The very large sums allocated to transport by developing countries and by aid-giving organizations, together with frequent examples of the low returns from marginal transport projects, suggest a reallocation of resources. The transfer of ten percent of the transport budget to telecommunications investment could make a more immediate and probably a far more effective contribution to development in most countries today.

### Transport and Urban Congestion

After food, the most important of man's material needs are jobs and shelter. Expansion of the urban-industrial sector continues to outstrip total population growth, and the big cities are growing fastest of all.

The result is overcongestion, slums, high infrastructure costs, and the substitution of urban unemployment for rural underemployment.

The possibility that industrialization will continue to focus on a limited number of super metropolitan centers compels attention to feasible alternatives. The need is for less costly sites for industry and less degrading conditions of living for industrial workers. The present trend will result not only in intractable cities, but in an ever wider gap between a few urban-industrial enclaves and a vast rural hinterland. Both the city and the country will be victims of the failure to introduce more desirable spatial arrangements.

New technology, especially in transport and communications, now makes it possible to plan an economically and socially more desirable pattern of urbanization. Air and highway transport are agents of dispersal rather than of concentration and congestion. Many sites at a locational disadvantage in an age dominated by rail and water movement can flourish on the much larger network of routes served by motor vehicle and aircraft. Telephone and radio reinforce this changing picture.

The diseconomy and unrest of the slums and the new technology that can help to avoid them suggest that developing countries consciously plan and build an economically and socially better urban future. This will involve land use planning, new tax policies, regulations and financial incentives designed to avoid overconcentration, and the necessary infrastructure planning, including transport.

Just as transport programs have paid too little attention to the needs of the farmer, they have neglected the opportunity to contribute to the economic viability of the urban-industrial sector. The ways to solution lie in combining transport investment with other public services to create viable settings for industrial growth. The opportunity afforded by modern transport and communications is to focus new industry in medium-sized communities rather than in already overextended high-cost metropolitan complexes, using relatively low-cost intercity transport connections to take advantage of space. The outcome will help to introduce modernization and economic opportunities over wider areas, and to forge additional links between rural and urban populations.

## Reducing Transport Burdens

Industrial location and urbanization planning open up the broader subject of how technology may help to avoid the creation of unnecessary transport burdens. Today in developing economies every one percent increase in national output is accompanied by at least a 2 to 3 percent increase in freight transport. As a result, a heavy proportion of resources is being dedicated to transport. In much of the developing world, 20 to 30 percent of total public investment is allocated to this purpose.

This used to be true of the more developed countries, also, but it is no longer the case. In these countries a one percent increase in national product involves no more than a one percent increase in what has to be moved, and sometimes less. The objective of transport and other policies should be to approach these same conditions in less developed countries as rapidly as possible. For by reducing the volume of freight movement for a given rate of growth it will be possible to release resources to meet other urgent needs.

One way to do this is to reduce the cost of transport by selecting the appropriate technology, and by designing transport to achieve specific goals in other sectors that promise a good return. The other way is to reduce the need for transport where this can be accomplished economically through scientific innovations.

Energy policies indicate one approach to reducing transport demand. Often coal traffic can be reduced and energy supplied more cheaply by shifting to petroleum or gas that move cheaply by pipeline. Long-distance transmission of electric power also permits the location of generating plants close to sources of coal, and the use of nuclear power will virtually eliminate the need for transporting fuel. Other possibilities of reducing transport burdens include the processing of agricultural produce close to the source and the construction of adequate storage.

The conventional approach to planning transport improvements is not sufficiently goals oriented to identify the opportunities for transport-saving solutions. For the question generally asked is how can adequate transport be provided, when the basic question is how can food, shelter, energy, or education be provided, and what approaches to the transport problems involved will contribute most to the outcome.

## Economic Integration

Transport can contribute to economic growth by facilitating regional developments that permit greater specialization and trade. Countries and regions once forced to seek self-sufficiency are now able to exploit their comparative advantages and exchange their products with neighbors.

Today regional and national boundaries have been erased by the speed and economy of modern transport, and the advantage of economic planning on an international scale is increasingly evident.

The establishment of transport connections is one of the pre-conditions of economic integration. Trade among South American countries is still only about ten percent of their vital world trade, and while there are many logical trading partners on the continent, only a few have even fairly good transport links.

The advantages of specialization and trade can now be realized through modern transport and communications. The new technology has opened the way to common markets and has made possible joint production arrangements on a global basis. Development plans need to take into account the mutual benefits to be realized through greater accessibility and complementary programs of industrialization and agriculture.

## Needed Institutional Arrangements

More effective institutional arrangements are needed to guide the application of transport and communications technology to the task of economic development. This objective could be accomplished through the conduct and support of research, education, information exchange, and technical assistance in the field of transportation as it relates to development.

At home, the Agency for International Development can now turn for help to the newly established Department of Transportation. For the first time an agency of the federal government is concerned with total transport systems and can provide a focal point for the consideration of overall transport problems. Brookings has made available staff assistance and relevant materials to help in the initial stages of setting up staff and program for carrying out the technical assistance work that AID operations call for.

The new Department of Transportation should be able to provide AID with a much higher quality of advice and assistance, the necessary research back-stopping, as well as better facilities for transport and development education. The new Department should be able to act as an intermediary in getting AID-sponsored transport research accomplished through the Department's own agencies and its connections with industry and the universities. The Department should also be able to help in assuring appropriate contacts and inspection trips for foreign transport officials, in strengthening university training for students from abroad, and in identifying individuals and firms in the United States having the desired qualifications for AID transport work abroad. While the Brookings program attempted to carry out some of these functions, the magnitude of the demand clearly calls for a systematic effort by the U. S. Government itself.

Finally, the United States should take the initiative in encouraging the improvement of transport assistance to developing countries through international agencies. The United Nations Organization and individual foreign countries are acutely short of personnel, research and planning capabilities, and educational facilities to aid in the task of improving transport. The Brookings program made staff available and performed special studies to assist such agencies as the Economic Commission for Asia and the Far East, the Economic Commission for Africa, and the governments of India, Colombia, the Sudan, and other countries. Also, following their assignments at Brookings, staff members have taken posts in Brazil, Chile, and other countries, and with AID and the World Bank. However, it has not been possible to respond to more than a fraction of the requests for help.

The magnitude of current efforts to modernize transport throughout the world is growing. A systematic effort is needed to assess this experience, to improve planning techniques, to provide a clearing house for exchanging and disseminating relevant ideas and information, to support the necessary educational and research programs, and to expand the acutely scarce supply of competent transport advisers in the development field.

Particularly unfortunate is the situation of the United Nations and its regional commissions and development institutes. Lack of budget and personnel makes it impossible to carry out more than a very limited effort. The technological innovations that are doing the most to bring about a more close-knit global community are not being imaginatively applied to support the increased demands for higher levels of living.

Transport technology should be made to support food production efforts, to help overcome rural isolation, to narrow the gap between rural and urban societies, to reduce costs of production, to extend the benefits of specialization and commerce, and, together with communications, to move information and ideas. It is our conclusion that the United States should take the lead in helping to establish the necessary world transport center, affiliated with the United Nations, to serve these urgent needs.

Wilfred Owen  
Director,  
Transport Research Program

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Koichi Mera, Efficiency and Equalization in Interregional Economic Development

Paul O. Roberts, Transport Planning: Models for Developing Countries

Hrishikesh Vinod, Variable Tests and Non-Linearization of the Leontif Input-Output System

### Advisory Services

Orientation meetings have been provided for consultants leaving on transport survey missions as requested by AID and AID contractors.

Seminars on transport economics have been conducted at the World Bank's Economic Development Institute, the Yale Growth Center, the Economic Commission for Asia and the Far East, the Asian Institute of Economic Development, the Indian Planning Commission, the University of Los Andes in Bogota, and at Northwestern, Syracuse, and other universities.

Transport projects of interest to AID have been reviewed by the Brookings staff for the Sudan, Gabon, Burma, Tanganyika, Nigeria, Sierra Leone, Central America, and Turkey-Iran.

Special staff assistance has been made available to the Harvard Advisory Service in Dacca and Karachi, the National Council of Applied Economic Research in New Delhi, the IBRD Economic Mission to India, the Economic Commission for Africa, the White House Conference on International Cooperation Year, the AID-sponsored Kanpur Seminar, and the President's Science Advisory Committee Panel on World Food Supply.

In connection with work on macroeconomic and transport simulation models at Harvard, work has been carried out with AID and Lockheed International on applying a transport model in the Sudan, with IBRD on application of the models in Colombia, and with other groups in applying parts of the Harvard models to Somalia and Israel.

## TRANSPORT RESEARCH PROGRAM PARTICIPANTS

June 12, 1962 - June 12, 1967

### Advisory Committee for the Transport Program

- |                   |   |  |
|-------------------|---|--|
| Carl F. Christ    | - | Johns Hopkins University                                 |
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George W. Wilson  
Martin Wohl

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### Research Associates

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Nuhad J. Kanaan  
Martin S. Klein  
Brian V. Martin  
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