PRELIMINARY - NOT FOR
QUOTATION OR ATTRIBUTION

THE IMPACT OF TRANSPORT ON DEVELOPMENT

by

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I

Introduction: The Importance of Transport

The overriding economic problem of the next several decades is to find effective techniques for accelerating economic growth in underdeveloped nations. That this is a complex endeavor is obvious from the fact that after almost twenty years a satisfactory understanding of the development process seems to be as elusive as ever. Although economists and policy-makers have learned a great deal since the early postwar period, there is now a keener awareness of the nature and magnitude of the tasks required to accelerate the pace of economic progress.

Despite all of the difficulties so far encountered, most analyses of growth still focus on the need to raise the proportion of national product devoted to capital formation. However, skepticism is growing, and some writers have noted the general lack of clarity that shrouds the so-called "savings-centered" approach. _/

_/ The general irrelevance of contemporary, Western, aggregative analysis to the problems confronting most poor countries has been neatly summarized by Dudley Seers in "The Limitations of the Special Case," Bulletin of the Oxford University Institute of Economics and Statistics, May 1963, pp. 77-99. This is further elaborated and more fully examined in the forthcoming volume by Gunnar Myrdal and associates, to be published by The Twentieth Century Fund of New York.

If there is any relationship between capital formation and economic growth, there must be some relationship between an important component of capital formation and growth. Indeed, it may even be that the composition of an aggregate is more significant than the magnitude of the aggregate itself. There is thus some utility in an analysis of evidence that is substantially disaggregated. An approach following Rostow's "organized disaggregation"_/

_/ W. W. Rostow, "Some General Reflections on Capital Formation and Economic Growth," National Bureau of Economic Research, Capital Formation and Economic Growth (Princeton University Press, 1955), pp. 635 ff.

(not disorganized aggregation as sometimes occurs) seems long overdue.

Why Transport?

Attention to any one of a variety of components of capital might be profitable. Many of them, such as education, referred to as "investment in man," have already been subjected to close scrutiny. Among physical assets, however, the significance of transport looms very large indeed.

In developed countries such as the United States, Canada, and Western European countries, investment in transportation facilities constitutes about 10 to 14 percent of annual gross domestic investment._/ A rough estimate

_/ For Western Europe, see J. F. Dewhurst and Associates, Europe's Needs and Resources (Twentieth Century Fund, 1961), Table 14-9, p. 457. Canadian estimates from National Accounts, Income and Expenditure 1962 (Ottawa:

Dominion Bureau of Statistics, 1963), Table 25, p. 40. U. S. estimates from J. F. Dewhurst and Associates, America's Needs and Resources: A New Survey (Twentieth Century Fund, 1955), pp. 1009-1021.

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for Canada suggests that the value of the capital assets in transportation amounted to almost 17 percent of total gross capital stock, both social and industrial, in 1955._/ In underdeveloped countries, the proportion of total

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_/ William C. Hood and Anthony Scott, Output, Labour and Capital in the Canadian Economy, A Study Prepared for the Royal Commission on Canada's Economic Prospects (Ottawa, February 1957), Chapter 6, Appendix B.

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public expenditures devoted to transportation and communications generally ranges between 20 and 40 percent._/ Similarly, 20 percent or more of total

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_/ For details, see Wilfred Owen, Strategy for Mobility (The Brookings Institution, 1964), Table 3-1, Chapter III.

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developmental loans made by various United States lending agencies were for transportation investments._/

_/ For details, see ibid, Appendix Tables XIII-XVI.

Therefore, one reason for singling out the transportation sector is its relative importance in virtually all countries. As an important absorber of scarce resources, ill-timed, misdirected, or misplaced investment in transportation can have a serious impact upon the whole economy. This is especially the case since much investment in transport is large, indivisible and long lasting; hence it can tie up vast amounts of resources for long periods of time.

But a more important reason for stressing the role of transportation is the frequent assertion that, at least in the early stages of development, it is the key sector. E. K. Hawkins asserts that "the one sure generalization that can be made about the underdeveloped countries is that investment in transport and communications is a vital factor."_/ Christopher I. Savage states that the

_/ E. K. Hawkins, Roads and Road Transport in an Underdeveloped Country (London: Colonial Office, 1962), p. 26.

influence of railroads in United States development "can hardly be over-emphasized; agricultural and industrial development and the settlement of the west would scarcely have been possible without it."_/ Similarly, W. W.

_/ Christopher I. Savage, An Economic History of Transport (London: Hutchinson, 1959), p. 184.

Rostow claims that the railroad was "historically the most powerful single initiator of take-offs." Again, "the preparation of a viable base for a modern industrial structure requires that quite revolutionary changes be brought about in two nonindustrial sectors: agriculture and social overhead capital, most notably in transport."_/ Many other examples in a similar vein could

_/ W. W. Rostow, The Stages of Economic Growth (Cambridge University

Press, 1960), pp. 25, 26, 55.

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readily be given.

Indeed, one reason for the high percentage of transportation in the total investment or capital stock picture are these views regarding its significance. They are reinforced by the fact that a transport base was created prior to, or coincident with, rapid growth in western industrial nations. Ever since Adam Smith argued that the "division of labor is limited by the extent of the market," people have stressed this sequence: improved transport extends the market which increases the division of labor (specialization) which raises productivity. In their enthusiasm for abridging distance, policy-makers seldom realize that the relationship of transport to this sequence is partial and indirect.

It is partial because there are two senses in which "extent of the market" may be construed -- a spatial meaning, to which transport obviously applies, or a purchasing power sense which does not necessarily involve a widening of geographical horizons. The extent of the market for any product depends upon much more than general purchasing power of any geographical region. It is also a function of price, quality, the nature of the commodity, sales effort, tastes and preferences -- none of which are necessarily tied to the capacity to move the product. The sequential relationship between transportation and growth implied in Smith's famous dictum may in fact be broken at many points.

It is indirect because such sequential linear processes are not absolute. Development of any kind requires "clusters of change" which "if they occur together will produce one kind of result while if they occur separately or sequentially, different results will occur."_/ Even using the implied sequence

_/ Margaret Mead, "Patterns of Worldwide Cultural Change in the 1960's," Social Problems of Development and Urbanization (Science, Technology, and Development - United States Papers Prepared for the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas. Volume VII. Government Printing Office), p. 8.

of Smith, it may be that markets were growing prior to the provision of transport. Or extending them may also require other policies to induce use, such as special stimuli to productive activity along the route, planned or induced migratory movements, and so on. Transport to be successful must be part of a cluster of change. It is the purpose of this study to find some common ingredients of this cluster besides improved transportation capacity.

The whole emphasis on transport as a strategic sector is reinforced by two other interrelated factors:

(1) The observed correlations between rising gross national product per head and some index of mobility._/

_/ See Owen, op.cit., Chapter III for examples, and Chapter I for the relationship between mobility indexes and levels of development.

(2) The many noneconomic roles ascribed to transportation -- national cohesion, political and social unity, and military and logistics needs. Even where considerable doubt attaches to the economic value of new trans-

port capacity, the noneconomic roles can overwhelm the dubious economics.

It is generally agreed that adequate transport capacity is an important precondition for growth, but all too often it is held to be the agent initiating rapid development. Yet there are many illustrations of abundant transport facilities and lack of economic dynamism just as there are plenty of cases where the two coincide. Some degree of capacity for movement of goods, people and resources is <u>necessary</u> for growth, but it may be questioned whether any given degree of capacity is sufficient.

Thus the present study focuses on transportation because of its apparent significance in the process of economic development and its suitability to a disaggregative approach. A major problem will be to examine those <u>other circumstances</u> of sufficiency, those necessary clusters of change which serve to explain the varying results from large investments in particular instances. The search for "other circumstances" that may have rendered particular investments in transport successful or not is the purpose of the analysis of the case studies presented herein.

Another reason for concentrating on transport is that it is uniquely associated with distance. Analysis of economic development has neglected the spatial orientation of economic activity. Indeed, it is one of the characteristics of economic theory in general that the impact of location and distance has been bypassed or assumed to be of little consequence. Only in recent years have serious efforts been made to assess the effects of space on some widely held economic beliefs. A discussion focused on transportation, especially in particular instances, will necessarily involve considerations all too generally assumed away.

There is, moreover, another problem associated with the spatial factor. In countries not closely bound together economically and which contain within themselves large islands of self-sufficiency and isolation, the meaning to be attached to national aggregates is especially ambiguous.

The Approach

For these reasons a series of case studies involving transportation improvements within relatively small regions of underdeveloped countries are presented in Part I and analyzed in some detail later. Although there are weaknesses in any case-study approach (for details see Part II), it is useful to develop a set of such cases and bring them together in one volume for purposes of detailed examination and comparison.

It is important to emphasize that any case study is *a posteriori*. This means that each transport investment is taken as given and the situation afterwards compared with that prevailing before. The improvement in transport is taken as a datum on the economic scene regardless of the wisdom or foolishness of the action, in terms of the investment options existing before actual construction. The main concern here is not with whether the investment was excessive, badly timed, poorly located, inadequately maintained and so on, even though these are important questions that affect the outcome. This is a before-and-after analysis that seeks to determine why certain things happened in some of the cases and not in others following the creation of additional transport capacity. The ultimate aim, however, is to assist in the pre-investment analysis of transportation. If the cases yield useful generalizations regarding the role of transportation in economic development, it will then be possible to suggest in advance the conditions most conducive to a successful outcome. At this point the a posteriori analysis will have come full cycle.

The General Relationship Between Transportation Capacity and Economic Growth

It is not difficult to show the kinds of relationships between improvements in transportation capacity and economic growth. The following is a brief and highly schematic, generalized discussion of this interconnection.

There are three possible outcomes of improved transportation -- (1) a positive stimulus to further development; (2) a deceleration of growth; and (3) an absolute decline in the level of income per head.

The Positive Case

An improvement in transport capacity permits a more effective abridgement of distance. It permits faster, safer, cheaper, and more dependable service which in turn allows a greater movement of goods and people per unit of time. Each of these service dimensions of transportation has a somewhat different impact upon mobility and economic growth.

The speed factor permits more intensive use of existing transportation facilities which is capital-saving in two senses:

(1) Less needs to be invested in transport to provide the same amount of service, assuming depreciation does not rise in proportion to use per time period. In fact, total depreciation may even decline if the improved

facility, such as a good road surface, leads to less wear and tear on the conveyances.

(2) Nontransportation producers may retain smaller inventories so that a greater amount and variety of real investment is possible. This permits a larger total output per unit of labor input.

The safety factor has both a cost and psychological dimension. Improvement in safety tends to stimulate use and to reduce the hazards of movement. This brings about greater utilization of the facility per time period and reduced costs in the form of damage, loss, or insurance.

The cost factor refers to the reduced inputs required to move any given quantity of goods or number of people between two points. These released inputs become available for other purposes, permitting greater total output from the same labor force. The surplus product so generated may accrue in pecuniary form to producers (if freight rates are reduced in proportion to the cost reduction), to the providers of transport service (if rates remain the same), or to both, depending upon the degree of competition in the transportation and goods markets. In the longer run, the gains may accrue to consumers of the product, again depending on the degree of competition in the relevant market. The disposition of these pecuniary gains will condition subsequent secondary effects and may range all the way from increased leisure through increased consumption to greater investment in productive facilities.

The dependability factor allows producers to schedule operations more efficiently. This implies reduced costs in the nontransport sector. The potential secondary effects are comparable to but probably less extensive than those mentioned above.

In general, improved transport in any of the four service dimensions leads to a reduction in the total resources required to produce and distribute a given volume and pattern of output per time period. How these released resources are subsequently used will determine the crucial secondary effects which ultimately induce changes in the magnitude and composition of output, assuming the released resources are in fact employed.

The Retarding Case

Essentially this case involves misdirected investment. The creation of additional transportation capacity may have absorbed some portion of scarce resources that should, on economic grounds, have been employed elsewhere. In terms of opportunity cost, this investment was less productive than some alternative and kept the growth rate below what it would have been through a more efficient use of resources.

Clearly, mistakes in allocating resources can occur in any sector. Cost-benefit analysis, even when properly carried out, is still loaded with subjective evaluations regarding such things as what price to put on those benefits normally not marketed, the appropriate rate of discount, and so on. This means that errors are inevitable in the sense that some other allocation would have yielded better results although this cannot generally be foreseen. Alternatively, mistakes may be made in the prior estimate of maintenance or other operating costs of assets actually constructed. But this applies to any sector of the economy. Yet various economists have argued that it is especially liable to happen in the transportation sector for two reasons:

(1) The lumpiness, specificity, longevity, and externalities associated with much transportation capital create greater hazards in calculating and specifving future benefits and costs. This makes decisions to invest in transport not as easily reversible nor as readily corrected as with assets that wear out rapidly or that can be built in small increments;_/

_/ Hirschman has argued that investment in social overhead capital, of which transportation is a major item, is "impervious to the investment criteria that have been devised to introduce some rationality into development plans . . . (and that) the absence of ex ante criteria is compounded by the weakness of sanctions when mistakes have actually been made." See Albert O. Hirschman, The Strategy of Economic Development (Yale University Press, 1962), pp. 84-85.

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(2) There is a belief that transport is a "safe" investment in the political sense. For example, Albert O. Hirschman asserts that "perhaps it is this absence of criteria and of sanctions that has endeared SOC [social overhead capital] so much to the developers. Development planning is a risky business and there is naturally an attraction in undertaking ventures that cannot be proven wrong before they are started and that are unlikely ever to become obvious failures." Ibid, p. 85. Hawkins, op.cit., p. 359, also makes this point.

These two factors suggest that the probability of misallocating scarce resources is especially acute in transport. Particularly may this be the case with railway transportation. Indeed, Robert T. Brown argues that railroad decisions are structural and in some sense "fundamental." "If they are in error, there is no turning back: the implications of the decisions are far-reaching both in space and in time. They are decisions which involve not five or ten or twenty million dollars but rather hundreds of millions. An erroneous decision of this nature can be classed as a 'disaster' for the economy."_/

_/ Robert T. Brown, "Transportation and Planning and the 'Railroad Decision'," to be published, p. 6.

In short, these viewpoints suggest that there is a greater chance for scarce capital being invested in transport and that there is a greater possibility of error here than in other sectors.

The Negative Case

An increase in transport capacity may actually lead to a decline in output per head. The mechanism is relatively simple although there are two variants of it. The first is the simple protectionist argument which suggests that the tender bud of initial industrialization in any area requires the protection of high transport costs as a shield against low-cost competition from other nations._/ The second is the belief that in an underdeveloped economy

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_/ See E. F. Schumacher, Roots of Economic Growth (Gandhian Institute of Studies, Varanasi, 1962), p. 38.

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the backwash effects tend to swamp the spread effects and that this detrimental impact on one segment of the economy, due to the improved transport, is not counterblanaced by equivalent expansion elsewhere._/

_/ See, for example, Gunnar Myrdal, Rich Lands and Poor, (Harper, 1957). Chapter III and Hirschman op. cit., pp. 187-201.

On a more fundamental level of analysis, this latter version also implies that, in the case of additional transport, there will be set up a cumulative mechanism of growing regional disparities which may stifle aggregative development.

Critique of the Relationships of Transportation to Growth

In each of the above cases there is a large element of contingency. None of the alleged effects is necessary. None emerges from any inevitable or inexorable sequence of probably eventualities. In every case certain things may happen. But it is equally true that they may not, and furthermore, in the latter two cases, the effects can be counterbalanced by deliberate policy. Nonetheless, there is a growing skepticism in some quarters regarding the potential of transport for accelerating growth, and there have been some recent attempts to reinterpret past history to show that transport followed, rather than preceded, economic dynamism, or that its role in the growth process has been overstressed. _/ This is perhaps a healthy reaction to some of the

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_/ See for example Paul H. Cootner, "The Role of the Railroads in United States Economic Growth," The Journal of Economic History, Vol. XXIII, December, 1963 and R. Fogel, "A Quantitative Approach to the Study of American Economic Growth," The Journal of Economic History, Vol. XXII, June 1962.

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excessive claims made for transport capacity. It is useful when "finding the rod bent too far in one direction to bend it too far in the other in order to straighten it." Nevertheless, each of the above cases tells but part of the story, and each is based upon particular assumptions which, even when not of doubtful validity, are far from relevant in most instances.

In the positive case the immediate effect of increased transport is to increase the incomes of producers, consumers, or those who provide transportation services. Much depends on their use of additional income. It is usually assumed that there exists an enterprising, rationalistic environment in which certain entrepreneurial types actively seek pecuniary advantage and hence respond positively to decreasing costs which would emerge through improved transportation. Furthermore, the surplus receipts which accrue to some groups as a result of the cost decrease are employed productively. They end up in business or businesslike hands either directly in the form of excess profits or indirectly, from the increase in household savings made possible by lower prices through a banking system, security exchange or other financial intermediary. In short, the positive case implies one or two things: a prior dynamism obviously held back by a transportation bottleneck or a set of institutions which may be deemed modern as distinguished from traditional. Neither of these is applicable to most underdeveloped regions. Noneconomic, or institutional, factors--often assumed away--make the impact of improved transportation uncertain. Even assuming "economic man" and an economically propitious environment, however, there must be adequate investment opportunities which permit exploitation of available raw materials and other resources.

The retarded case rests on the validity of the two assumptions about transportation. The first is that transportation is basically different from other industries, in fact, unique. Attempts are seldom made to specify in what sense the industry is in fact unique, and in those few instances where this is attempted, _/ it is customary to list a series of items which relate

_/ See, for example, National Transportation Policy, Report of the Committee on Commerce U. S Senate, 87th Congress, 1st Session, June 26, 1961, Part V, Chap. 1. Sec. 1.

as well to a good many other industries. It may be granted that some (but not all) forms of transportation investment are lumpy, indivisible, and durable, but surely this is not a fundamental difference from investment in, say, a steel mill or a power facility. E. E. Hagen, however, argues that even railways can be expanded in bits and pieces and cites Colombia as an example._/

_/ On the Theory of Social Change, (Dorsey Press, Homewood, Ill., 1962), pp. 45-46.

Furthermore, except for construction of an entire rail network, it is possible to proceed in stages, to modify the impact of a mistake by relatively small adjustments which do not necessarily require additional capital. Indeed, as Brown points out, the extreme lumpiness and so on is confined to what he calls the "railroad decision" and does not apply to other forms of transportation investment. But even regarding railroads, the case is overstated, for rail investments are not fundamentally different from others that may be equally large.

The second assumption, that transportation is a politically safe investment, is also open to serious question. Steel mills, dams (e.g. Aswan), a modern air force, atomic power plants, and so on are politically safe regardless of their economic benefits. Indeed, they are more symbolic of progress in the eyes of aspiring or even entrenched politicians than a single-track railway or a gravelled road. Transport is more a grubby kind of necessity when not lavishly overdone. Even when overdone, as it frequently is, transport investment is no more politically safe than any other symbol. Some of the past eulogies of transport may have made it appear safe but hardly any more so than steel mills and all the rest. Nor is it true that cost-benefit analysis is less applicable to even an expensive, long-lived piece of transportation capital than it is to, say, major investments in housing, education or health, and so on.

In short, the "uniqueness theorem" does not stand up. The retarded case is based upon dubious assumptions. The chance of misdirected investment in transport is not necessarily greater than in many other sectors.

The first aspect of the negative case is perhaps the most dubious of the lot. It is a variant of the infant industry argument but has even less to recommend it than that extensively disputed piece of conventional wisdom. High transport costs work both ways. While they may protect local producers, they disadvantage industries where economies of scale might exist and reduce the net receipts from the export trade which are so important for most underdeveloped countries.

As far as the spread and backwash effects are concerned, it is always stressed that these tend to occur only under the rather special circumstance that the market mechnaism is operating freely. Even in this case there is no necessary growth in regional inequality over very long periods. Long before regional disparities grow to such an extent that further growth of the entire nation is jeopardized there will come into play deliberate policies to correct the situation. _/

_/ Hirschman, op. cit., p. 190. Myrdal, however feels that policy may aggravate rather than alleviate the situation (op. cit., Chapter IV).

Once again we are forced to the conclusion that generalization with respect to the developmental impact of improved transportation depends upon many "other things" normally left unspecified.

Obstacles to Mobility

If it is agreed that adequate or improved transport capacity is not by itself a sufficient condition for accelerating the growth rate, some insight might be gained into the relationship between transport and growth by examining those factors that impede mobility even in the presence of adequate transport capacity. In general, mobility between any two points or regions (except for pleasure travel which will be ignored), requires a demand in one area and supply in the other. These in turn imply the existence of a market and an excess supply above consumption needs in the respective areas.

In addition the cost of movement must not be so high as to reduce or eliminate the ability for profitable exchange. Thus, one set of reasons for restricted mobility is the following: subsistence production, the absence of recognized markets, transport costs which in relation to market values are too high to make increased production profitable, excessive delays or risks in transportation which either adversely affect the value of the product or are too burdensome to warrant the trouble.

It is clear that the above set of reasons for restricted mobility are interrelated in the sense that any one of them can thwart increased production but only one of them relates directly to transportation capacity. Furthermore, given the presence of any one implies the others in most circumstances. They are mutually interdependent. The absence of cheap transportation may induce subsistence production, and conversely the prevelance of subsistence production may be responsible for the dearth of transportation capacity since it is not apparently required. This is essentially the meaning of the phrase "clusters of change." To induce use of a transport facility requires a simultaneous stimulus to organize markets more effectively, transmit market information, establish credit facilities and so on.

Since the essence of development in its strict economic sense requires increased specialization, this means increased interdependence and a breaking down of islands of self-sufficiency which in turn necessarily entails an increase in mobility. More people and goods must be moved usually over longer average distances because the number of market centers tends to decline (once development has proceeded for some time) although each handles proportionately greater volumes of business. Both the number of tons shipped and miles travelled tend to rise as the units of self-sufficiency break down and become ever more closely linked to market processes. However, these social and economic changes may be resisted to such an extent that mobility is restricted.

The so-called poverty mentality, an accommodation to a chronically static, low level of output per capita, is usually inimical to rapid change in ways of doing things because the scope for experimentation is so narrow and the consequences of error so great. Where the situation is worsening there may be a push into new areas. However, this case is scarcely an auspicious one for subsequent development as is evident from many of the migrations to urban areas induced by increasing rural squalor. Beyond this, there is little natural inducement for change. The impulse must therefore come from without and accessibility must be provided, in the first instance at least, to help overcome the very high resistance to change. The imposition from without, however, naturally encounters greater resistance than internal and spontaneous change. This implies that the way in which the impulses from without are instituted is not inconsequential in terms of the response to be expected.

In general, it is clear that the obstacles to mobility are virtually co-extensive with the obstacles to development. Thus, the analysis of specific cases relating to the utilization of new or improved transport facilities should also prove relevant to the broader and more significant issues of overall economic growth and development.

The foregoing brief summary of some of the views regarding transportation and its relationship to the complex problem of economic growth indicates the need for an approach that is disaggregative, specific and subnational. What follows in Part I is a summary of eleven case studies; five of which were done explicitly for the present volume. The rest are previously published reports which have many of the features of case studies relevant for present purposes. Following the cases is a critical analysis that attempts to isolate the recurring themes and derive some generalizations applicable to development theory and useful for preinvestment surveys in the realm of transportation in general and road transport in particular.

1

PART I

INTRODUCTION

The first five chapters in this part are based upon extensive reports specially prepared for the case study program by particular investigators. _/

_/ Research on the cases was performed by the following: Guatemala, Martin S. Klein (United Research Inc.); Nicaragua, John McCamant (University of Washington); El Salvador, Leon V. Hirsch (United Research Inc.); Bolivia, Barbara Berman (Brandeis University); Venezuela, Charles J. Stokes (University of Bridgeport). I am indebted to each investigator for performing the fundamental spade work and for suffering the agonies of on-the-site inspection under often trying circumstances.

The chapters to follow inevitably omit much of the information contained in the original reports, but it is believed that all the significant aspects have been retained. The analysis in Part II is based upon the cases as presented in Part I and no important conclusions or implications relate to unpublished materials. If the reader disagrees with the interpretations advanced, he can at least feel assured that this is a real difference of viewpoint and not one arising because he has been denied some relevant facts.

The last chapter in Part I contains summaries of cases published elsewhere and while less complete in many respects than the others they are nevertheless felt to be useful supplements and worthy of extended analysis. At the very least, they widen our vision of transport reality in a variety of different circumstances and societies.

As a preamble to the cases, we have drawn together in Table 1, a few general economic indicators that might provide a convenient frame of reference for the countries in which the cases are located. The figures are of doubtful validity and vary considerably in quality among the countries. The table is presented chiefly to indicate whether there is much overall dynamism and to suggest a crude ranking of the countries by the index of income per head. No significance whatsoever should be attached to absolute differences except to say that of all the countries, Venezuela is by far the best off economically while Uganda, Bolivia and India are the poorest. All the other countries are "somewhere between," probably toward the lower end. This is all that the conceptual and empirical crudity of the estimates can reasonably be taken to imply in terms of a static comparison. Dynamically speaking, Venezuela appears to have had the fastest rate of growth of aggregate output per head during the fifties, over 4 percent, while Bolivia, India, and Guatemala had the lowest (i.e. near the one percent level) with the others probably between one and a half and two and a half percent per year. If the figures have any meaning at all, they suggest relative stagnation in Bolivia, India, and Guatemala, and somewhat more satisfactory progress in the other countries, especially Venezuela, during the period to which the cases mainly pertain.

Some evidence concerning overall traffic trends in the countries is presented in Table 2 and in Figure 1. In all countries, motor vehicle

TABLE 1. National Income per Head and Trends in Output in the Case Study Countries[a]

Country	National Income per Head[b] (In U.S. Dollars)	Annual Growth Rate of Real Output per Head[c] (In Percent)
Bolivia	80	Under 1
El Salvador	180	1.0-2.0
Guatemala	150	1.0-1.5
India	70	1.0-1.5
Nicaragua	230	1.5-2.0
Peru	120	1.0-2.0
Thailand	90	1.5-2.5
Uganda	60	[d]
Venezuela	880	Over 4

[a]The figures are derived from a wide variety of sources which are frequently conflicting. The estimates above represent crude approximations based on the wide variations observed in published documents from the United Nations, the Agency for International Development, country plans or private studies.

[b]Average for 1958-1960.

[c]Decade of the 1950's.

[d]Not available.

TABLE 2. Transport Trends in the Case Study Countries, 1950-60
(Motor vehicles in thousands; railway data in millions)

Country	Motor Vehicles		Railway Traffic			
	Total Number 1960	Percent Increase 1950-60	Total Freight Ton-Kms. 1960	Percent Increase 1950-60	Total Passenger-Kms. 1960	Percent Increase 1950-60
Bolivia	[illegible][a]	197	300[b]	21	236[b]	40
El Salvador	29	244				
Guatemala	[illegible]	[illegible]	270[a]	13	-	-
India	529	98	6,921	57	74,519[a]	11
Nicaragua	14	422	23	12	60	(-67)
North Borneo	5	391	4	-	18	-
Peru	144	142	420[a]	4	259[a]	8
Thailand	88	481	1,138	137	2,353	64
Uganda	31	259	-	-	-	-
Venezuela	369	173	20	18	25	56

Source: Wilfred Owen, Strategy for Mobility, The Role of Transport in Development. (The Brookings Institution, 1964) Appendix Tables 2, 6, and 7.

[a] 1959 data.

[b] 1957.

[c] Estimated.

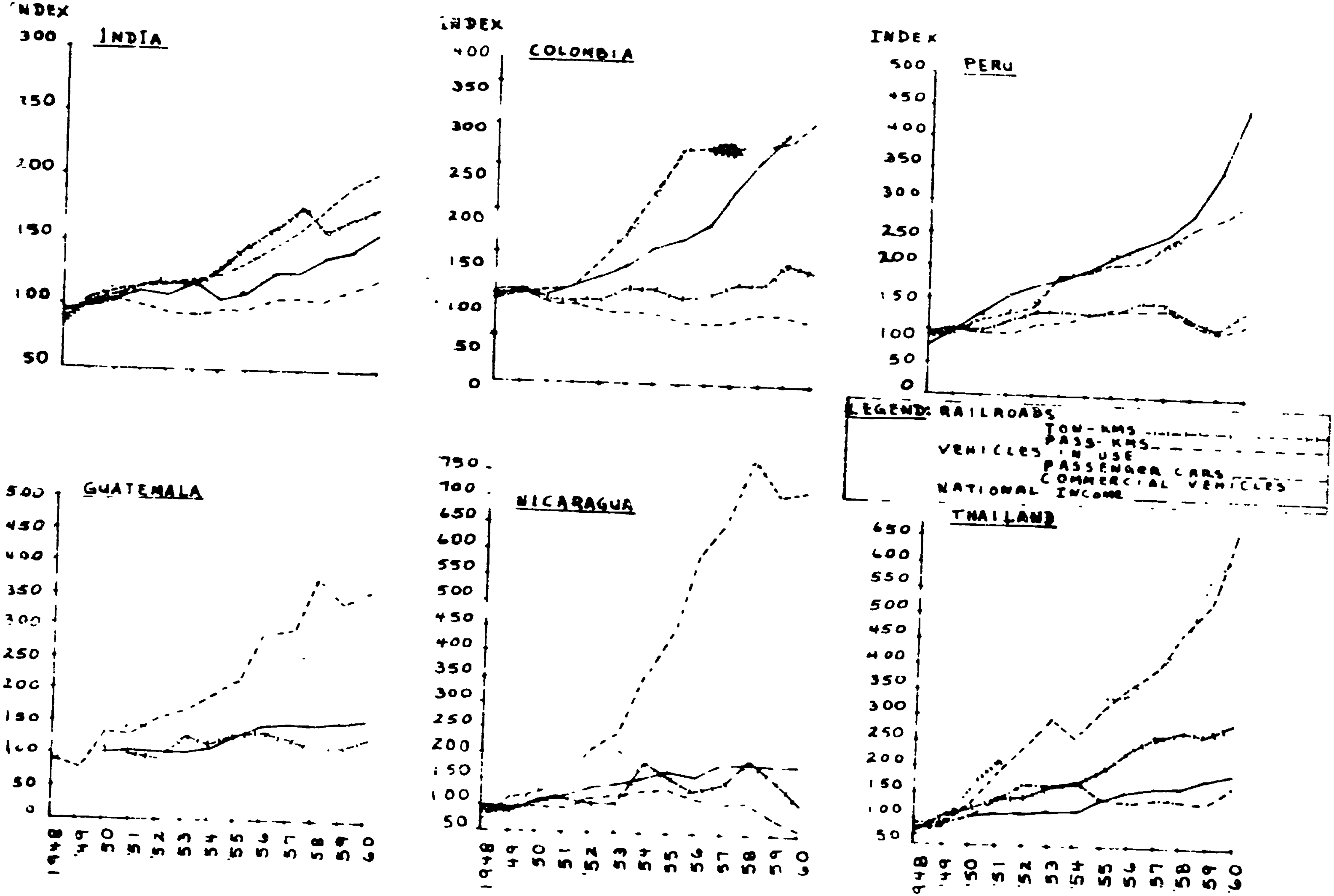

Figure 1. Trends in Transport and National Income, 1948-60, Selected Countries

Sources for Figure 1.

Indexes based on Average of 1948, 1949 and 1950.
Exceptions:

G.D. P. Colombia based 1950
N.I. Guatemala based 1950
N.I. Thailand based 1950
Net Ton Kms. Guatemala based 1951

Sources: Indexes computed from data contained in the United Nations, Statistical Yearbook, New York.

Exceptions:

(1) G.D.P. Nicaragua - source: Banco Central de Nicaragua, Primer Informe Anual, Managua, 1961. p. 55.

(2) G.D.P. Colombia - source: United Nations, Boletin Economico de America Latina, Vol VI, November 1961, Suplemento Estadistico, p. 22. (Index of real G.D.P.)

(3) N.I. Thailand

registration has increased sharply over the decade of the fifties by amounts varying from about 100 percent in India to almost 500 percent in Thailand. Using a different indicator, the figures show that rail freight has increased at a slower rate, generally less than 50-60 percent, except for Thailand, and rail passenger traffic has declined in two countries, Colombia and Nicaragua, increased less rapidly than freight in India and Thailand and more rapidly in the other countries for which data are available. The transportation trends during the fifties shown in Figure 1, for several of the countries suggest some relationship to national income although this varies among the countries. Not much can be read into these aggregate trends nor is there any apparent relationship between economic levels as shown in Table 1 and the mobility index as defined by Wilfred Owen. _/ This is not

_/ See Owen, op. cit., Chapter 1. Further details on aggregate trends in a large number of countries may be found in Owen's volume.

surprising and, as previously noted, was part of the reasons for undertaking the case study approach in the first place. The following section presents the summaries of the eleven case studies.

CHAPTER 1

THE COCHABAMBA-SANTA CRUZ HIGHWAY IN BOLIVIA

_/ This chapter is largely derived from the case study, "Transportation in the Strategy of Bolivian Development: the Cochabamba-Santa Cruz Highway," by Barbara Berman, Associate Professor of Economics at Brandeis University (Brookings [forthcoming]).

The highway connecting Cochabamba and Santa Cruz traverses 502 kilometers of rugged mountainous terrain that separates the two culturally and geographically distinct areas of Bolivia--the highlands and lowlands. Starting at an elevation of 8,500 feet in Cochabamba, the road rises to 12,500 feet and then descends in a series of irregular curves to Santa Cruz which is only 1,500 feet above sea level. (See figures 2 and 3.) Although studies for the Cochabamba-Santa Cruz highway go back to 1928 and work was begun in 1931, it was not until 1954 that an all-weather road was finally opened to traffic. Paving was not completed until 1957. The total cost of the road was approximately $42 million, of which about 80 percent was financed by the Export-Import Bank.

Bolivia and Its Economy

Bolivia is a land-locked area of some one million square kilometers bordering five other South American countries--Peru, Chile, Argentina, Paraguay, and Brazil. All of the larger Bolivian cities are in the highlands,

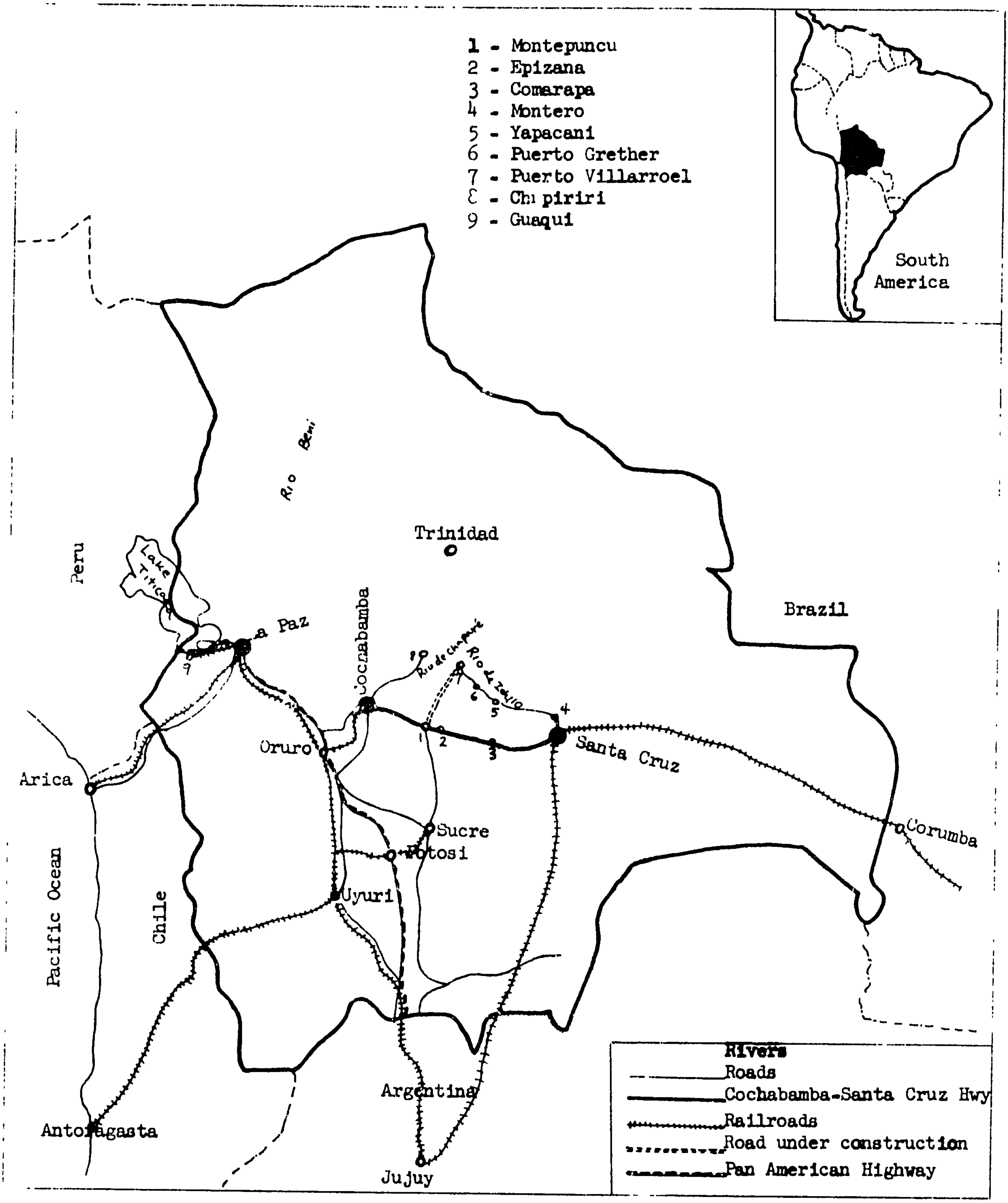

Figure 2. Map of Bolivia: Principal Cities and Transport Network

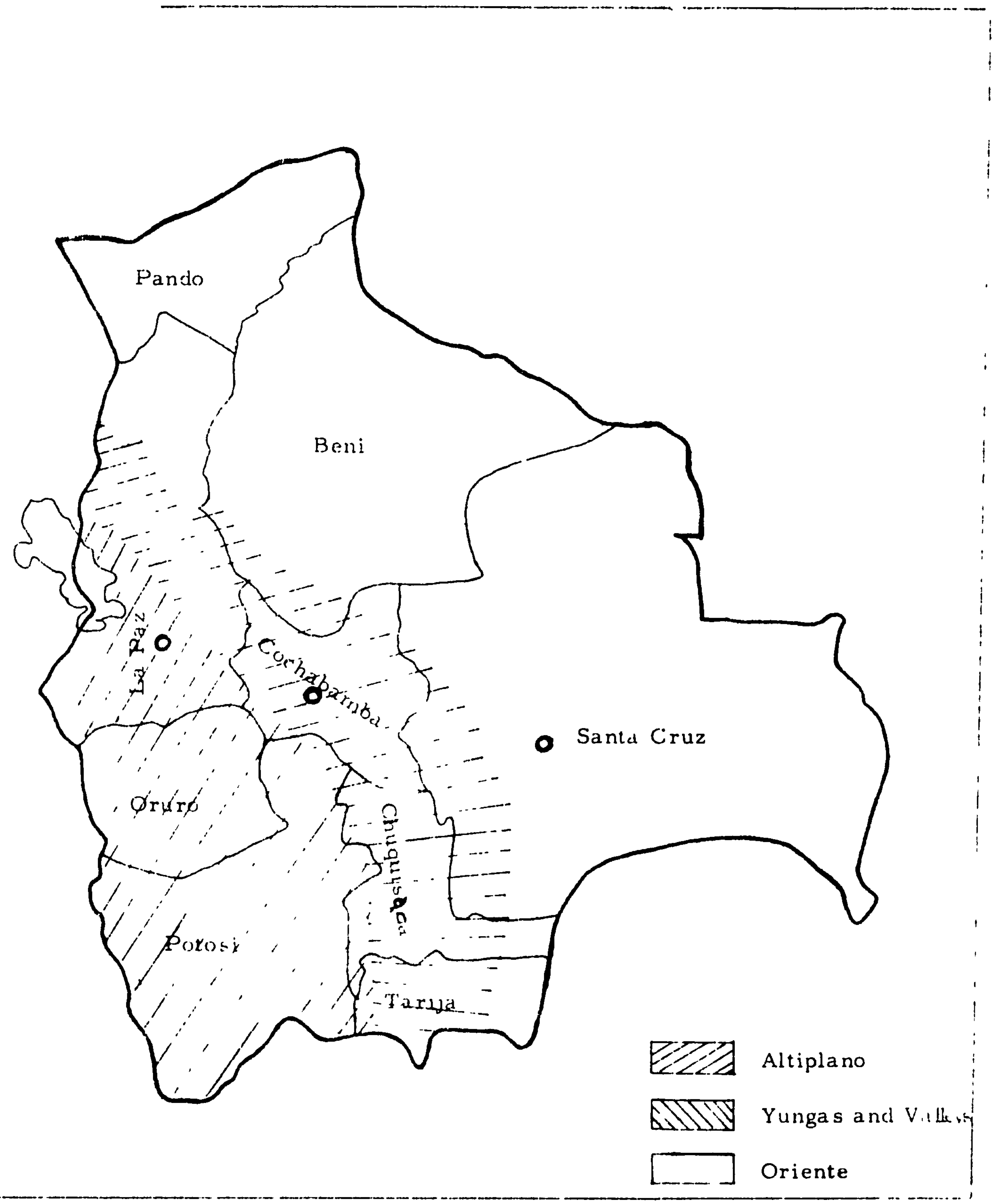

Figure 3. Map of Bolivia: Political and Geographic Divisions

including the capital, La Paz. Most of the people of highland Bolivia herd llamas and grow potatoes on the cold, flat Altiplano or cultivate wheat in the high valleys, such as the Cochabamba area. The remainder of the highland population makes its livelihood by extracting tin concentrates from the mines which appear to be almost exhausted. The unrefined ore is shipped out on railways for export through the Chilean seaports of Arica and Antofagasta on the Pacific coast, and imported food and manufactures are brought up in return. Highland Bolivia has heavy population densities per square kilometer of arable land.

By contrast, lowland Bolivia, the Oriente, is very sparsely populated, averaging only 1.4 people per square kilometer, while the corresponding figure is 7.4 in the highlands. The climate of the Oriente is tropical and much of the area is unpopulated jungles. White settlers came to this part of Bolivia from Argentina and Paraguay, and most of the aboriginal inhabitants retreated into the jungle.

Bolivia, like most other countries of South America, exports raw materials in order to finance imports of manufactured goods. Approximately 75 percent of the country's export earnings are derived from its tin concentrates. The country's economy suffers from serious imbalances in foreign trade and in the relative importance of agriculture, much of which is of the subsistence variety. If Bolivia is to emerge from its persistent low-level stagnation, there are three possible directions in which productive activity may be expanded: mineral extraction, manufacturing, and cash crop agriculture.

Mining. Successful exploitation of the nationalized Bolivian tin mines is hindered by fluctuating world prices, past lack of reinvestment, poor labor discipline, and featherbedding. Under the Plan Triangular, a joint United States, German, and Bolivian assistance arrangement, attempts are being made to increase investment and reorganize the mines. However, the much needed labor reform is problematical and poses a serious challenge to those attempting to develop Bolivia. Increased discovery and extraction of petroleum is hoped for, but its contribution will be largely to provide revenue to the government, which might or might not use the funds for productive investments.

Manufacturing. In late 1956 the Bolivian government undertook stabilization measures in an attempt to curb the runaway inflation which had sent price levels soaring by 7,900 percent in seven years. Since then, manufacturing activity has never completely recovered and in 1961 industrial production was still about 10 percent below that in 1952._/ Probably low demand, a poor

_/ Reported in United States Agency for International Development memorandum, 1963.

climate for private enterprise, serious weaknesses in government administration, and political unrest all contribute to impede the expansion of manufacturing. Effective development of the Oriente may provide impetus to revive manufacturing activity and create new opportunities. But few observers feel that manufacturing can expand greatly without improvements in other sectors of the economy.

Agriculture. The land of the Oriente remains as a particularly inviting and strategic resource for those concerned with Bolivian development. In contrast to the bareness and coldness of the Altiplano and the mountainous areas to the west, the eastern lowlands provide vast expanses of unexploited fertile tropical soils. According to Lucio Arze, a specialist in Bolivia's natural resources, the Chapre area in the Santa Cruz Department could comfortably accommodate all of Bolivia's 3.5 million population and, together with the Yapacani region, offers unlimited potential for sugar, rice, citrus, and banana production. _/

_/ Bogart Rogers, "New Highway Solves Bolivia's National Emergency," Road International, International Road Federation Ltd., No. 15, Winter, 1954-55.

It has, therefore, been a prime objective of policymakers in Bolivia to open up the lowlands. The hope is that colonization of the lowlands will relieve population pressure in the crowded, poverty-stricken highlands; that food products imported with the decreasing proceeds from tin exports, supplemented by credit and aid, will be replaced by the agricultural products grown in the lowlands; and that the danger of losing the lowland area to neighboring states will be diminished if this isolated part of the country is brought into the national orbit.

Thus, for both economic and political reasons, the highway connecting Cochabamba and Santa Cruz has strategic significance.

Previous Transportation Facilities

Prior to the opening of the Cochabamba-Santa Cruz highway in 1954, there had never been an adequate channel of transportation between the producing centers of the eastern lowlands and the consuming centers of the western highlands. The difficult terrain that separates the highlands from the lowlands made commuhications between them costly, time-consuming, dangerous, and during the rainy season, impossible. This hindrance to free mobility encouraged economic separation of the areas as well as a tendency toward political separation already exacerbated by ethnic differences.

The only means of communication between Santa Cruz and Cochabamba was a mule track, which took three to five weeks to traverse. In the thirties, a dirt road was completed but it carried only a limited amount of motor traffic since it was dangerous or impassable for much of the year. Thus, throughout the forties and early fifties, the Santa Cruz Department remained isolated from the rest of Bolivia and virtually inaccessible during the rainy season. Its physical connection with the outside world consisted of air transport and rail lines through Argentina and Brazil. The opening of the Cochabamba-Santa Cruz highway, the first and only paved road, in 1954, improved the possibilities for national integration and facilitated the scheme to induce immigrants from the highlands to settle in the Santa Cruz area.

Effects of the Highway

Agriculture. The increased mobility resulting from the new highway, along with other investments and policies directed toward the agricultural sector (such as investment in feeder roads, sugar mills, rice mills, and fertilizer as well as colonization schemes) have had a dramatic effect on agricultural production and marketing in the Santa Cruz area. As a result of the effective transport link between the highlands and lowlands, Santa Cruz is now able to supply much of the food needs of the western region. As domestic production of rice rose 92 percent between 1958 and 1962, and sugar production increased tenfold between 1954, the year the highway was opened to traffic, and 1962, the country's sugar and rice imports accordingly decreased sharply. Private imports of sugar and rice are now forbidden. By 1962, domestic production supplied 83 percent of the country's total sugar consumption. The amount of rice produced in 1962 roughly equals the estimated national consumption in 1958.

Population Growth. Between 1950 and 1962 the population increase in the city of Santa Cruz was estimated at 70 percent, more than three times the rate in Bolivia as a whole. The rate of growth in the Department of Santa Cruz, however, is smaller than in the country as a whole. Much of the increase in urban population in the city of Santa Cruz is no doubt due to increased commercial activity resulting from the agricultural boom in the area.

Traffic on the Highway. In 1959, the estimated number of vehicles per day on the highway was 104, or 39,000 a year. A Corporacion Boliviano de Fomento(Bolivian Development Corporation) estimate for early 1962 is 120 vehicles per day. _/

_/ See Alfonso Balderrama, El Transporte Por Carretera, Consejo Nacional de Caminos, Departamento de Relaciones Publicas, La Paz, (1962),p. 32.

Increased mobility in terms of number of vehicles travelled on the highway is by no means dramatic. However, the highway has brought relative ease of travel between Cochabamba and Santa Cruz and substantially reduced travel time. In the forties, with considerable luck, it took from two to four days for a truck to travel between Cochabamba and Santa Cruz during the short dry season. Now buses take about 12 hours to traverse the highway and trucks take about twice that time. In addition, trains of pack animals use the highway. Few private cars make use of the highway, and since there are not many settlements along the route, most of the motor traffic is between the two terminal points.

Before the highway, the cost of transporting cargo from Santa Cruz to the highland cities was about three times as much as shipping it from the Pacific coast. A ton of cargo can now move more cheaply to Cochabamba from Santa Cruz than from the Pacific coast.

Colonization of Santa Cruz. The colonization program in Santa Cruz has met with some success, and many observers believe that the influence of the road has increased the willingness to move. By the end of 1962, about 3,000 of the country's 15,000 colonizing families moved down to Santa Cruz; about 10,000 were in the Chapare and 2,000 in the Alto Beni. It was estimated that annual production per family on the Bolivian colonies settled under the CBF sponsorship ranged from $312 on a four-year-old colony to $563 per family on a seven-year-old colony. This production figure is expected to rise sharply in a matter of a few years. While large numbers of colonists who came to the area in the early 1950's gave up and went home, a rising proportion (estimated now at 80-85 percent) are staying. Many of the new colonists are coming spontaneously rather than as part of government-arranged groups, and among these there is a high proportion of success.

The Bolivian Development Corporation, using conscripts, has cleared a colonization belt connecting Montero with Yapacani and Puerto Grether on the Rio de Ichilo. This trail will eventually be extended to join the Rio de Chapare (where even greater migration is taking place) and will be connected with the junction of the Puerto Villarroel-Montepuncu road now under construction. The provision of the feeder road between these two points means the eventual transportation of cash crops produced in the colonized areas to the highlands along the Cochabamba-Santa Cruz highway.

Because thousands of people, previously regarded as immobile and resistant to change, have moved to these newly opened areas on their own initiative, the Development Corporation is trying to slow the pace of migration as it does not have sufficient financial and other resources with which to help the newcomers. _/

_/ Richard W. Patch, "Bolivia's Developing Interior," West Coast South America Series (Bolivia), Vol. IX, No. 3, American University Field Staff Inc. (New York, 1962), p. 7.

Perhaps the most important psychological impact of the new settlements has been the diminishing of centuries-old attitudes of futility nurtured by a stark existence in the mountains or on impoverished soil. The progressive tendencies of many of the Bolivian colonists contrast with the prevalent belief that the highland Indians will never share the widely observed human tendency to "truck, barter, and exchange." The new Indian colonists of the Santa Cruz area appear to be far more interested than the old-line villagers in entering the monetary economy by producing a large-scale cash crop.

Population and Production in the Highlands. The migration to the Santa Cruz area has so far only slightly relieved crowding in the Cochabamba valley but may have raised average productivity in agriculture. The city of Cochabamba serves as an entrepot point for the freight traffic between Santa Cruz and the Altiplano. This line of activity will probably expand in the future.

An interesting possible effect on the highlands of the development of the lowlands is that higher agricultural incomes in Santa Cruz and Cochabamba may increase demand for consumer goods and thus stimulate production of manufactured goods in the highlands. Moreover, the lowlands may be able to supply raw materials necessary for industrialization.

The Bolivian Balance of Payments. The gross effect of the agricultural boom in Santa Cruz on the Bolivian balance of payments is fairly easy to compute. In 1950 sugar and rice constituted 11 percent of the value of Bolivian commodity imports, while in 1961, they accounted for only 2 percent of total commodity imports. Recently, the value of sugar and rice production in Bolivia was estimated at $8 million per year. The net effect on the balance of payments of the Santa Cruz boom, however is probably only a fraction of $8 million. The growers of cash crops tend to spend much of their income on imported manufactured goods. This means that some of the foreign exchange previously spent on sugar and rice is now spent on other imports. Thus, perhaps the major balance of payments effect is potential rather than actual.

SUMMARY AND CONCLUSIONS

The principal effects of the new highway on the Santa Cruz and Cochabamba areas may be summarized as follows:

There has been a dramatic expansion in agricultural production in the Santa Cruz area. Subsistence farming has given way to the growing of cash crops, particularly sugar and rice. Soybeans, citrus, cotton, and livestock are also promising possibilities.

The long-desired colonization of the lowlands by emigrants from the crowded highlands has been given a substantial impetus by completion of the highway. Improved communication between the two areas has made potential colonists more willing to move, as has the opportunity to earn cash income in the Santa Cruz area because of the growth in agricultural production.

While there is no way to measure accurately what proportion of benefits from colonization of the Santa Cruz area can be credited to the highway, available information seems to indicate that the Santa Cruz colonists are better off economically than are those in the Chapare and Alto Beni, which have poor road connections to the highlands.

Population growth in the city of Santa Cruz has been rapid, although the rate of growth in the Department of Santa Cruz is estimated to be even lower than that in Bolivia as a whole.

Manufacturing may be stimulated in the highlands because of an anticipated supply of raw materials flowing from the lowlands and higher demand, occasioned by the higher total and per capita agricultural incomes in Santa Cruz.

The major balance of payments effect of the highway is probably potential rather than actual. Self-sufficiency in sugar and rice means a large saving in foreign exchange, but this is probably offset to a considerable extent by the purchase of imported luxury items. Further improvement in the balance of payments would be achieved if Bolivia were able to develop substantial exports of agricultural products.

But it is unlikely that by increasing agricultural production alone a country in the geographic situation of Bolivia can gain for its population a standard of living characteristic of even the poorest of the presently developed countries. Only if the agricultural development of the lowlands encourages economic activity in other sectors and social change in the whole population will the development strategy of making large investments in transportation be successful.

In short, the highway, along with government support of migration, construction of new plant facilities, and other complementary investments and policies, has already begun to produce results. But it is scarcely more than a beginning.

CHAPTER 2

THE LITTORAL HIGHWAY IN EL SALVADOR _/

_/ This chapter is a summary of "The El Salvador Littoral Highway: A Case Study of a Development Highway," a field study prepared by Leon V. Hirsch, Senior Associate, United Research Incorporated.

The Littoral Highway in El Salvador extends more than 300 kilometers across the country from the Rió Paz in the west and connects with an extension of the Inter-American Highway near La Unión and the Port of Cutuco in the east. (See Figures 4 and 5) Built between 1955 and early 1962 at an ultimate cost of about $28.5 million, the two-lane paved highway along with supporting feeder roads (not included in the above cost), serves the entire Pacific coastal region. It roughly parallels the railway in the western half of the region from Zacatecoluca to La Unión. Some $11.1 million was provided by a loan from the World Bank with the balance supplied by the government of El Salvador. An additional $5 million loan from the Bank and a further $8 million loan from the International Development Association are designed to construct feeder roads, most of which will connect with the Littoral Highway, and to improve and support maintenance procedures.

THE BACKGROUND

El Salvador and Its Economy

El Salvador, with an area of only 8,260 square miles, is the smallest of the Latin American countries. However, it has an extremely

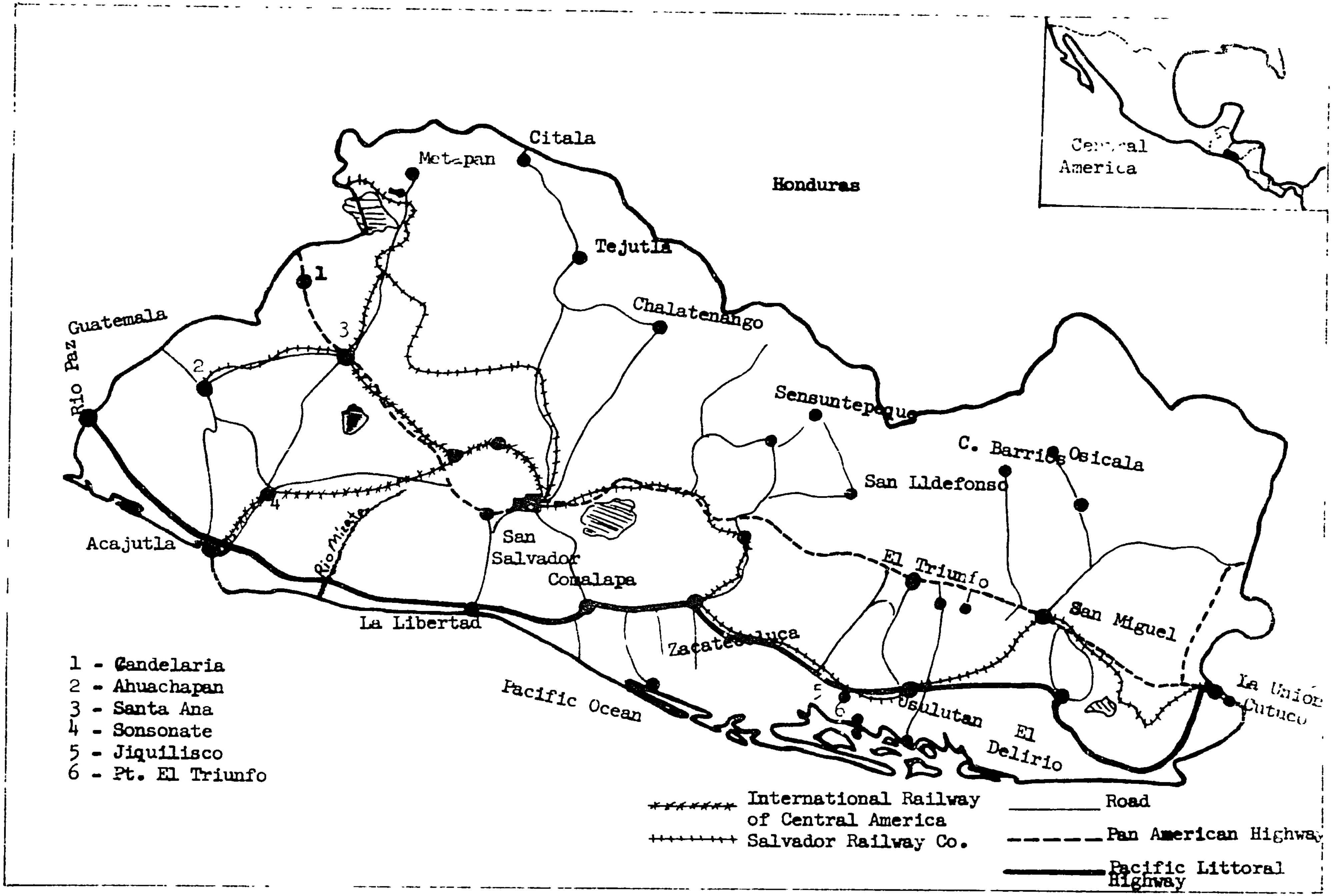

Figure 4. Map of El Salvador: Major Cities and Transport Network

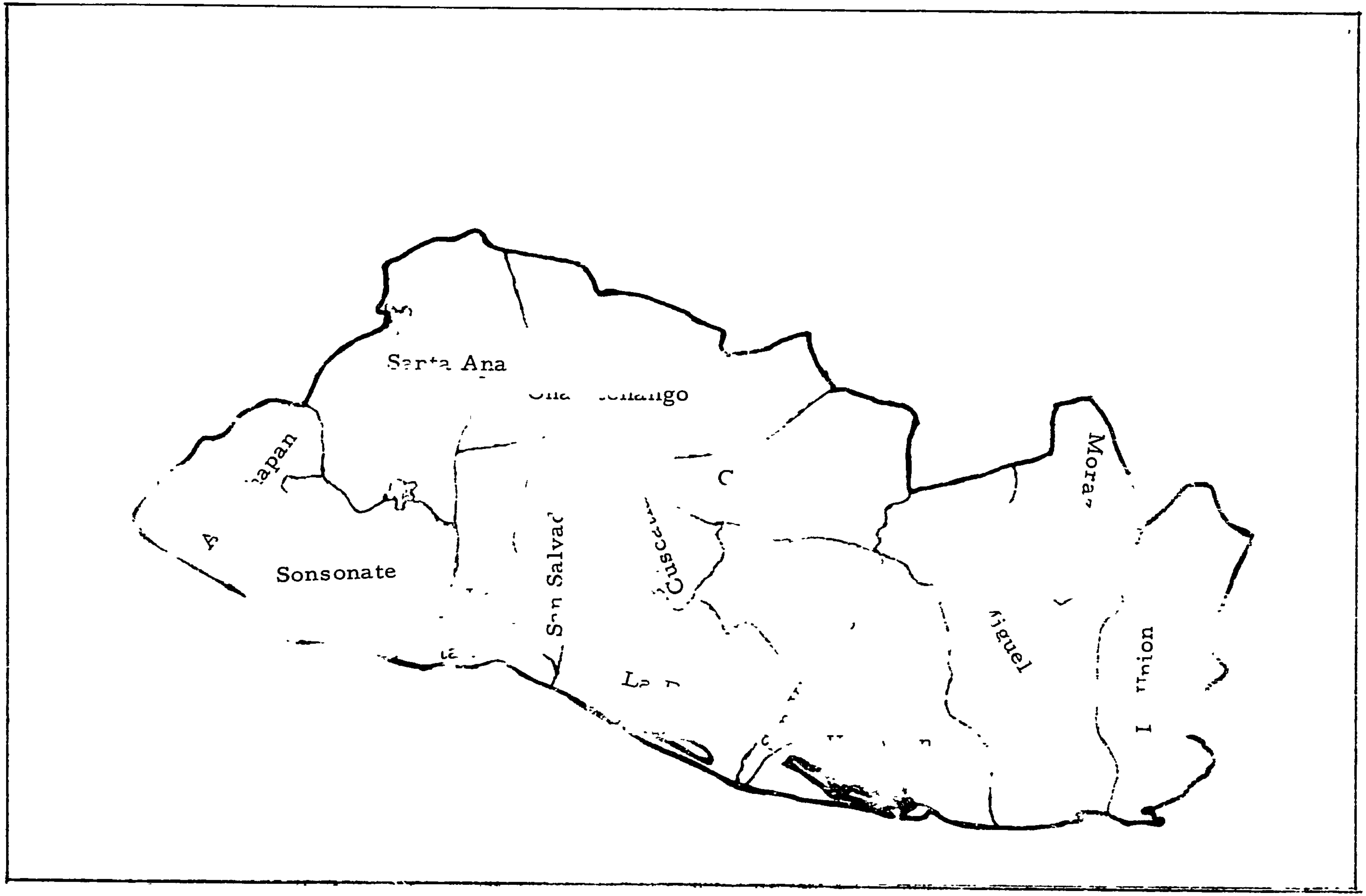

Figure 5 Political Divisions of El Salvador

high overall population density, almost 310 people per square mile. This figure is based upon the population estimates of slightly over 2.5 million for 1961.

Terrain and Climate. In general, El Salvador is a land of mountains and fertile upland plains. There are three main geographic regions: (1) The hot, narrow Pacific coastal belt (the Littoral) about 160 miles long and 10 to 15 miles wide which is the area of greatest concern to the present case; (2) the central plateau, an area of rich volcanic soils lying between two mountain ranges where the coffee crop is grown; and (3) the northern lowlands formed by the wide Lempa River Valley.

El Salvador is located entirely in the tropical zone. The dry season extends from November to April when only very light rain occurs, while the wet season (May to November) is responsible for an annual average rainfall of over 70 inches. The temperature varies with altitude but in general averages between 64^{o} to 90^{o}F. for the year with a low range of monthly temperature variation.

Economy. The economy is primarily agricultural with coffee the major crop. It is estimated that in 1957 over one-third of gross domestic product was derived from agriculture. Coffee accounted for some 80 per-cent of the total volume of exports in the same year. Industry is mainly small scale and consists of light consumer goods and handicrafts, as well as the processing of agricultural commodities. The chief industry is cotton textiles. Most of the forest resources have been depleted by heavy cutting, and their relative scarcity (only 13 percent of the total area) has created serious problems of soil erosion. Known mineral resources are limited in both amount and variety. Principal imports are machinery, motor vehicles, textile yarn, petroleum products, manufactured fertilizer, and cereals.

Previous Transportation Facilities

In 1954, El Salvador had one of Central America's best transportation systems, although there were obvious inadequacies. Only the central coffee-growing highlands were well served by the highways. Several roads connected this region with the ports of Acajutla, La Libertad and La Unión-Cutuco. There were two railroad systems in the country: the domestically owned Salvador Railway Company, Limited, and the International Railway of Central America (IRCA) which connected the country with Guatemala.

In the Pacific coastal region, transport facilities were very poor. In many large sections there were no roads at all and in other areas only oxcart trails. The Acajutla-La Libertad beach could be driven upon only during low tide, and other parts could be traversed during the dry season and then only with some difficulty. There was a paved road from El Playon to Comalapa and a passable dirt road from there to Usulután. The El Salvador branch of the IRCA paralleled this road for much of its distance, connecting Zacatecoluca, east of Comalapa and Usulután. The railway also connected Usulután with La Unión-Cutuco via San Miguel, a route to the north of the future Littoral Highway.

It was evident, however, that if the fertile plains area was to be developed and made an integral part of the economy of El Salvador, additional transport capacity was required. The Littoral Highway was a response to this apparent need.

ANTICIPATED EFFECTS OF THE HIGHWAY

The main results expected from the highway were that it would open up new areas to cultivation and make possible increased agricultural production. An increase in corn and rice production as well as beef and milk output was anticipated.

Primarily because of the increased agricultural opportunities, it was believed that there would be denser settlement of the Littoral and that development of an independent peasantry would be encouraged. In addition, the Littoral Highway was looked upon as playing an important international role in helping to link Guatemala and Honduras with El Salvador.

In order to achieve the maximum effect, it was recognized that the road would have to be properly maintained and that the construction of subsidiary, feeder roads would be necessary.

Furthermore, it was realized that by itself the construction of a highway could probably not achieve the expected benefits and that other inputs might be needed. These included improved health conditions; better land use, soil conservation, and improved production methods through agricultural extension services; establishment of more adequate processing, storage, and credit facilities; and irrigation.

EFFECTS OF THE HIGHWAY

Population

Urban population in the area deemed to be most immediately affected by the highway grew at about the same rate as urban areas in the country as a whole, but the rural population grew much faster. Between the census years of 1950 and 1961, the rural population increased by 149 percent compared with an increase of 131 percent for the nation as a whole. A rough estimate suggests that perhaps as many as 75,000 additional people have been attracted to the region as a result of the economic opportunity opened up by the highway.

Agriculture

The sharp increase in rural population was associated with significant changes in agriculture. There has been a substantial growth in cash crop production and a more intensive use of land. Before the highway, the main crops in the region were corn and beans, typical products of subsistence farming. Cash crops such as sorghum, cotton, sugarcane, and rice were grown, and there was some cattle raising. But to a large extent, the land was substantially underutilized and devoted to pasture or woods. With the building of the highway, this pattern has been drastically changed. Cotton has displaced much of the corn production. Cattle output dropped off sharply, and the production of minor crops has remained fairly stable.

But the basic change in this region is in cotton production. Between 1953-54 and 1959-60 the area devoted to cotton doubled, and production increased two and a half times. (See Table 3.) More recently, the growth has risen at an even faster rate. Between the 1959-60 crop year and 1963-64, the area devoted to cotton increased another 250 percent and output doubled. In short, the shift to cotton has not only increased the total value of agricultural production but represents a significant move out of inefficient small-scale, subsistence farming.

If farming practices do not change, there may be difficulties in sustaining the present high yields from cotton. These include problems deriving from erosion, depletion of fertility, and pest infestation. But for the moment, at least, effective exploitation of a hitherto underutilized but fertile area has taken place in a big way. This in itself should stimulate the search for and employment of improved methods and crops, should cotton yields begin to decline in the future. There is every possibility that the changes already induced will persist. Reversion to the previous subsistence farming seems to be most unlikely even if cotton yields decline.

<u>The Mechanism of Agricultural Change in El Salvador</u>. The reasons for the sharp increase in cotton production are many. One is the profit potential of cotton compared with other crops following construction of the highway. Other factors influencing the manner in which the region developed are the pattern of land ownership, the so-called "agricultural entrepreneurs" and a key institution.

TABLE 3. Index of Cotton Acreage, Production, and Price, 1953-54 to 1963-64, El Salvador
(1953-54 = 100)

Year	Areas (Manzanas)	Production (Quintals)	Average Price per Quintal (Colones)[a]
1953-54	100	100	100
1954-55	140	120	96
1955-56	217	191	83
1956-57	182	286	81
1957-58	189	301	78
1958-59	254	335	68
1959-60	204	369	75
1960-61	269	289	77
1961-62	388	390	77
1962-63	444	546	77
1963-64	541	673[b]	n.a.

Source: Salvadorean Cotton Cooperative, Ltd., Memoria for 1962-63 harvest; 1963-64 data from the Ministry of Agriculture and Cattle ; and also see Leon V. Hirsch, "El Salvador Littoral Highway: A Case Study of a Development Highway", 1964, (Unpublished), see Table 7 for detailed figures.

[a] U.S. $1.00 = ¢ 2.5.

[b] Estimated.

Most of the land south of the highway was and is owned by a few non-residents in parcels of hundreds or thousands of manzanas. North of the highway the concentration is less pronounced although the land is still held by relatively few people. One estimate is that about two-thirds of the land in the entire Littoral was held by large holders, about 25 percent by the government and the remainder by small holders. Before the highway, squatters occupied some of the land, but for the most part it remained undeveloped. The highway, however, has not changed the pattern of ownership. What it has changed, as already noted, is the intensity and efficiency of land use.

The principal agents of this change were the agricultural entrepreneurs, professional or business people living mostly in San Salvador, who rent land from the large owners and utilize it for productive purposes. Their activities have been described as "speculative farming by absentee investors." With their recognition of the profit potential from cotton, these people began renting land in the Littoral. Many of them are members of the growing middle class who supplement their incomes through investment of their relatively moderate savings. They have been described as sophisticated, willing to take risks and to spend some time managing their investments. Investments in cotton growing proved to be an ideal outlet for them, especially after the highway was completed.

However, there was some cotton development before the highway. Indeed, it has been suggested that interest in cotton caused the highway to be built rather than the other way around. But, as was the case in Nicaragua, the highway greatly facilitated these types of nonresident investment and control by permitting easy access to the land. Part-time farm management became practical on a large scale for nonresidents only when people could drive in a few hours from San Salvador to the areas of production. There are many variations in this pattern, but the dynamism of the area must be attributed mainly to the agricultural entrepreneur who actively seized the economic opportunity opened up by the highway.

In all this the role of the cotton cooperative was likewise significant. The Cooperativa Algodonera Salvadoreña, Limitada, was established in 1940 as a private nonprofit institution which by law has statutory authority to license cotton growers. It has a monopoly on the purchase, ginning and sale of cotton. Licenses are freely issued. The organization pays for cotton on the basis of world market prices; loans money for seed, fertilizer and insecticides; gins, stores and arranges for the sale of cotton. These activities greatly simplify the job of the potential agricultural entrepreneur and allow him to concentrate attention on one aspect of the business, namely, growing the cotton. Without being spared the problems of marketing in particular, many small-scale entrepreneurs would probably not have the time, money, or ability to enter the business. This is especially true of men who participate in the business as a sideline.

The dramatic impact on agriculture since the highway, and to a lesser extent before it, has been more spontaneous in nature than planned or organized. Various schemes of land redistribution and resettlement, provision of credits to small farmers, grain price stabilization, extension services, or irrigation have made little impact in the area although attempts along these lines have been made for some years back and are still continuing. The existence of agricultural entrepreneurs with some capital available, assisted by the Cotton Cooperative, represent the key to the dynamism of the region. Now that regional development has begun, however, organized activities to assist small-scale farming should prove to be more effective in the future.

Shrimp Fishing

Equally dramatic, though quantitatively less important than cotton, is the growth of the shrimp industry. From virtually nothing before 1957, shrimp exports in 1962 totalled over four million kilograms valued at some 14 million colones. (There are roughly about 2 1/2 colones (₡) to one U.S. dollar.) Those familiar with the industry argue that this could not have happened without the highway and point out that all previous attempts to develop shrimp production had failed. Shrimp is exported mainly by refrigerated trucks from Jiquilisco and El Triunfo to the Guatemalan port of Matías de Gálvez, although some moves by refrigerated ship from the deep water port of Acajutla and some by air.

The development of the shrimp industry is attributed primarily to the Alvarez family, which brought some experienced Portugese shrimp fishermen to El Salvador in 1958, purchased shrimp boats and financed their operations. Their success in this venture induced others to invest and helped create a new export industry of some importance.

Current investigations hope to find ways to expand the fishing industry. Other products of the sea, such as tuna, may be developed. Related canning activities may be started. None of these activities would have been feasible on a large scale without improved access.

In contrast to agriculture and fishing, there has been little development of industry and commerce, except for cotton gins and small shops along the roadside. But in two other areas the road has played an important role, namely recreation and health in the Littoral region.

Recreation and Health

The ocean front between the Río Mizata and La Libertad with its excellent beaches is eminently suitable as a recreational area. Before the highway, this land was valued at about ¢25 per manzana (1.73 acres). Now, some of this land has changed hands at between ¢30,000 and ¢100,000 per manzana. Similarly, developments have occurred elsewhere in ocean front areas served by the highway. One estimate suggests that potential resort land has increased in value by amounts approximating the total construction cost of the highway.

The highway has increased the effectiveness of the antimalaria program in El Salvador by providing access to previously isolated locations. Areas of El Salvador less than 100 to 200 meters above sea level, which includes most of the region affected by the highway, are subject to malaria. Indeed, at one time 70 percent of the inhabitants of Acajutla suffered from this disease. In 1949 a malaria control program was begun with international assistance which was further extended in 1956. But the building of the highway made possible a change from malaria control to malaria eradication in 1957. In fact, the first vehicle to travel the Acajutla-Rio Paz segment of the highway was a UNICEF truck with DDT. As of mid-1964, less than 3 percent of the population in the previously endemic malaria areas are affected by the disease. In addition, construction of the Littoral Highway has aided in the provision of health services to isolated areas through mobile facilities.

Traffic

The substantial increases in production destined for sale beyond the region are reflected in traffic volume. Traffic counts taken during the last five months of 1959 indicate the following average number of vehicles per weekday at the designated points: Zacatecoluca-653, Usulutan--390, and La Unión--298. Not all of this is due to the new highway. Especially at La Unión some proportion originated from the Inter-American Highway. But, by 1962, another traffic count indicated that at Zacatecoluca average daily traffic had increased by about one-third while at Usulutan average vehicles per day were between 1000 and 1200. Traffic at La Unión had increased by 60 percent. Most of the increase appears to have come from the Littoral Highway. There are important variations along different segments of this highway, ranging from a low of about 150 vehicles between Acajutla-La Libertad and between El Delirio-La Union to a high of more than 1,000 between Zacatecoluca and Usulutan. (See Table 4.)

There was no detailed breakdown by type of vehicle involved in these surveys, but for the country as a whole, automobiles make up about half of vehicle registrations, trucks about 25 percent, and buses and station wagons 20 percent. The remainder is made up of jeeps, not counting the ox-carts that are still seen on the new highway. It is estimated that heavy buses and trucks make up about 20 percent of all road traffic.

Passenger Traffic. No information is available on the number of passengers moving along the highway though service is described as excellent and appeared to develop as soon as sections of the highway were completed. Most of the bus companies are very small and operate only a single unit. Entry into the business and maximum rates are controlled by the Transport Department of the Ministry of Economy. Entry policy seems to be liberal enough although there is some evidence of favoritism to applications from ex-army officers. Rates do not appear excessive. For large buses of 30 to 60 passenger capacity they average between ₡ 1.15 to 2.00 per 100 kilometers, depending upon whether the service is express or local. For smaller vehicles of 8 to 18 passenger capacity, the range is between ¢ 2.00 to 3.00. Costs have been estimated at close to ¢ 2.00 per 100 passenger kilometers so that many parts of the service appear to be unprofitable although there is much variation in particular costs.

Largely due to the Littoral Highway, rail passenger traffic has declined by about 22 percent, but rail fares have remained unchanged for the past decade at ¢ 1.875 per 100 passenger kilometers. The service features of buses are apparently the significant factors inducing the shift of patronage.

Freight Traffic. Most trucking companies using the new highway are small, one-truck operators often buying and selling the products they carry. Most of the four or five large firms are engaged in the capital-to-port business. One international operator uses the highway to transport export shrimp from the El Triunfo-Bay of Jiquilisco area to the Guatemalan port of Matías de Gálvez. There is no regulation of the trucking business so that rates vary widely both over time and for different regions, but charges between ¢ 0.08 and ¢ 0.15 per ton-kilometer over good roads are not unusual.

Total rail traffic has not been adversely affected. Ton-kilometers for local service have dropped by almost 50 percent between 1957 and 1962, because of truck competition, but this has been more than offset by a doubling of export traffic combined with a relatively stable import business. (See Table 5.) The sharp rise in export traffic is attributable to the

TABLE 5 . Railway Freight Traffic in El Salvador, 1957-62
(In millions of ton-kilometers)

Year	Local Service	Exports	Imports	Total[a]
1957	23.4	14.8	39.2	77.4
1958	21.5	18.4	43.1	84.2
1959	19.4	20.1	42.3	81.8
1960	16.2	24.3	46.6	87.2
1961	11.2	22.1	43.5	76.8
1962	13.2	30.6	39.7	83.5

Source: Salzgitter Industrieban GmbH, Estudio Sobre las Condiciones de Trafico en la Republica de El Salvador, (1963) Volume I, p. 68.

dramatic growth of cotton output, as discussed earlier. Before completion of the highway, both raw and bulk cotton was transported to and from the gins by rail. Now almost all raw cotton moves by truck to the gins which are generally located close to the rail line. This accounts for much of the decline in local rail traffic. But the baled cotton for export is moved almost entirely by rail through the Port of Cutuco. Although the railroad's share of the cotton traffic has dropped by about half, the total amount carried by rail has risen. Furthermore, fertilizer imports have increased sharply in response to the rise in cotton production and they are moved mainly by rail. In short, the general stimulus to production in the area has benefited all except indigenous forms of transport, despite relative shifts in favor of trucks.

However, the Littoral Highway has reduced the use of the Inter-American Highway for export and import traffic. For example, when the final link with Guatemala was completed in April, 1962, almost 33,000 toneledas _/ of goods were imported over the Littoral Highway compared

_/ one toneleda = 1,000 kilograms.

with only 11,600 over the Inter-American Highway. In 1960, import tonnage over the latter amounted to 35,880 toneledas which increased to 52,900 toneledas in 1961. The Littoral Highway appears to have arrested a growing trend on the Inter-American Highway. Similarly, exports to Guatemala c. the Inter-American Highway which amounted to 10,300 toneledas in 1960 and 13,400 in 1961 dropped to barely 1,300 in 1962, while exports over the new facility were 12,500 in 1962. The new road from San Salvador to Guatemala is of better quality and is thus preferred to the Inter-American Highway, even though it is 22 kilometers longer to Guatemala City.

Comparable data concerning exports and imports to and from Honduras are not available since the Littoral Highway connects with the Inter-American Highway to the west of La Unión. There are no good traffic estimates along each highway which consider import and export business separately. This precludes assessing the relative importance of each. It is worth noting, however, that total traffic to and from Honduras increased as various segments of the eastern part of the Highway were completed in 1957 through 1959. (See Table 6 .) The trend, however, started earlier and the degree to which this was influenced by the Littoral Highway cannot be ascertained.

Balance of Payments

Until recently El Salvador was a country that relied heavily upon one or two major crops for its export earnings. Originally it was a leading exporter of indigo, but this market was undercut by synthetic dyes developed during the First World War. By 1926 coffee had become, and remains, the main export. So long as world coffee prices were high, El Salvador had substantial export earnings. They remained high (excluding the depression of the 1930's) until the drop in 1957-1958. Fortunately, cotton exports expanded at about this time, and shrimp exports became important. Neither

TABLE 6. Total Traffic to and From Honduras Over the Inter-American Highway, 1953-62
(Thousands of toneladas[a])

Year	Imports	Exports	Total
1953	12.4	5.0	17.4
1954	21.6	9.0	30.6
1955	10.2	11.2	21.4
1956	28.0	10.2	38.2
1957	25.5	15.7	41.2
1958	30.2	24.3	54.5
1959	52.4	28.4	80.8
1960	49.7	24.4	74.1
1961	47.4	29.5	76.9
1962	82.5	37.3	119.8

Source: Ministerio de Economia, Direcion General de Estadisticas y del Censo, Anuario Estadistico. El Salvador

[a]One tonelada = one thousand kilograms.

of these products would have developed to the extent they did without the highway, so it is clear that the highway has played a strategic, though perhaps fortuitous, role in preventing a serious balance of payments crisis. More importantly for the longer run, the productive potential of the coastal area provides a greater variety of export potential and, possibly, increased flexibility in responding to price changes in particular world markets.

SUMMARY AND CONCLUSIONS

The apparent catalytic effect of the Littoral Highway in El Salvador was in fact a result of a conjunction of circumstances. The highway eased the task of exploiting a naturally fertile area, and it broadened the extent of economic opportunity. Making use of the new possibilities, however, depended upon a spirit of entrepreneurship which was located outside of the coastal region itself. The role of the Cotton Cooperative was equally important. It simplified the managerial requirements, thereby permitting a more extensive, effective, and concentrated participation in the production side of the cotton industry. Without the cooperative, it is unlikely that nearly so many investors would have had the capital, skill and technical know-how required to carry out the whole process from seed to market.

It is not possible to tell whether, given the other circumstances, development in other areas and/or enterprises would have taken place without the highway. What does appear certain, however, is that the highway created a situation wherein new economic opportunity was made easily exploitable by the small-scale business and professional community then existing in El Salvador. It is possible that without the highway other investment options might have appeared less desirable and more difficult or risky to undertake. The highway paved the way for a spontaneous response from a group of people generally deemed to be in short supply in most developing countries. The highway thus contributed to more efficient use of land, managerial man-power, and capital.

Furthermore, as far as foreign trade is concerned, the new prospects are particularly important for an economy previously dependent upon a single crop. Cotton, shrimp, and, in the more remote future, tourism and sugarcane may well become important components of a rising value and volume of export. The possibilities for increased production of domestic foodstuffs will also permit greater amounts of developmental imports.

With the addition of new feeder roads, the viability and flexibility of the economy of El Salvador will be further enhanced. In short, although the new highway itself was not responsible for all of these rather substantial results, it provided a key ingredient in the latent developmental potential.

CHAPTER 3

THE ATLANTIC HIGHWAY IN GUATEMALA_/

_/ This chapter is a summary of "The Atlantic Highway in Guatemala: A Study in the Effect of Providing a Competitive Mode of Transportation in a Developing Economy," a field study prepared by Martin S. Klein, Research Associate, United Research Incorporated.

Between 1951 and 1959 the Atlantic Highway was built to link Guatemala City with Puerto Barrios, Guatemala's major foreign trade port. In addition a new port was constructed at Matiás de Gálvez, near Puerto Barrios on the Caribbean coast. The cost of the port and a major portion of the construction cost of the road were borne by the government of Guatemala. The remaining cost of the highway was financed by a grant from the U. S. International Cooperation Administration and by a portion of a loan from the International Bank for Reconstruction and Development.

The Atlantic Highway parallels, for most of its length, the tracks of the International Railway of Central America (IRCA). (See Figures 6 and 7.) The government-owned new port of Matiás de Gálvez is a scant three miles from the older port, Puerto Barrios, which is owned by the railroad.

THE BACKGROUND

Guatemala and Its Economy

Guatemala has the largest population of any Central American country--about 3.5 million people--concentrated largely in the valleys and

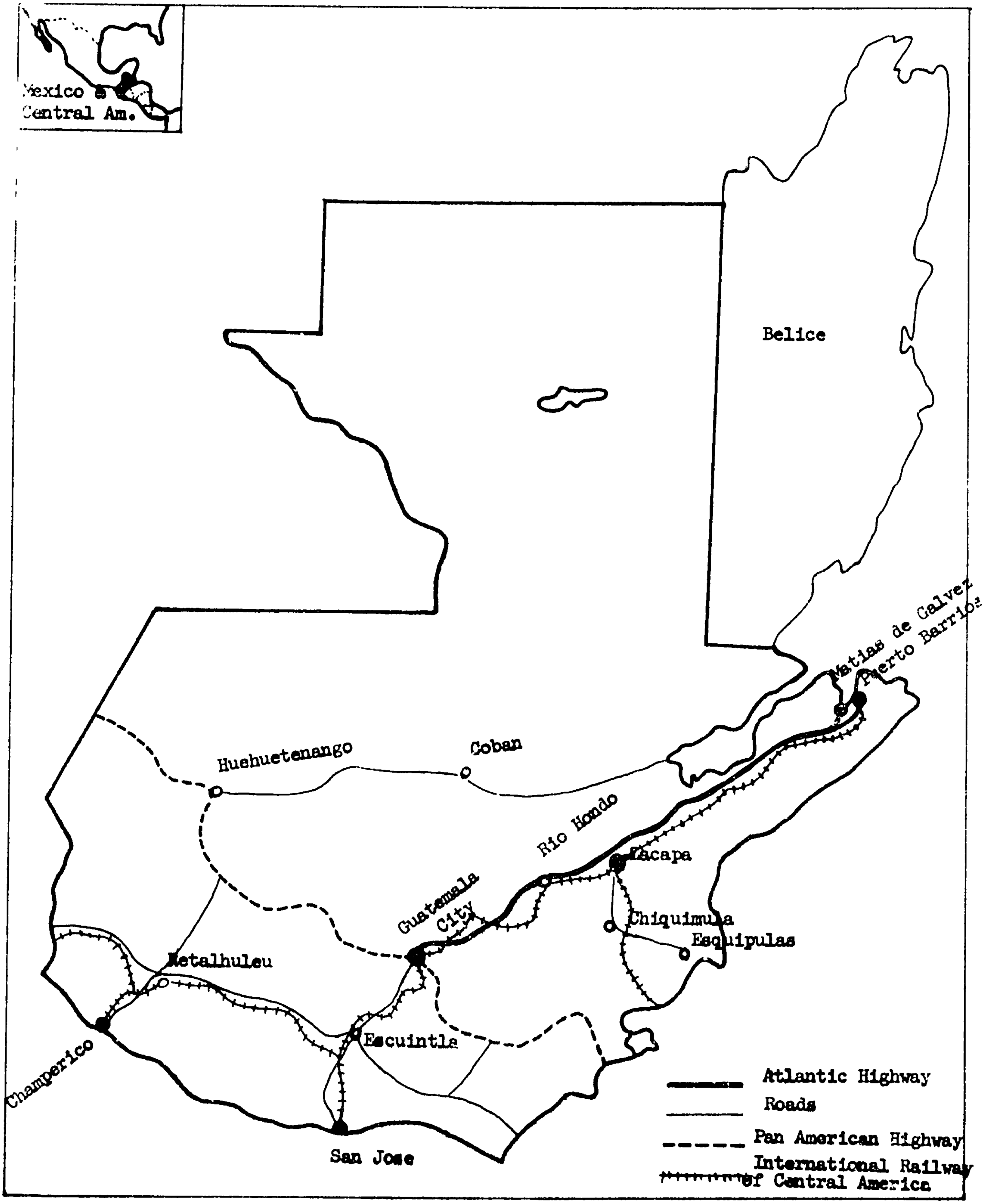

Figure 6. Map of Guatemala: Principal Cities and Transport Networks

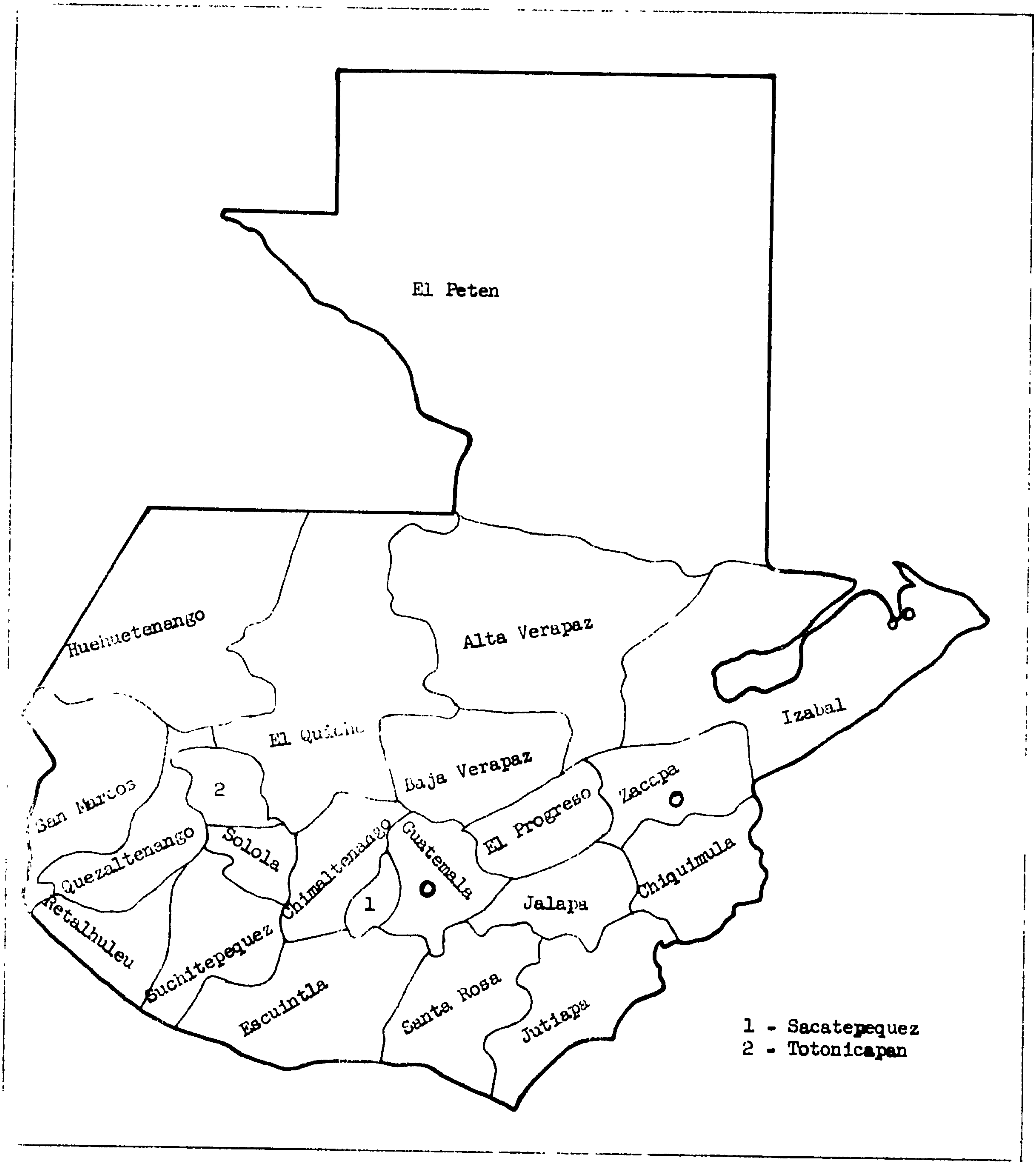

Figure 7. Political Divisions of Guatemala

plateaus of the highlands in the southern part of the country.

Terrain and Climate. Its territory is mainly mountainous; the mountains that run through Central America cross Guatemala along the narrow Pacific coastal plain and cover most of the south-central part of the country. There are many high volcanoes in this area, and earthquakes occur frequently. The northern third of the country is low, tropical and covered with thick forests. The rivers are not generally used as waterways. Those flowing down the Pacific side of the mountains are short, swift, and shallow. The only river of any commerical importance is the short Rio Dulce, which flows from Lake Izabal (Guatemala's largest lake) to the Caribbean. The climate varies from hot and humid in the lowlands to cool in the mountains.

Economy. The economy is chiefly agricultural, and in its dependence on banana and coffee exports Guatemala resembles several other Central American countries. Coffee is the country's most valuable export. Cotton has recently replaced bananas as the second most valuable export. Chicle, and citronella and lemon-grass oils are also exported, while corn, sugarcane, rice, beans, and wheat are grown for domestic use. The chicle, as well as some mahogany and other fine woods, are the products of the forests, which cover 60 percent of the country's territory. Lead and zinc are mined, but are relatively unimportant. Manufacturing consists chiefly of the processing of agricultural products.

Principal imports are machinery and vehicles, textiles, petroleum products, foodstuffs, iron and steel manufactures, and clothing.

Previous Transportation Facilities _/

_/ The material in this section has been drawn from Stacy May and Galo Plaza, The United Fruit Company in Latin America (National Planning Association, 1958) and from a memorandum prepared for the Brookings Institution by IRCA in August 1963.

In Guatemala, unlike other Central American countries, railroad construction began many years before establishment of the banana industry. By 1885, 20 miles of track had been laid from Guatemala City toward the Atlantic; and by 1904, 136 miles of track had been laid inland from Puerto Barrios. In that year the Guatemala Railroad Company was formed to lay the 61 miles of track necessary to cross the mountains and complete the link between Guatemala City and the sea. Since no road ran from the City to the coast, the railway was the first means of surface transport over the route. In 1912 the company acquired the Western Railroad linking Guatemala City with the Pacific Coast and El Salvador, and the company's name was changed to the International Railway of Central America (IRCA).

Completion of the rail link between Puerto Barrios and Guatemala City opened up for exporters of Guatemalan coffee a shorter and quicker route to markets in the southern and eastern United States and in Europe;

while the Pacific coast area of Guatemala was opened up for the large-scale production of bananas. Similarly importers in Guatemala recieved the benefit of shorter routes and more frequent service from Europe and the United States.

Beginning of Highway Competition. No significant highway competition developed in Guatemala until the early 1930's, when several trucking concerns began operating between San José (Guatemala's major Pacific port) and Guatemala City. Intense price competition characterized the industry over the following years, and the railroad was forced to lower tariffs in order to maintain its tonnage. Within a few years virtually all of the major truckers had either gone into bankruptcy or withdrawn from business. By 1933 it had also become apparent that the railroad could no longer continue profitable operations with its prevailing volume and type of traffic. With major obligations falling due, IRCA had no liquid funds with which to purchase needed new equipment. Further, the continued survival of the railroad was menaced by the terms of an existing agreement between the Guatemalan government and the United Fruit Company.

Under the agreement United Fruit received concessions for the cultivation of bananas at the Tiquisate plantation near the Pacific coast, but was obligated in return to construct the first major deep water port on that coast. This would have had dire implications for IRCA, which derived a major portion of its gross revenues, and an even more significant portion of its net revenues, from the long-haul transportation of coffee and other commodities from the Pacific side of the country to the nation's major foreign trade outlet at Puerto Barrios.

IRCA convinced United Fruit that it would be practical to ship the bananas from its Tiquisate plantation over the railroad and through Puerto Barrios, and the company in turn persuaded the government to release it from its obligation to build a Pacific port. _/ United Fruit then undertook

_/ Guatemala still lacks a deep water port on the Pacific. At both San José and Champerico ships lie at anchor and are loaded and unloaded by lighter.

to salvage the railroad from its financial difficulties. In 1936 the company obtained 42 percent of the stock of IRCA and invested heavily in banana cars and other equipment for the railroad.

Under the terms of several agreements United Fruit paid less per carload of bananas hauled over the line than did its competitors. It is beyond the scope of this study to determine whether the differential was actually justified, as IRCA claimed, by the low rental paid by IRCA for its banana-hauling equipment and by the fact that United Fruit assembled its trains for delivery to the railroad at Tiquisate, while IRCA was responsible for the assembly of competitors' trains. It is clear, however, that this policy, among others, led to a very pronounced hostility toward the railroad on the part of the Guatemalan public.

<u>The Situation in 1951</u>. The railroad retained its monopoly of surface transportation between Guatemala City and the Atlantic coast. An unpaved road had been built from Guatemala City to Los Amates but there was no usable link between Los Amates and the sea. Widespread belief that IRCA was not serving the national interest led to plans for building a major highway parallel to the railroad. The Arbenz regime, in power at that time, showed a marked antagonism toward the United States, _/ and the government threatened openly to confiscate major United Fruit holdings.

_/ IRCA memo to the Brookings Institution (August 1963).

The transportation situation between the capital and the Atlantic coast as of 1951 may be summarized as follows:

1. Through traffic and traffic originating or terminating north of Los Amates was generally confined to the railroad. There was no through highway. Air service was provided between Guatemala City and Puerto Barrios.

2. Puerto Barrios (owned by IRCA) handled over two-thirds of the country's international trade.

3. Local traffic between Guatemala City and Zacapa was handled by both road and rail.

4. There was a small and primitive port facility at Santo Tomas near Puerto Barrios. Historically this port had served the small community of settlers, largely of Belgian descent, who lived in the coastal area of Izabal Department.

Need for Highway and Port Construction. In 1951 an Economic Survey Mission of the IBRD visisted Guatemala to help formulate a program of economic development. It assigned a very high priority to creation of a heavy duty highway between Guatemala City and Puerto Barrios and the construction of a second pier at Puerto Barrios. The Bank tentatively estimated the total cost of the project at $19.5 million, of which $17 million was for the road and $2.5 million for the pier. Additional weight was given to this recommendation when it was supported by a special study team of United Nations experts in 1953.

At this time (the early 1950's) no detailed quantitative analysis of the potential benefits of such a highway seems to have been made. Instead, the recommendation was based on the following:

1. Control of transportation rates by providing an alternative mode of transportation.

2. Maintenance of adequate service. The railroad was subject to interruptions caused by rockslides, and because it was forced to assign priority to the transportation of bananas on its one-track road, it delayed other traffic.

3. Improved speed of shipment. The trip by rail took about 12 hours for the 200-mile run from Guatemala City to Puerto Barrios because of the steep grades and single, narrow-gauge track.

4. Opening new areas to transport, the Guatemalan government and the IBRD foresaw an Atlantic highway as the backbone of a network of roads

serving the hitherto untapped northern section of the country.

5. Improved security. The government felt that it was at the mercy of foreign interests in matters concerning the security of Izabal Department.

Possible Alternatives to the Atlantic Highway. Other remedies might have been found for some of the ills identified by the IBRD and United Nations survey missions:

1. The tariffs of the railroad might have been reduced by government legislation or decree although this would have been in violation of the contract between the government and IRCA. The cost of this alternative would have been negligible, but such action was apparently considered unacceptable by even the most zealous nationalists in the Arrevalo and Arbenz governments.

2. Transport capacity between Guatemala City and Puerto Barrios might have been expanded through improvement and expansion of the railroad's facilities. At the time when plans for the highway were made the IBRD estimated that a second track for the railroad would cost as much as $150,000 per kilometer, or about $45 million for the entire route. This sum, while less than the ultimate cost of the highway, was however far greater than the original estimates of the highway construction cost.

CONSTRUCTION OF THE ATLANTIC HIGHWAY

In 1951 the Guatemalan government began work on two parts of a completely new "system" for transporting imports and exports between the capital and the Atlantic Ocean: the Atlantic Highway and the new port of Matiás de Gálvez. The government disregarded the advice of the IBRD in building the new port instead of expanding Puerto Barrios. The existing facility at the latter port is a finger pier with no back-up space, equipped to load bananas onto ships directly from their railroad cars but inherently unsuited to loading and unloading trucks. Further, the Guatemalan government considered Puerto Barrios basically unsuitable for expansion because significant areas of the town are below sea level, drainage is difficult, the water supply is unreliable, and malaria is a constant problem. Santo Tomas, where the new port of Matiás de Gálvez was built, seemed to the Guatemalans more suitable for development although it had not been mentioned by the IBRD mission.

Cost of Construction

Between 1951 and 1954 some Q5 million (One Guatemalan quetzal (Q) equals one U. S. dollar.) was spent from Guatemalan government funds for construction of the new port, [1] and over Q15 million for construction of

[1] Data from IBRD.

the Atlantic Highway. An additional Q3 million was spent on construction of the highway during the fiscal year 1955 (July 1, 1954 through June 30, 1955). _/

_/ Data from Direccion General de Caminos, Guatemala City.

The port of Matiás de Gálvez was completed in 1955, long before the road, which was needed if the port were to be of much use. The new port was however used for importing materials and equipment needed for building the road. Although the Guatemalan government had spent over Q18 million on construction of the highway, it was evident that very large additional sums, including substantial foreign exchange, would be required if the road were to be the major artery that had been envisaged by the IBRD and United Nations missions and the Guatemalan planners.

In the end the highway was to cost at least Q29 million more before it was completed, the total being almost three times the IBRD's original estimate and considerably more than later estimates made in 1955. The detailed currency requirements estimated in 1955 by the IBRD are given in Table A. 1.

Foreign Assistance

Help was received from two foreign sources: the IBRD and the International Cooperation Administration of the United States.

In 1955, the government of Guatemala applied for, and received, a loan of $18.2 million from the IBRD for the construction of the Atlantic Highway and portions of the Pacific Highway and for the funding of an adequate highway maintenance program. The IBRD justified the project on these grounds:

1. The highway was needed to "support and supplement" the single-track railroad, which was near the point of saturation. The primary functions of the highway were to provide an alternate link between Guatemala City and Puerto Barrios and to connect Guatemala City with Matías de Gálvez.

2. An alternative mode of transport was needed because the capacity of the railroad was inherently limited by its single track and steep grades. The mission's report had concluded that raising the capacity of the railroad would require large investments for new equipment, lengthening of sidings, or construction of a second track.

3. The economic advantage of the Atlantic Highway was its ability to alleviate the delays which occurred on the railroad due to: (a) the priority given to banana traffic, and (b) landslide and other damage. It would also provide capacity for handling development traffic in the future.

No attempt was made to quantify the "development benefits." It was noted that the region to be traversed by the highway was generally ill-suited to immediate expansion of agricultural production because of a combination of inappropriate topography, acid soil, and excessive rainfall in some locations. The Bank suggested, however, that some areas, then inaccessible, contained 260,000 hectares of land suitable for food crops, rubber, cocoa, and coffee. (An hectare is about 2.7 acres.) For any development to take place in the area, however, further investments would be needed in drainage, irrigation, and feeder roads.

The Bank also noted that in the future the road could be extended to the upper part of the Motagua Valley and linked with the North-South highways, thus giving the fertile but underdeveloped areas of the North direct access to the Atlantic. Also, it was pointed out, the Atlantic Highway would be able to carry future international traffic. For example, the Zacapa-Chiquimula-Esquipulas road could in due course be connected with Honduras and would provide Western Honduras with access to the Atlantic. The same road could also be connected with El Salvador, giving that country direct access by road to the Atlantic through Matias de Galvez. (El Salvador already had direct access to the Atlantic by rail through Puerto Barrios.)

On September 12, 1955, the International Cooperation Administration of the United States agreed to assist Guatemala in "completing as much of the construction work which remains to be done as is possible with the funds made available hereunder for this purpose." The amount was "not to exceed $2,805,000," not counting $500,000 made available earlier. Actually this amount was only the beginning of assistance from the United

States. As work on the highway progressed, it became increasingly apparent that the estimates of the official consulting engineers for the Atlantic Highway, as well as those of the Guatemalan government and the IBRD, were extremely optimistic. During the next three years, ICA made eight additional grants to the Guatemalan government to bring the total to $13,505,000 (not including the $500,000 mentioned above). Of this amount, some $2,257,000 was in local currency obtained by the United States as payment for U. S. surplus agricultural commodities.

With the opening of the highway, / the road-rail-port system of

/ When the highway was officially opened on November 28, 1959, a scale of tolls was established for traffic over the road, a move that was strongly protested by the IBRD, which felt that the revenue collected would not constitute a significant contribution to the maintenance needs of the highway, and might impede use of the highway. The scale of toll charges and the amount of tolls paid on the Atlantic Highway are shown in the tables below:

Scale of Toll Charges on the Atlantic Highway
(In Quetzals)

Section	Motorcycles	Autos	Others (per axle)
Guatemala-Zacapa turnoff or vice versa (km. 16-17)	.25	.40	.20
Zacapa-Puerto Barrios or Matias de Galvez turnoff or vice versa	.35	.50	.30

Tolls Paid on the Atlantic Highway, 1960-63

Year	In Thousand Quetzals[a]
1960 (Feb.-June)	43.2
1960-1961	112.9
1961-1962	118.9
1962-1963	133.8
Total:	408.8

Source: From the records of the Contador General de la Nacion--provided by Lic. Ing. Victor Manuel Rosales.

[a]One quetzal = one U. S. dollar.

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transportation between Guatemala City and the Caribbean coast assumed the design shown in Figure 6. The Atlantic Highway and the Port of Matias de Galvez had cost almost $53 million. For the first time in the nation's history, it was possible for shippers to choose between alternate routes and modes of surface transportation connecting the country's largest city and its major port complex.

EFFECTS OF THE HIGHWAY

Cargo Transportation

The immediate effect of the opening of the highway was rapid and dramatic.

Price War. As soon as the paved highway was completed, trucking interests began operating to and from the port without published tariffs and indulged in rate-cutting until rates had been forced down to less than a third in some cases less than a quarter, of those that IRCA had been charging. Beginning in late 1959 the price was increased steadily in severity, indicating marked overcapacity in the trucking industry.

The railroad generally met competitive rates. The major changes (see Table A. 2) included reductions from \$0.98 to \$0.35 (later raised to \$0.50) per hundredweight for the transportation of coffee from Guatemala City to Puerto Barrios, from \$0.93 to \$0.60 for the transportation of heavy machinery in the reverse direction, and from \$1.98 to \$0.40 for the haulage of general merchandise in local transportation. In general, rates on import and export haulage over the route fell from about \$1.00 per hundredweight to less than \$0.50. Table 7. shows the changes that occurred in the railroad's operations between 1958 and 1962.

Threat of Government Intervention. During the first years following completion of the highway, a combination of overloaded vehicles and inadequate maintenance kept the road in an almost constant state of disrepair. In spite of its interest in the government-owned trucking line, Atlantida, the Guatemalan government appears to have considered novel measures to stop disintegration of the highway. The action considered, in collaboration with railroad officials, would have driven the major truckers out of business on all roads serving communities that were also served by rail and ultimately would have raised the cost of rail transport to the users.

Among the measures proposed were: (a) additional tolls for trucks, (b) increased license plate taxes on trucks and buses in intercity traffic,

TABLE 7. **Guatemalan Railway Freight Traffic, Revenues, and Expenses - Percent Change, 1958-62**

Operating Sector	[illegible]
Tons of freight handled:	
Export bananas	-15
Export coffee	+27
Other exports	+20
Imports	- 8
Local	-46
Operating revenues:	
Export banana freight	-24
Export coffee freight	-21
Other export freight	+33
Import freight	-22
Local freight	-29
Passenger revenue	-56
Express & miscellaneous	-22
Port revenues	-18
Total operating revenues	-27
Operating expenses:	
Maintenance of way & structures	-19
Maintenance of equipment	-22
Traffic	-13
Transportation	-12
Port expenses	no change
General expenses	-20
Total operating expenses	-16

Source: Guatemala Division, International Railway of Central America.

(c) a 5-cents-a-gallon tax on diesel fuel, and (d) collection of tolls by municipalities. The tolls and taxes were to be so established as to force the truckers to raise their rates to the point at which the traffic would logically pass to the railroad.

These measures were never implemented. The press, traditionally free and unrestrained, learned of the proposals and raised a hue and cry which aroused public opinion and Congressional debate. It is beyond the scope of this study to analyze the motives of the parties involved, but it may be noted that prohibiting traffic seems a rather drastic weapon for solving maintenance problems. During the period 1955-60 the government seems to have vacillated from one extreme to another in its transport policy--from a policy of creating intense competition for the railroads to one of restoring the railroad to its preeminent position in the transportation of goods over routes served by its tracks.

Agreement Among Truckers and IRCA. In 1962 the price war took its toll, and all parties to the battle sought peace. In November of that year the trucking companies proposed that the rates to and from the ports of Matias de Galvez and Puerto Barrios should be increased to a level that would permit the truck lines to operate without an out-of-pocket loss. The truckers were practically bankrupt and would have had to cease operations unless the railroad joined them in increasing rates. It should be pointed out here that the railway had approached the truck lines on several earlier occasions in an attempt to secure an adequate rate structure that would have permitted both the railway and the trucking interests to operate without actual losses.

Rates were restored to a more sensible level on February 1, 1963, but they were still much below that which would permit both railway and truck operators to make a reasonable profit. _/ There is no formal written

_/ IRCA memorandum (August 9, 1963).

agreement between the trucking interests and the railroads although one has been signed by the major trucking firms.

Local Traffic. The agreement does not apply to local traffic, for which an entirely different set of ground rules is currently in effect. Railroad rates are generally about $0.10 per hundredweight less than trucking rates for similar distances in order to offset the cost of pick-up at one end of the line and delivery at the other. Many shippers continue to use the railroad for carload lots, but since the opening of the highway, trucks have captured much of the traffic because of their greater flexibility of service. As indicated in Table 7, local tonnage handled by IRCA on its Atlantic route had declined by 46 percent since the opening of the highway. Flexibility in the local movement of freight is so important that truckers have been able to set their rates without considering those of the railroad. At times truck rates have been as much as 50 percent higher than railroad rates for comparable local hauls.

Some of the marked advantages of trucks in local traffic apply also to short-haul export traffic. For example, most export cotton is grown near the Pacific coast and shipped via Pacific ports to customers in the Orient. Within Guatemala it is transported by trucks.

Import and export haulage rates are fixed by an explicit agreement among truckers, to which the railroad has tacitly consented. However, some undercover price-cutting has been taking place, and the truckers are somewhat dissatisfied with the agreement. The situation is in a state of flux, and it is not now known whether price-cutting will become so widespread as to destroy the agreement or whether the railroad and the truckers will maintain a solid front in their relations with shippers.

Influences on Choice of Transport Mode

The following factors influence the choice of mode of inland transport that will be used in a particular case:

Port Use. The Atlantic port through which cargo is to enter or leave Guatemala effectively determines the mode of inland transport that will be used. Virtually all goods passing through Puerto Barrios move inland by rail, and trucks deliver and receive all goods moving through Matias de Galvez. The railroad has not been able to negotiate terms with the government for construction of a railroad spur from Puerto Barrias to Matias de Galvez to enable goods to move to and from Matias de Galvez by both road and rail. Furthermore the government has a set of regulations designed to encourage use of Matias de Galvez. On the other hand, the railroad has been very reluctant to permit trucks to pick up and deliver goods at Puerto Barrios, which is physically unsuitable for large-scale loading and unloading of trucks.

Timing. Export crops are generally sold with the delivery date to a particular ship at a particular port specified. The flexibility of trucks has been an important factor influencing their use by producers of coffee and cotton. The banana producers have, to date, continued their exclusive use of the railroad. United Fruit, however, is considering the use of trucks for boxed bananas.

Nature of the Cargo. Truckers prefer not to handle certain kinds of "dirty cargo" (such as, carbon black), which may make the trailer unfit for hauling other goods. In other cases, the trucking industry has provided special facilities, such as, refrigerated trailers for frozen cargo, not available on the railroad.

Special Services. The railroad is more flexible than are the truckers in the use of equipment. Some manufacturing firms near Guatemala City prefer to import raw materials by rail because IRCA is willing to leave a sealed car at a factory's siding until a customs inspector can come out from Guatemala City to inspect the cargo and until the factory can spare labor to unload the car.

On the other hand, the railroad cannot compete effectively with trucks for the cotton export trade because the hauls are short and gins do not have labor available for loading railway cars. Truckmen select, weigh, and load bales for their account. Railway rates are generally only two-thirds of going truck rates, but cotton exporters will not use railway service.

Customer Relations. The oil companies still ship some petroleum products by rail, even though it is generally agreed that road transportation rates are lower. Some of the oil companies consider IRCA a major customer and have refrained from withdrawing their business entirely from the railroad.

Passenger Transportation

In Guatemala, as elsewhere in Central and South America, the distinction between passenger and cargo transport is frequently hard to establish, especially in the case of highway transport. For example, many of the buses operating on the Atlantic Highway carry impressive amounts of cargo on their roofs. Trucks, on the other hand, are frequently used to transport passengers. While the actual extent of this practice is hard to determine, the majority of trucks on the Atlantic Highway carry people as well as cargo. The passengers apparently negotiate their own financial arrangements with the truck drivers.

The Atlantic Highway has made possible increased speed and flexibility in the movement of people. The railroad traditionally operated only two passenger trains a day between Guatemala City and Puerto Barrios. However, the traffic was mostly local in nature, the average trip being about thirty miles. Similarly, until 1961, AVIATECA, Guatemala's national airline, maintained a DC-3 passenger service of one or two flights daily between Guatemala City and Puerto Barrios. Now, because of the highway, road transport has replaced air transport as the principal first-class mode of passenger travel.

The air service required about one hour for the trip. It is now possible to drive the length of the highway in reasonable comfort in about five hours, and the express buses regularly adhere to a five-hour schedule. The trip by rail takes about twelve hours. The air fare was formerly $11. After the highway was opened, it was reduced to $7, but the airlines could not compete with the bus companies, which began their services charging $4 and soon lowered this, because of intense competition, to $3 for the express service and $2.95 for the local. Railroad fares were, and are, $2.95 second class and $5.90 first class.

The current state of the bus transport industry can only be described as chaotic, with vehicles of every description operating along the Atlantic Highway. Some eighteen companies operate over the entire length of the highway, while at least eighty-nine others are licensed to operate over routes which entail the use of portions of the highway. While long-haul charges generally are fixed by the competitive situation, local charges are determined by "what the market will bear." In some cases local fares are higher per kilometer than through fares, and in many instances they are appreciably lower.

One proposal for solving the problem of overcapacity in the bus industry is to limit the number of buses operating on the Atlantic Highway proper. Those authorized to operate on the highway would not leave it en route but would transfer passengers at interchange points to buses of other lines operating "feeder services." This, it is claimed, would mean a substantial foreign exchange saving since less fuel would be used and the buses, which are imported, would not depreciate as rapidly as at present, when all lines are operating at less than capacity and when almost all buses must run on bad roads as well as good. Many passengers, of course, are transported in private cars and pickup trucks. The passenger traffic lost by the railroads has been captured by a combination of private vehicles, buses, and formalized hitch-hiking on trucks.

Such data as are available suggest, however, that there has been no dramatic growth of passenger transportation since the opening of the highway. Tables 8 and 9 show all of the available data on the volume of traffic on the highway since its opening.

As shown in Table 8, the average number of vehicles per day in 1960 did not differ very much from the traffic registered in 1962. Data on tolls collected (see footnote tables on pages 66 and 67) also tend to support the conclusion that there has been no substantial traffic growth, although it should be noted that toll data do not include Guatemalan government or foreign diplomatic vehicles.

TABLE 8. Traffic Count at Garrita No. 7 on the Atlantic Highway[a]

Year	Total[b]	Autos	Buses	Trucks
1960 (Jan.-Nov.)	183,352	84,658	43,996	54,698
1961 (Nov.-Dec.)	23,485	11,822	5 784	5,879
1962 (Jan.-Nov.)	173,956	73,308	52,132	48,516
Average Number of Vehicles Per Day				
1960 (Jan.-Nov.)	556	257	133	166
1961 (Nov.-Dec.)	391	197	96	98
1962 (Jan.-Nov.)	527	222	158	147

[a]The table is based on the traffic counts made by the Traffic Police at Garrita No. 7, which is located some six kilometers from Guatemala City. This point is between Guatemala City and the Toll Station at Kilometer 17.

[b]Does not include the following traffic:

	Bicycles	Motorcycles	Tractors	Wagons	Cattle
1960	17,274	15,051	1,916	752	13,875
1962	19,939	16,574	929	574	26,288

TABLE 9. Number of Vehicles on the Atlantic Highway, Week of October 9-15, 1962[a]

Type of Vehicle	Guatemala Km. 17	El Rancho Km. 81	Garita Peaje Km. 127	Puerto Barrios Km. 292
Passenger cars	2,416	1,589	1,684	1,137
Trucks	1,956	1,507	1,302	1,211
Buses	715	380	155	295
Total:	5,087	3,476	3,141	2,643
	Average Number of Vehicles Per Day			
Passenger Cars	345	227	240	162
Trucks	279	215	186	173
Buses	102	54	22	42
Total:	726	496	448	377

[a]The table is based on a special traffic survey conducted by highway engineers of the Direccion General de Caminos, Guatemala during the week of October 9-15, 1962.

Entrepreneurship and Movement of Capital

The most significant new type of entrepreneurial activity within the transport sector has been refrigerated trailer service for frozen cargo. One major firm, owned by an American corporation, is currently operating this service between Central American points and Miami. Goods are hauled by road from as far away as Costa Rica, and the freezer trailers, each carrying 20 tons of cargo, are placed aboard ferry boats at Matias de Galvez. Its exports, including meat, vegetables, shrimp, garlic, tomatoes, and pineapples, were valued at slightly more than $3.5 million in a recent twelve-month period. The company also carries substantial imports on the return trip and has recently secured an exclusive contract for delivery of United States surface mail to Central American points at a considerable time saving.

There seems to have been little visible movement of capital as a result of the highway. Some commercial farming of garden crops (mainly tomatoes) has been started in the Teculutan area to supply produce to a few canneries and bottling plants near Guatemala City. Other ventures include small-scale hog and chicken raising, rubber plantings, and corn planting. Two efforts at resettlement failed because of the unhealthy conditions in the coastal area, indicating the need for investment in public health, drainage, irrigation, and education.

Labor. The road was not designed primarily to encourage specific labor flows and has not done so. It has neither tapped new sources of labor for the cities nor encouraged significant resettlement of agricultural workers.

Land Use

Rural Land. In general, there have not been dramatic changes in land use along the highway. While it is extremely difficult to ascertain the price at which land changes hands in Guatemala, there is reason to believe that land along the highway, formerly valued at about $5 an acre, is now selling at $15 an acre.

Urban Land. The Atlantic Highway begins in the northeast corner of Guatemala City. With no formal approaches, it is reached by narrow streets, many of them unpaved and in a very unsatisfactory state of repair. There has been only light industrial development along the part of the highway near the city. Although there are some small-scale housing developments, no significant "suburbia" has developed. Since extremely rugged terrain inhibits major expansion of the city toward the northeast, this may be somewhat due to natural limitations.

Similarly Zacapa, the largest town between Guatemala City and Puerto Barrios, which is located among small farms and grazing lands, has not changed much since the highway. There have been significant changes in Puerto Barrios, however, which was still in a very rudimentary state of development in the late 1930's. An airport was constructed, and a new street plan implemented, for example. However, most of the development occurred before the paved highway was built.

Matias de Galvez has evolved as a permanent settlement since 1955, when the new port was built on the site of the former settlement of Santo Tomas. It is linked to Puerto Barrios and the interior by the Atlantic Highway. Substantial development has occurred along the road to Puerto Barrios, and some minor roads have been constructed between the highway and the sea. The area inland from the highway, however, has remained virtually untouched.

Future Role of the Highway

Beyond the direct effects discussed above, the Atlantic Highway may play a key role in the development of the rest of Guatemala's internal highway network and in the development of the Central American Highway System, which has been approved, in principle, by the governments of the five Central American nations.

The Guatemalan Highway Plan. Figure 8 shows the routes of proposed new links in the Guatemalan Highway System. First priority is being given to the El Rancho-Coban link. Coban is the capital of Alta Verapaz Department, which Guatemalan planners see as a future "breadbasket" of the country. The road would open up the produce of the area to domestic markets in Guatemala City and export markets through the Atlantic and Pacific ports. A second step would extend the El Rancho-Coban road to

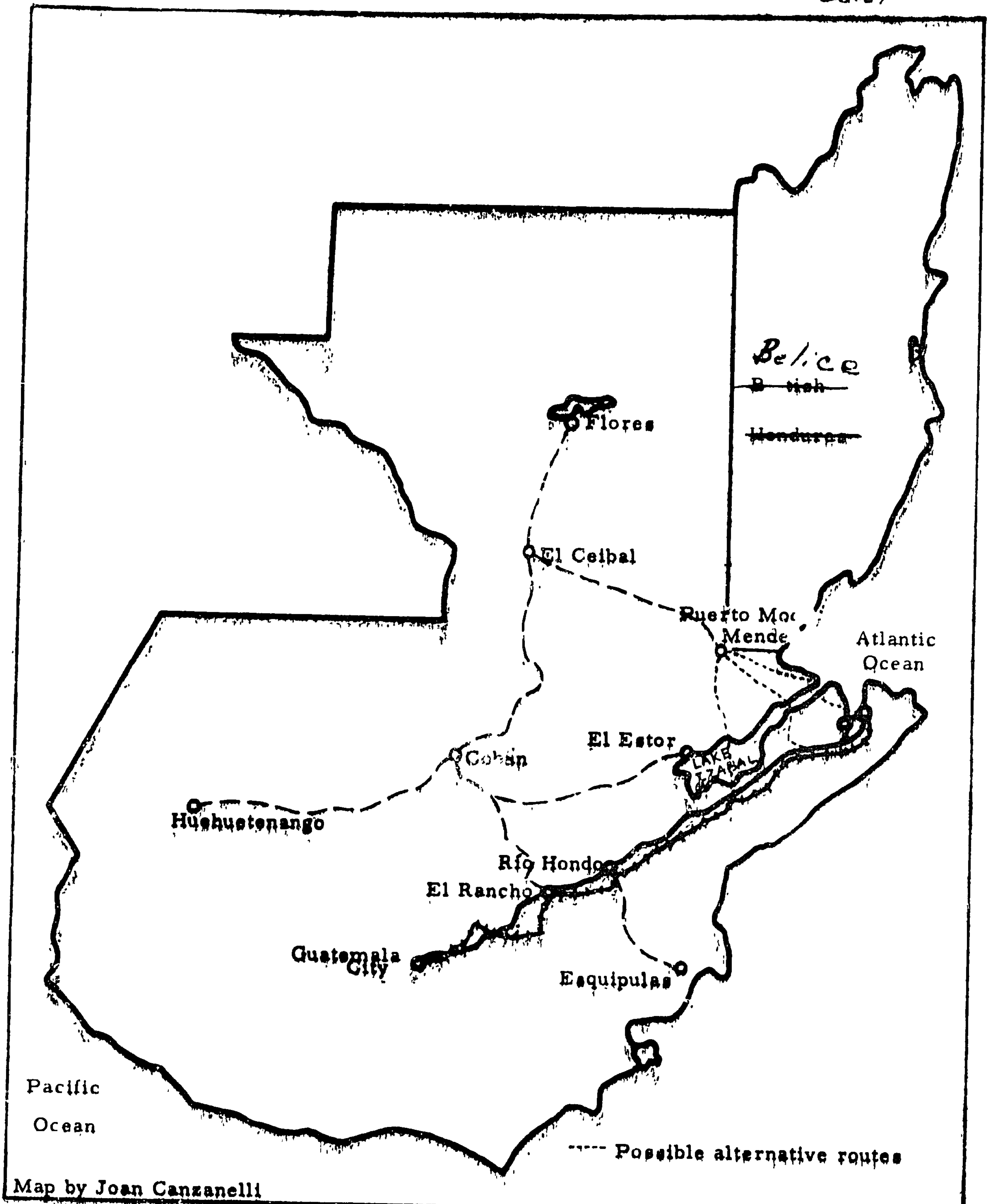

Figure 8
[redacted]. Guatemalan Highway Program, showing proposed major roads.

El Ceibal and Flores, facilitating new settlement and making possible the efficient shipment of timber, cattle, and produce of Guatemala's vast untapped North. Another link in the system would carry the road west from Coban to the desperately poor Indian settlements of Huehuetenango Department and from Coban to El Estor on Lake Izabal. While there are immense practical difficulties in such an undertaking, it would be theoretically possible then to resettle the Indians of the West in the more fertile North and East--a favorite dream of Guatemalan planners. A final link planned for the region north of the highway would connect El Ceibal and Puerto Modesto Mendez with the Atlantic Highway and the ports, thus tying the central area of Izabal Department to the sea and to the interior.

Whatever the economic merits of the Guatemalan highway program, however, it seems clear from the Atlantic Highway experience, that its purpose cannot be achieved without large and basic investments in such projects as irrigation, drainage, electricity, education, and public health. A carefully planned program of resettlement is desperately needed. None of these ancillary programs nor the highway program itself appears to be likely in the foreseeable future without substantial external assistance.

Some Lessons of the Atlantic Highway

There is danger in attempting to derive morals with wider applications from a unique situation. However, it seems appropriate to suggest some "lessons" which seem to emerge from the story of the

Atlantic Highway.

First, it is easy to underestimate the degree to which a developing country can obtain international assistance, and then go its own way. It seems clear that foreign assistance was, in this case, provided largely on the recipient's terms. Guatemala received a great deal of help from two major external sources of development finance, without finding it necessary to accept their suggestions concerning tolls, rate regulation, maintenance policy, highway approaches, port development, or the status of the consulting engineers.

Second, it seems clear that there may be widely differing motivations among the planners of a project. In the case of the Atlantic Highway, the prime impetus for the implementation of the project was the recommendation of a highly reputable World Bank survey team. Initial sponsorship of the proposedproject, however, was the responsibility of a Guatemalan government motivated by internal political considerations, and the desire to obtain redress of grievances against an unpopular United States firm. For example, it seems doubtful that the World Bank's recommendation would have been adopted so readily if the railroad had been Guatemalan-owned. It is possible that the variance in the motives of the planners may have contributed to subsequent disagreements over such matters as tolls, maintenance, and rate regulation.

Third, in a developing country, neither the motivation behind a project nor the effects of the project should be considered as static. In Guatemala, the character of the government shifted significantly while the project was under construction, and the policies of subsequent governments have vacillated between an antirailroad bias and an antitruck bias. Current policy appears to be stabilizing at a point of moderation, and the railroad may actually be linked to the port built for the truckers. Similarly, it is impossible to predict the ultimate savings to users of the Guatemala City-Puerto Barrios "corridor" as a result of the highway, because the future level of transport charges is not known, and will probably continue to be affected by agreements among the truckers and the railroad. The character of such agreements will in turn depend upon such factors as whether the railroad is linked to Matias de Galvez.

Finally, it is clear that transportation development should not be considered an elixir for the remedy of other national ills. A transportation improvement may serve as an effective catalyst for development in other sectors, but if it is to perform this function, other elements must also be present.

CHAPTER 4

THE PACIFIC LITTORAL HIGHWAY IN NICARAGUA

Construction of the Pacific Littoral Highway connecting the cities of Managua, Leon, Chinandega and Corinto (See Figures 9 and 10.) began in 1952 and continued by stages until the last section linking Chinandega to the port of Corinto was completed in 1961. The 141 kilometer (88 miles) paved highway was built at a cost of $8.8 million or about $62,000 per kilometer. When the cost of various feeder roads is added to that of the main road, the total investment amounts to $12.5 million, part of which was financed by a loan from the International Bank for Reconstruction and Development (IBRD) of $3.5 million in 1951, and another loan of the same amount in 1953, although not all of these funds were destined for the Pacific Littoral Highway. The balance was financed by the Government of Nicaragua.

THE BACKGROUND

Nicaragua and Its Economy

Nicaragua is the largest of the Central American countries with an area of almost 60,000 square miles. The overall population density is low, about twenty-five people per square mile. Since the population is heavily concentrated in the Western Plains and central highlands, this understates the extent of crowding. Indeed, the small area bounded by Lakes Managua and Nicaragua down to the Pacific Ocean has a density of almost 350

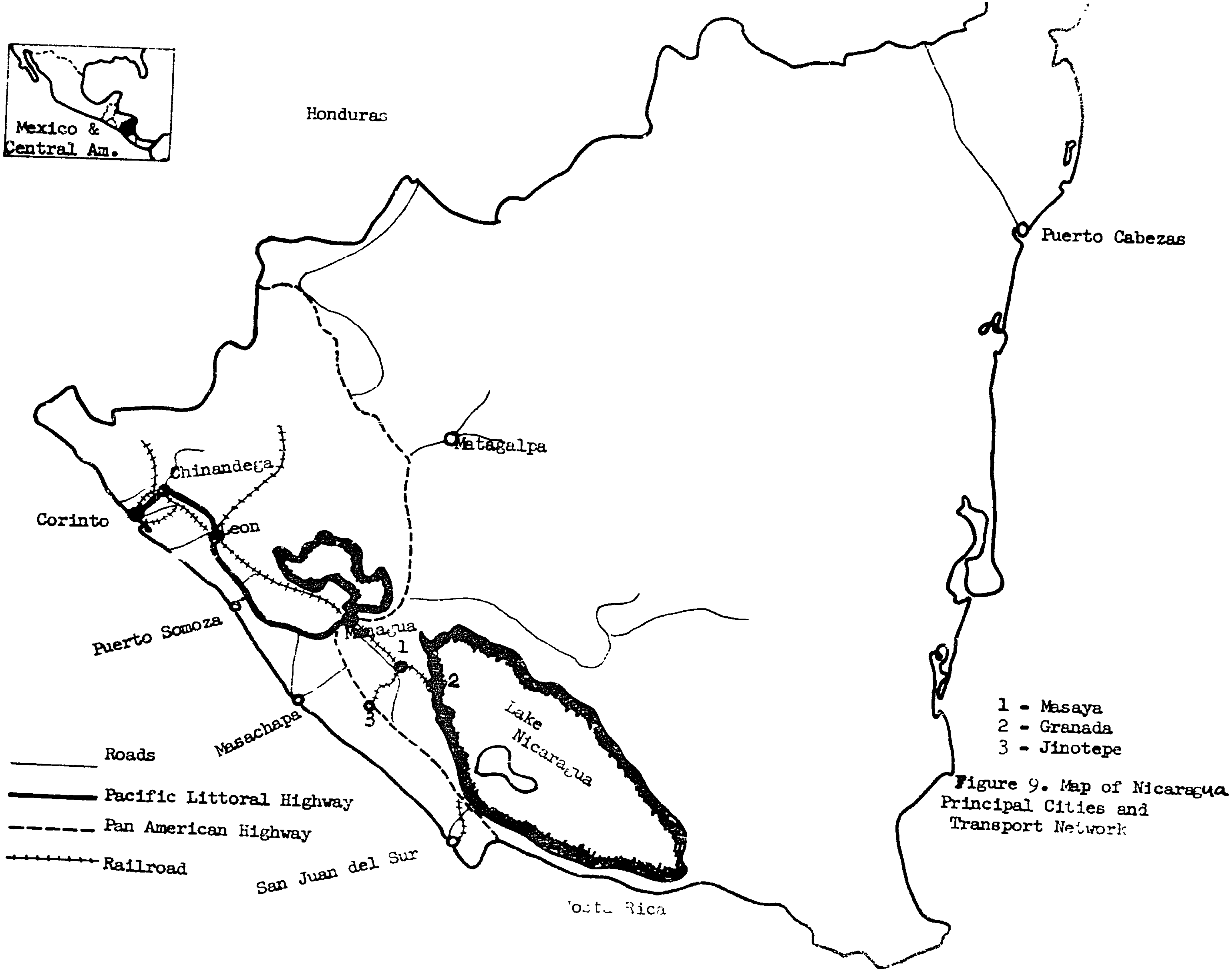

Figure 9. Map of Nicaragua
Principal Cities and
Transport Network

Figure 10. Political Divisions of Nicaragua

inhabitants per square mile.

Terrain. Four main regions are usually distinguished: (1) the Western Plains along the Pacific coast--containing extremely fertile volcanic ash soils, where cotton, sugar, corn, rice and beans are grown; (2) the Managua-Carazo uplands--a small sierra plateau especially suited for coffee production; (3) the Central Montane--rugged, with small lowland valleys and plateaus, also suited for coffee but with substantial stands of pine trees; and (4) the Eastern Plains--covering over half the land area with a prevailing vegetation of tropical evergreen hardwood forest.

Climate. The climate is generally hot and humid, depending upon the elevation, with a marked wet and dry season except in the Central Montane region.

Economy. The economy is chiefly agricultural. The main export crops are coffee, cotton, sesame, rice, and sugar. Corn, sorghum and beans are the basic domestic crops. There is an important livestock and forestry industry and a small manufacturing sector specializing mainly in processing, textiles, beverages, apparel, and shoes. Gold and silver are mined. There are known deposits of such materials as copper, iron, and bauxite, but they are not effectively exploited at present.

Imports are predominantly manufactured commodities.

Previous Transportation Facilities

Until the early 1950's the country's only railroad, the government-owned Ferrocarril del Pacifico de Nicaragua (FCPN) monopolized the surface transportation of export and import freight passing through the port of Corinto. But the volume of freight traffic gradually increased in the early fifties as a result of expanded trade and a cotton boom on the Pacific coast. Then the railroad became heavily burdened, and it was totally unable to handle the traffic during the harvest season. Rail capacity suffered from antiquated equipment, a narrow gauge, and the inefficiencies inherent in handling small shipments. Furthermore, delays and high costs of the railway were aggravated by the many intermediate stops made along the line.

The anticipated further growth of the Western Plains region required an increase in transport capacity, either by modernizing the railroad through large investments or by building a parallel highway. The IBRD mission concluded that construction of a highway would be better than a large-scale expansion of the railroad. Trucks would provide a considerable saving on short hauls and were especially needed to replace oxcarts for hauling cotton to the ginning mills. Distances involved were short, and goods were moved in small quantities, two factors that make rail transportation uneconomical.

The rough and disconnected roads in the Pacific region led to high vehicle operating costs. Most local agricultural products were carried on mules or in oxcarts from the growing areas to the railway stops. In short, the relative inaccessibility of ports in the fertile Western Plains area, especially towards Corinto, meant that little of the agricultural potential was being realized. Much of the land was used for grazing on subsistence production of corn and beans. Much was left uncultivated. Improved access was felt essential to facilitate the expansion of cotton and sugarcane production which was already underway in response to rising prices during the early fifties. The Pacific Littoral Highway was believed to be the most appropriate way to do this.

EFFECTS OF THE HIGHWAY

Cargo Transportation

It is difficult to draw definite conclusions about the effect of the Pacific Littoral Highway on railroad cargo traffic. The railroad had already been affected by the construction of a few other roads in the western part of the country before the highway was completed in 1961. One of these is an access road to Puerto San Juan del Sur (a southern port) which branches off from the Inter-American Highway. Another, built with private funds, provided access to the small lighterage port of Puerto Somoza. A third is a 40-kilometer highway to the south of Managua linking Masaya and Granada. Previously, the Managua-Masaya-Granada section of the railway had been the only modern means of transport serving the market in these densely populated urban areas.

Completion of the access roads, as well as the Managua-Masaya-Granada Highway, and partial completion of the Pacific Littoral Highway undermined the railroad's monopoly of surface transportation. Railroad revenues gradually declined through loss of traffic, and for the first time in its history it was operating at a deficit in 1957. Until 1955 it had managed to maintain profits of up to $850,000 a year by virtue of its monopoly. (See Table 10.)

Railway Rate Reduction. In 1958 the anticipated opening of the highway to Corinto coupled with competition from other roads, forced the railroad to reduce its rates in order to recapture some of the cargo traffic lost to the highways.

The major changes included a reduction of tariffs on imported goods. Rates on the shipment of iron and steel goods were reduced from 11 cents a ton-kilometer to 4.4 cents for less-than-carload lots and from 8 cents to 3.3 cents for carload lots. On textiles the reduction was from 13 cents a ton-kilometer to 5.3 cents for less-than-carload lots. In general it is estimated that shippers of imported goods saved about 6 cents a ton-kilometer as a result of the reductions.

By comparison, savings on the transport of export products were very small. The reduction in the case of cotton was from 3.7 cents a ton-kilometer to 3.3 cents and in the case of coffee from 3.7 cents to 3.0 cents.

TABLE 10. . Revenues and Expenses of Ferrocarril del Pacifico de Nicaragua, 1950-62
(In thousands of U.S. dollars)[a]

Year	Gross Income	Wages	Depreciation	Profit or Loss[b]
1950	1,682	728	67	636
1951	2,083	927	75	793
1952	2,352	985	77	804
1953	2,476	1,090	84	854
1954	2,651	1,330	89	685
1955	2,796	1,469	105	596
1956	2,413	1,360	189	273
1957	2,341	1,131	180	-101
1958	2,095	1,072	127	-172
1959	1,809	993	112	-221
1960	1,353	897	92	-287
1961	1,220	725	90	-132
1962	1,210	625	93	53

Source: Planning Office of Nicaragua, based on data from Ferrocarril del Pacifico de Nicaragua.

[a]Calculated from cordoba figures at rate of 7 cordobas = 1 dollar.

[b]Expenses not shown separately are rent, interest, social security, and fuel.

The smaller reductions in the rates for export goods can be easily explained. Under the old rate system (based on value) export cargo consisted of relatively low-value bulk commodities, such as coffee and cotton, while import cargo was composed largely of small shipments of high-value manufactured goods. With the introduction of truck transport, competition for the import traffic was especially severe since trucks are better suited to the movement of high-value, small-package commodities.

Local Traffic. Although the highway attracted much of the Managua-Corinto railroad traffic, the principal advantages of truck transport were found in local hauling of small shipments. Trucks have replaced oxcarts in delivering seed cotton from the growing fields to the gins along the highway. Moreover, the short distances between the gins in the Chinandega-Leon areas and the Port of Corinto have enabled trucks to deliver processed cotton directly to the port without transshipment on the railroad.

The impact of the new highway has been even greater on the delivery of local consumer goods. For example, local manufacturers and distributors of bottled beverages in Managua and Leon can now deliver their goods directly to stores in company-owned trucks. This direct delivery service has eliminated the difficulties and expense involved in arranging shipment on the railroad with pickup service at the destination. Other major products shipped locally include agricultural produce, grocery and drug items, textiles, toys, fertilizers, and insecticides.

It is estimated that local shipments, which account for a large share of the tonnage in the Managua-Leon-Chinandega traffic, would cost an average of 4 cents more per ton-kilometer if they were moved by truck over a poor dirt road rather than a good paved one. Thus the highway meant great savings to producers and consumers of local items through reductions in distribution costs.

A rough calculation of local traffic indicated that rail ton-kilometers declined from about 9 million in 1954 to less than 7 million in 1962. Local highway traffic was estimated at about 12.5 million in 1963. As shown in Table 11, traffic data to and from the port of Corinto suggest a similar pattern. The railway share of the Corinto port traffic declined from 100 percent in 1954 and 1955 to 31 percent in 1962.

TABLE 11. Port of Corinto Traffic, 1954, 1955, and 1962
(In Thousands of metric tons)

Year	Imports	Exports	Total	Percent Carried by FCPN
1954	141	83	224	100
1955	162	85	247	100
1962[a]	277	195	472	31

Source: Total port traffic data furnished by Customs Office. Railroad data obtained directly from the Ferrocarril del Pacifico de Nicaragua. Highway data estimated from other two figures. (The FCPN did not have a record of cargo carried from the port for the earlier years during which the highway was finished.)

[a]The customs office was unable to furnish tonnage for 1962 and it was necessary to estimate it from the value. The assumption is that tonnage increased in the same proportion as value between 1961 and 1962.

Passenger Travel. In Nicaragua, as elsewhere in Central America, it is hard to distinguish between passenger and cargo transport, especially on the highways. Many buses (including microbuses, station wagons, and converted pickup trucks) carry impressive amounts of cargo on their roofs, while some trucks carry passengers with cargo.

Passenger travel appears to have been greatly stimulated by the availability of buses and private vehicles. A rough estimate suggests that in 1963 total passenger-kilometers on the highway in the north Pacific region were from three to four times greater than the total rail passenger-kilometers in 1954 and 1955. _/ In 1963 buses and private vehicles accounted for over 300 million

_/ See Tables A.8, A.9, and A.10 for the computation of passenger-kilometers.

passenger-kilometers, while the railway accounted for only 50 million passenger-kilometers, substantially less than in 1954 and 1955. The volume of highway passenger traffic by private vehicles between Leon and Chinandega was about twice that between Managua and Leon, indicating that there was considerable short-distance travel over the highway.

This spectacular increase in highway passenger traffic has come about despite low passenger rates on the railway. Second-class railroad coaches are still the cheapest means of travel. Many people prefer to travel by bus since buses provide a smoother ride and more frequent departures. Moreover, the buses leave from the center of town, usually from a market rather than from the edge of town where the railroad stations are located.

In 1955 the railroad introduced self-propelled diesel passenger wagons, which cut travel time by one-third. However, the regular buses provide just as fast service as the diesel train, and express buses and private vehicles offer even greater speed. Since those who travel by private motor vehicle generally belong to an important economic group--businessmen or government officials--time is an important factor influencing the type of transportation chosen.

Construction of the Pacific Littoral Highway apparently stimulated private investment in motor vehicles. Between 1958 and 1960, for example, the average number of vehicles per day traveling over the 30-kilometer section of the highway north of Managua more than doubled, and by 1963 it had quadrupled. It is estimated that two-thirds of the motor vehicles on the highway are private automobiles and jeeps.

Agricultural Production

The north Pacific region of the country is completely dependent on agricultural production and particularly, in recent years, on the export of cotton.

Cotton. Although the production of cotton increased sharply during the decade after highway construction began, the increase is not wholly attributable to the new road. In Nicaragua, expansion of cotton production had a momentum of its own in the early 1950's. The Leon and Chinandega areas are ideally suited for cotton, but production was uneconomical until after World War II because of the pests and diseases that accompany the region's rainy season. Most of the cotton was grown in the Managua and Granada areas, some parts of which are less suited for cotton production than the more isolated Chinandega area. However, with the introduction of modern insecticides and with the encouragement of rising world prices in the early 1950's, farmers began to cultivate cotton on Nicaragua's Pacific plains.

Even after the cotton price slump in 1955, production continued to increase in the plains area of Chinandega, while production in the mountainous Managua and Granada areas declined as many producers were forced out. In a single decade the area devoted to cotton cultivation in the State of Chinandega expanded five times and cotton production increased more than ten fold. By contrast, the total area utilized for all agricultural crops (including cotton) showed an increase of only 68 percent during the same period, indicating a significant diversion of land to cotton production. (See Table 12.)

The impact of the highway on cotton production in Nicaragua can best be assessed by examining the three major factors that are necessary in the production process.

Constant inspection of growing crops, especially during the rainy season, is necessary. Since the growing season coincides with the rainy season and the rain washes away insecticides, farmers must apply

TABLE 12. Trends in Agricultural Production in Chinandega and Leon, 1951/52 to 1962/63 (Unit in thousands)[a]

Product	Area: Total 1951/52	Area: Percent Change 1951/52-1962/63	Production: Total 1951/52	Production: Percent Change 1951/52-1962/63	Value of Production: Total 1951/52	Value of Production: Percent Change 1951/52-1962/63
Department of Chinandega						
Cotton	10.2	511	61.7	1,119	2,008	973
Rice	5.2	(-84)	104.9	(-88)	855	(-90)
Sugar C.	10.4	37	420.3[b]	40	3,740	44
Beans	3.2	(-91)	65.4	(-94)	444	(-94)
Corn	18.0[c]	(-12)	459.9	(-23)	1,497	(-36)
Sorghum	3.3	33	85.4	(-43)	232	(-53)
Sesame	8.0	(-98)	86.4	(-99)	938	(-99)
Total:	58.3	68			9,714	189
Department of Leon						
Cotton	16.3	196	100.9	447	3,278	382
Rice	6.1	(-96)	90.8	(-95)	742	(-96)
Sugar C.	0.6	(-19)	21.5[b]	(-21)	191	(-18)
Beans	4.2	(-69)	51.7	(-80)	351	(-78)
Corn	15.0[c]	(-25)	372.2	(-60)	1,212	(-67)
Sorghum	9.4	(-13)	179.2	(-40)	488	(-50)
Sesame	16.2	(-85)	158.7	(-88)	1,720	(-87)
Total:	67.8	7			7,982	112
Grand Total:	126.1	35			17,696	155

Sources: Ministerio de Economia, Direccion de Estadistica y Censos. 1951-52 figures are from the first agricultural census. Those of 1962-63 are based on sampling done by the Ministerio de Agricultura. The value of agricultural production is based on

[a]Area in manzanas. One manzana = 1.74 acres; production in quintales. One quintale = 100 pounds; value of production in U.S. dollars.

[b]In metric tons.

[c]Area is that sown for first harvest to avoid double counting when totalling.

insecticides at least two or three times a week during October and early November. Yet many cotton growers live in the cities, at some distance from the fields. Without improved transportation frequent travel by farmers to the cotton fields would be almost impossible.

Furthermore, cultivation of cotton calls for shipment of a large volume of inputs, such as fertilizers, seeds, and insecticides. In addition, gasoline and spare parts have to be transported for tractors. Paved roads are essential if uninterrupted delivery of these supplies is to be made.

As was noted earlier, mechanized highway transport replaced ox-carts and mule packs in the local hauling of cotton to the gin. The secondary, all-weather, farm-to-market roads, which connect the highway and the rail-road, play a large role in making this possible. The previous farm-to-market roads were mere trails and were impassable during the rainy season. Oxcart transportation used to cost 50 cents a ton-kilometer in the dry season. With the highway, truckers can transport cargo at 10 cents a ton-kilometer for short haulage. For longer distances the cost is estimated at $1 per ton plus a variable figure of 4-5 cents per ton-kilometer.

Since shipment of cotton to the gin is an essential part of pro-cessing cotton for export, all-weather roads are a prerequisite. In recent years about 186,000 tons of seed cotton were shipped to gins over distances averaging 5 to 10 kilometers in the Leon and Chinandega areas. Shippers have been able to reap considerable savings as a result of the highway.

It should be noted, however, that increased cotton production results not only from successful use of the highway but also from a number of other factors. Though the improved road facilitated travel of cotton growers, local hauling of cotton, and the opening of new fertile land, cotton production was greatly stimulated also by high profits stemming from the rise in cotton prices in the early fifties, the introduction of effective insecticides, use of improved fertilizers, and liberal farm credits.

Other Crops. Much of the land now used for cotton production was previously devoted to pasture and the production of other crops, such as rice, beans, corn, sesame, and sorghum. Consequently, with the advent of the highway, production of these crops declined. (See Table 12.)

Production of sugarcane, grown in Chinandega by one large company, has increased modestly--40 percent above the 1951-52 level. The banana harvest was good in 1962, and the region was able to export 8,000 tons of bananas, valued at $800,000 in that year. Previously bananas had been grown in small plots for domestic consumption only. As shown in Table 12, for the departments of Chinandega and Leon the value of agricultural crops as a whole (including cotton) increased by 155 percent between 1951-52 and 1962-63. Yields per manzana have steadily increased since 1950-51 due mainly to earlier investment but also stimulated by the improved access. (See Table A. 7.)

SUMMARY AND CONCLUSIONS

In 1940 Nicaragua had only 27 kilometers of paved road in a total of 461 kilometers of roads of all kinds. By 1962 the country had 761 kilometers of paved road in a total of 6,151 kilometers covering the whole Pacific and central regions. Now only the vast and sparsely populated Atlantic region remains outside the system. Until 1956 the government-owned railroad had a virtual monopoly of internal transportation through the most populous and productive part of the country.

Construction of the Pacific Littoral Highway and other roads put an end to the monopoly and turned its substantial profits to losses.

Most of the cargo carried over the highway goes to or from the port of Corinto. A lesser amount of cargo and a great many passengers are carried between towns. Since the highway runs parallel to a large stretch of fertile land in the country, it also serves as a farm-to-market and market-to-farm road for both cargo and passengers. These three uses make the highway exceptional and result in considerable benefits to the country.

Introduction of an alternative mode of transportation and the consequent attempt of the railroad to meet the competition by cutting freight rates saved shippers of imported goods about 6 cents a ton-kilometer.

Since the reduction there is little difference between railroad and truck rates. However, the trucks have captured a large amount of cargo traffic from the railroad because of the advantage the former have in the local hauling of small shipments.

The availability of bus and private-vehicle transportation on paved highways has led to greatly increased passenger travel. Speed, flexibility, frequent departures, and cost have all been important factors in inducing passengers to use highway rather than rail travel.

A final benefit resulting from highway construction was the acceleration provided to the substitution of cash crops for subsistence cultivation. The Nicaraguan economy is changing from one of subsistence and export agriculture, which could not support industry, to an economy with a much enlarged domestic market and an even more important Central American market, which makes diversification through manufacturing possible. The production of the Pacific region is having an important effect on the Nicaraguan economy for two reasons. It is now connected with the rest of the Nicaraguan market, and increasingly with the total Central American market, not only by the railroad but by the expanding network of highways. And the foreign exchange from new export earnings permits importation of needed capital equipment. Although the Pacific Littoral Highway cannot be interpreted as causing these changes, it has obviously facilitated them and, in this sense, made an important contribution to the further development of the economy of Nicaragua.

CHAPTER 5

THE TEJERIAS-VALENCIA HIGHWAY IN VENEZUELA

In 1958 Venezuela completed its second major autopista, a high grade limited access highway from Tejerias to Valencia. This road, which parallels the Pan-American Highway as well as the Central Railway of Venezuela, is one of the largest such projects ever undertaken in Latin America. It cost 327.4 million bolivares (about 98 million dollars at 1959 exchange rates). An additional 24.8 million bolivares (Bs) was spent to bring the road up to the traffic demands in 1962. The 99-kilometer road was opened to traffic in 1958.

The new superhighway serves a region located mainly in the Venezuelan states of Aragua and Carabobo. It connects their capital cities of Maracay and Valencia with Tejerias and beyond to Caracas, the national capital, via a continuation of the Pan-American Highway. (See Figures 11 and 12.)

THE BACKGROUND

Venezuela and Its Economy

Venezuela, the wealthiest country in Latin America by most indicators, had a population of close to eight million in 1962 and an area of 352,150 square miles for an average population density of 22.4 persons per square mile. Four-fifths of the people live in the highly urbanized northwestern section of the country--from San Cristobal through the Lake

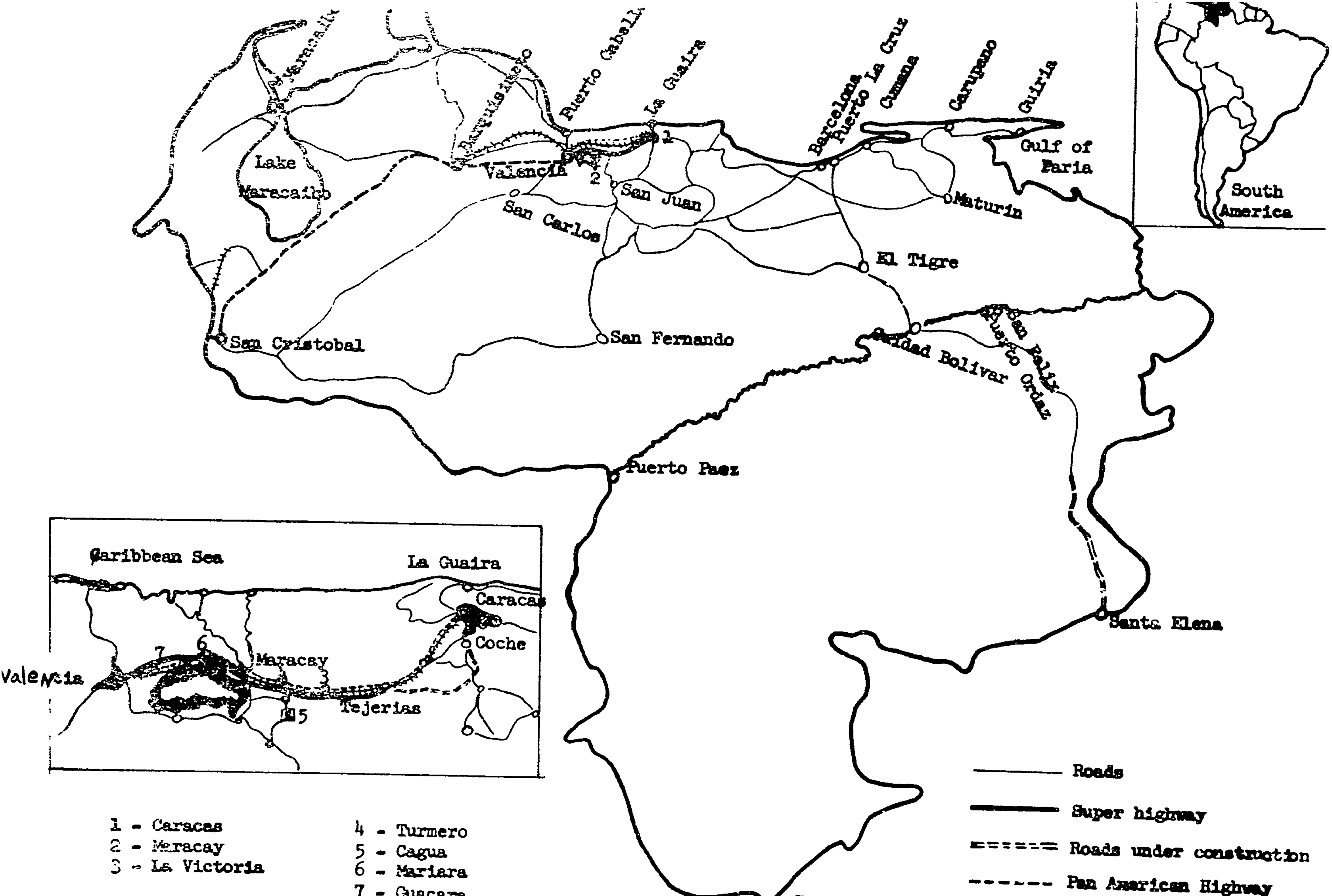

Figure 11. Map of Venezuela: Principal Cities and Transport Network

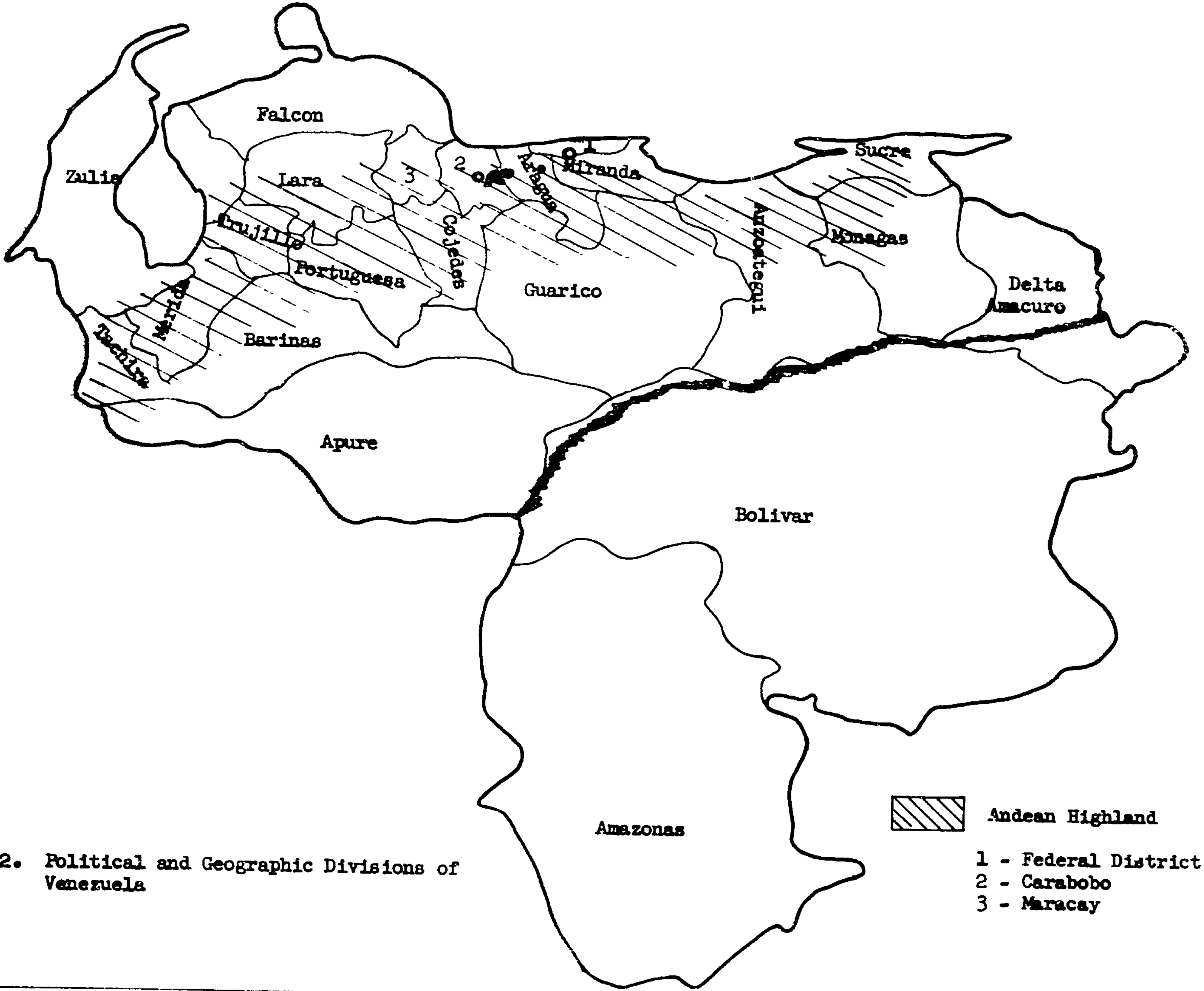

Figure 12. Political and Geographic Divisions of Venezuela

Maracaibo region to Caracas.

Terrain. Four geographic regions are normally distinguished in Venezuela: (1) The Andes Highland and adjacent coastal area, extending from San Cristobal in the Southwest to the Paria peninsula in the Northeast; (2) the Maracaibo Basin, the area adjacent to Lake Maracaibo; (3) Los Llanos, or plains, which extend from the Andes to the Orinoco River in the South and East; and (4) the Guayana Highlands located south and east of the Orinoco.

A tropical climate prevails over most of the country with the temperature changing with altitude. However, the city of Caracas and most of the region under study in this case have a sub-tropical climate with the temperature ranging from 50° to 77° F. There are two main seasons, a wet season from May to October and a dry season from November to April.

The Economy. Petroleum, produced mainly in the Lake Maracaibo region, is the most important product in the Venezuelan economy. It accounted for 90 percent of the total value of exports in 1959. Iron, important deposits of which are located south of the Orinoco, is the second most important mineral product. Gold, copper, coal, salt, tin, manganese, asbestos, diamonds, and mica are some of the other mineral products that are exploited in Venezuela.

Coffee production is concentrated in the Andes region and the coastal area west of Caracas. It is the most important agricultural product and second only to petroleum in terms of export value. Corn, bananas, yucca, sugarcane, cocoa, tonka beans, and rubber are also produced. Cattle raising is of special importance to the region traversed by the new autopista. Most of Venezuela's output of sugarcane, cotton, rice and citrus fruit comes from this area as well.

Venezuela is now rapidly industrializing, particularly in the fields of steel, petro-chemicals, plate glass, flour mills and bagasse paper.

Previous Transport Facilities

In 1954 the route between Valencia and the gateway to the Caracas valley at Tejerias was served by a single-track, narrow gauge railway and the Pan-American Highway--a two-lane paved road, running through the principal valley towns of Turmero, La Victoria, Maracay, Mariara, and Guacara.

The Central Railway of Venezuela had reached maximum use in 1944, when some 179,000 tons of freight and 507,000 passengers were moved over the route between Valencia and Caracas. At this time, the railway had begun to suffer from antiquated design and equipment. Moreover, it follows a tortuous route, especially between Tejerias and Caracas, where it crosses the mountains. The run from Valencia to Caracas takes more than four hours.

By 1954, rail freight tonnage had fallen to 39 percent of its 1944 freight peak level, and passenger traffic was only 19 percent of its 1944 peak. (See Table 13 .) The Pan-American Highway had attracted freight formerly carried by the railroad and in addition had captured much of the increased tonnage.

Need for Further Capacity. The traffic situation had reached the crisis stage by 1954. Combined railway and highway freight tonnage moving on the route to Caracas amounted to nearly 4,500,000. Even if the railroad had been operating at its 1944 capacity of 178,000 tons, the highway would have been severely taxed to carry the remaining tonnage. As it was, bumper-to-bumper traffic characterized the Tejerias-La Victoria sector, and maximum traffic density in various sectors was about 7,000 vehicles a day. It is clear that the existing rail and highway facilities were incapable of handling the growing traffic between Tejerias and Valencia.

The rapid rate of industrial expansion, especially in Carabobo State was the obvious cause of the traffic pressure. Indeed the transport bottleneck may well have retarded the growth of the valley's industries. There was, therefore, an urgent need to increase transportation capacity in the area if future growth prospects were to be realized. A true transport bottleneck situation appeared to exist.

TABLE 13. Freight Tonnage and Number of Passengers Carried by the Venezuelan Central Railway, 1942-62
(Freight in thousand tons; passenger in thousands)

	Freight			Passenger		
	Total	Valencia-Caracas	Index (1944=100)	Total	Valencia-Caracas	Index (1944=100)
1942	456	-	-	1,242	-	-
1943	529	-	-	1,530	-	-
1944	536	179[a]	100	2,028	507	100
1945	531	-	-	1,327	-	-
1946	506	-	-	1,392	-	-
1947	426	-	-	859	-	-
1948	391	-	-	605	-	-
1949	374	-	-	613	-	-
1950	306	-	-	588	-	-
1951	162	-	-	339	-	-
1952	183	-	-	431	-	-
1953	197	67	37	433	99	20
1954	162	70	39	292	98	19
1955	86	58	32	91	80	16
1956	87	64	36	84	78	15
1957	88	68	38	71	70	14
1958	63	63	35	71	71	14
1959	98	76	42	241	91	18
1960	172	78	44	288	84	17
1961	131	87	49	387	76	15
1962	195	90	51	362	63	12

Source: Memoria, Banco Central de Venezuela, 1960, 1961, 1962, and 1963.

[a] Estimate based on assumption that 1953 relationships held in 1944.

There were two alternatives to the autopista: (1) improve the Pan-American Highway and (2) expand rail capacity. The former was rejected because the very high and growing traffic densities called for a limited access highway to supplement the present highway rather than simply adding extra lanes. While the 1959 traffic volume could have been handled by highway improvements estimated to cost only Bs 40 million, successive improvements would have been required to accommodate the expected traffic increase. A piece-meal solution, or succession of temporary solutions, did not seem to fit the needs of the region.

The railroad option on the other hand appeared to be excessively costly. Cost estimates for modernizing the railway between Caracas and Valencia ranged from about Bs 200-420 million, including rolling stock, while the original estimate for the autopista was only Bs 146 million. (As already noted the actual costs were over twice this amount.)

On these grounds, the decision to build the autopista clearly seemed preferable to the other alternatives.

EFFECTS OF THE TEJERIAS-VALENCIA HIGHWAY

Savings in Time and Operating Costs

The greater speeds made possible by the autopista have brought time savings to road users. Because of a lower traffic density on the autopista and its superior design, travel time was reduced by one hour and ten minutes by truck and fifty minutes by car along the Tejerias-

Valencia route, when compared with the travel time required on the Pan-American Highway.

Shipper savings, calculated by subtracting the weighted average rate per ton imposed on freight passing over the new highway from the rate charged by truckers on the Pan-American Highway, amounts to Bs 15.3 per ton on the new highway. (See Table 14.) Truckers were able to lower rates because of a reduction in operating costs occasioned by the new facility. An estimate of costs per vehicle kilometer suggests that over the autopista savings of about Bs 0.60 for trucks were realized. (See Table 15.)

These shipper and carrier savings were not, however, the prime reason for the traffic expansion although they clearly provided a stimulus to use the new facility and somewhat relieved the congestion along the Pan-American Highway. The real source of the traffic pressure came from the spillover dynamism centered on Caracas.

Venezuela emerged as a rapidly developing nation when oil deposits were found in the Lake Maracaibo region. However, the most dramatic impact of the oil bonanza was felt in the national capital rather than in the area of the oil fields. While Caracas had few if any geographical advantages, its monopoly over government caused it to emerge as the growth center of the Venezuelan economy in the 1940's. Industries concentrated around the capital because it provided the quantity and type of labor needed, as well as ancillary services (including government) and goods essential to industrial development. Therefore, Caracas grew rapidly, but there were obvious

TABLE 14 Estimated Shipper Savings on Tejerias-Valencia Highway, Venezuela (In bolivares)[a]

Type of Highway	Freight Rate Per Ton (weighted average)	Shipping Cost Per[b] Average truck load
Pan American Highway	40.4	250.5
Autopista	25.1	155.6
Shipper Savings:	15.3	94.9

Source: Charles J. Stokes, unpublished manuscript prepared for the Brookings Institution, 1964. p.65.

[a]1962 controlled rate: Bs 3.3-3.5 = $1.00
[b]Average truck load = 6.2 metric tons

TABLE 15 Savings in Operating Costs on Tejerias-Valencia Highway, Venezuela (In centimos)[a]

Type of Highway	Operating Cost	
	Cars	Trucks
Pan American Highway	25	105
Autopista	15	45
Savings:	10	60

Source: Charles J. Stokes, unpublished manuscript prepared for the Brookings Institution, 1964, p.65.

[a]100 centimos = 1 bolivar. 1 bolivar (1962) = U.S.$.33-.35.

limits to its growth imposed by the narrowness of the valley, which limited the supply of land and forced up costs. This encouraged spillover into other regions, the movement of land, labor, capital, and entrepreneurial ability from the Caracas region.

Land

Land movement or more correctly, the changing pattern of land use, may be either intensive or extensive. Intensive land use involves successive uses of the same plot while extensive land use means that new lands are converted to economic purposes. Intensive use refers to such things as higher buildings, greater occupancy rates per building, more rational use of space, increasing segregation of activity, and the like. Under the second type, vacant areas, or areas previously used for agricultural purposes are converted into urban land.

Urbanization in Caracas, given the limited supply of land in the valley, necessarily became intensive in the 1950's. Any industry which could not produce enough through the sale of its products to cover the rising cost of land would have to seek a new location or cease to produce. Any new industry seeking to locate in Venezuela would have to take into account the high land costs and consider whether it could afford to locate in Caracas.

In Caracas, extensive land use required improved transport facilities because of the high mountains surrounding the city. The opening of cheaper highway routes into the adjacent Aragua valley and the Lake Valencia region permitted new lands to be occupied. The spillover of the Caracas industrial growth as well as the growth of the demand for agricultural products resulted in a clearly observable reshuffling of land use patterns in the Aragua valley.

Labor

As new industries were established along the *autopista* in the vicinity of Valencia and Maracay, new jobs were created. Previously, high incomes and wages in Caracas had attracted many people from the countryside. Now, however, workers were attracted to the industries that moved out of Caracas. This whole process was facilitated by the availability in the Aragua-Valencia region of a labor force at least equal in ability and training to that in the Caracas valley. If factories were moved out to the Aragua valley, there would be no more problems in staffing than were encountered in Caracas. In addition, there was the advantage of lower wages for comparable positions.

Capital

The movement of capital in the spillover process is naturally influenced by the above two factors; the availability of low-cost land and cheap labor. As Caracas grew, its savings increased and investment channels broadened. Alert investors seeking new avenues of investment directed their surplus funds into familiar activities in a new setting in the

Aragua valley.

This outflow of capital permitted the utilization of the geographical advantages of the Aragua valley and the development of what were at first satellite centers to the capital city. As these new centers are growing rapidly, it is reasonable to expect that they will provide a large market, establish a base for sustained economic growth somewhat independent of Caracas, attract labor, and perhaps ultimately export capital.

A migration of entrepreneurs from the city of Caracas was a natural part of the spillover process which accompanied the outflow of capital. Entrepreneurial opportunities in Caracas had apparently reached the saturation point, and new investment opportunities were welcomed. It was the entrepreneur who organized the firm, brought together the resources, assumed the risks, and exploited the market in the new centers.

In short, spillover readiness was high in Caracas, and the very rapid industrialization of the Aragua valley following the construction of the highway was an obvious result The highway could, of course, have gone in any direction. The development observable in the Aragua valley might have taken place, for example, in the state of Miranda beyond the pass leading down from Petare into Guatire and Guarenas. The direction of development spreading from a growth center is largely dependent upon the availability of efficient transport facilities. Thus the autopista served to channel the spillover of dynamism toward the west.

The tangible results of this process are evident when examining the behavior of certain demographic and production data. Population increased more rapidly in Aragua and Carabobo states than in the nation as a whole from 1950 to 1961 while the cities of Valencia and Maracuay grew even more rapidly than the states. (See Table 16.) Total manufacturing output in Aragua and Carabobo similarly grew faster than in the Caracas area or in the nearby states of Miranda, Zulia and Lara. (See Table 17.) A breakdown by industry suggests that in Carabobo the fast growing industries have been rubber, paper, and chemicals; in Aragua metal products, hides, and skins have exhibited the largest growth rates. (See Table A. 8 .) In general, the growth rate of durables in these two states has been far above the national average and that of other neighboring states, as indicated in Table A. 8 . As a result of these growth rates, the share of total manufacturing output originating in Aragua and Carabobo has risen from less than 8 percent of the national level in 1955 to around 14 percent in 1962.

Agriculture

The impact of the highway is also apparent in agriculture. Traditionally, Aragua has been a cattle feeding and slaughter center. Both in tonnage and in number of cattle slaughtered, Aragua's percentage increased. By 1961, Aragua was slaughtering 19.5 percent of the cattle handled in the nation by number and 20.3 percent by tonnage, both substantial improvements over the 1957 figure. Carabobo increased its share

TABLE 16. Population Increase in Aragua and Carabobo, 1950-1961
(Number in thousands)

	Total Population 1950	Total Population 1961	Percent Change 1950-1961
Aragua	190	313	65
Carabobo	243	382	57
Valencia	89	164	84
Maracay	65	135	108
Nation	5,035	7,523	49

Source: Republica de Venezuela, Ministerio de Comercio. Direccion General de Estadistica y Censos Nacionales. IX Censo Nacional de Publacion, Caracas, 1962.

TABLE 17. Manufacturing Indices in Venezuela, 1952-60 (1953 = 100)[a]

Year	Caracas Distrito Federal	Carabobo	Aragua	Miranda	Zulia	Lara
1952	88	87	78	89	99	105
1953	100	100	100	100	100	100
1954	111	125	111	94	118	93
1955	123	153	120	93	126	99
1956	134	166	133	97	137	102
1957	145	197	160	121	161	121
1958	161	214	208	124	141	126
1959	211	230	247	147	167	154
1960	218	317	271	147	143	223
Rates of Growth (In percent)						
Durables	10	27	33	1	10	17
Non-durables	12	16	15	9	5	9
Average growth	12	18	17	7	2	9

Source: Banco Central de Venezuela. Memoria, Caracas, Venezuela, 1961, pp. 378-381.

[a]Except for growth rates.

of this industry, but Zulia, Tachira, and Anzoategui remained stationary in this period. Pork slaughter increased as well for Aragua and Carabobo. Packing and slaughtering activities which depend heavily upon transport had become even more important to the economic base of the Lake Valencia region than before the completion of the highway.

As far as crops are concerned, the picture is mixed. Rice production in Aragua virtually collapsed between 1950 and 1961 and while increasing in Carabobo state by about 28 percent, it was still well below the increase for all Venezuela of more than 100 percent. Coffee and cacao output declined by greater percentages in these two states than in the nation as a whole, while the increase in output of black beans and corn was below the national average. On the other hand, sugar cane, coconuts, and papaya recorded increases in physical output in Aragua and Carabobo well above those for the nation as a whole. The number of hectares cultivated doubled in Carabobo but declined slightly in Aragua between 1950 and 1961. /

/ Data from Ministerio de Fomento, Memoria y Cuenta, Caracas, 1963.

Such figures as have been presented can give only an impression of the nature of the change. However, what they do reveal is that in many lines growth took place out of proportion to that in other sections of the nation including the capital. Aragua and Carabobo overtook Lara and even Zulia as vital sectors of the economy. There was deconcentration of economic activity in Caracas and much of that deconcentration favored these states. Furthermore, as new industrial areas grew up the process of import substitution was also accelerated. The change in the import structure consisted of more raw materials, parts assemblies and less food and finished goods along with a widening and upgrading of the remaining finished goods imports. Domestic production as a proportion of total consumption thus rose from 65 percent in 1959 to 82 percent in 1962.

Urbanization

The *autopista* had direct effects on the growth and structural changes of the urban areas affected. It played a dominant role in the location of economic activities as well as in the general conformation of the cities in the Aragua-Lake Valencia region. The following is a brief summary of the impact on a few selected urban centers.

Cagua-Turmero-La Encrucijada. (See Figure A.1.) Cagua and Turmero, which had been centers for the processing and marketing of farm surpluses from the eastern part of the valley as well as adjacent areas in the upper Llanos, retained their basic colonial form after the advent of the highway, but the area between the two towns became a large industrial zone. La Encrucijada, located between Cagua and Turmero, is the name given to the interchange on the *autopista* where connection is made with Route 2. It has become the center for this emerging urban area. Just beyond the toll house, one finds major hotel and motel facilities, restaurants, filling stations and garages, processing plants and mills, as well as new low-cost housing.

To the south, on the bypass around Cagua, a two-kilometer industrial zone grew up without planning guidance. In this zone, numerous plants were built, and the area has become a producing center for concrete, electrical supplies, hardware, prestressed concrete building specialities, earthenware, and processed food. These products depend on the existence of efficient transport facilities to find a nationwide market.

To the north of the autopista, large milling plants as well as fertilizer and farm chemical factories are found. There is a special area set aside for new housing to accommodate the growing population of the region.

In these old towns, new office and bank buildings, sophisticated shops, and large food stores are replacing the old retail outlets. Here, then, is a conurbation whose existence and structure has been strongly influenced by the autopista.

Maracay. (See Figure A.2.) Before the highway, Maracay was one of the many colonial centers that dot the Andean landscape. Largely self-sufficient, it was a cultural, religious, and administrative center for the region. There was some industrial development, mainly slaughterhouses and meat processing plants, with a few textile mills. Since the highway was built, an industrial area--containing many branch plants of well-known North American and European manufacturers of textiles, clothings, paper products, and packaged foods--has expanded along the right-of-way of the new road. To the north of the Caracas-Valencia highway are the metal working plants and allied industries which grew up following the completion of the first stretch of the <u>autopista</u> in 1956.

Though heavy through traffic has been diverted to the new road, thus easing local circulation, the old town faces new kinds of problems. Between 1950 and 1963 the city grew from a population of 30,000 to 160,000. One of the effects of this has been the creation of new slums, mainly populated by immigrants. Furthermore, the volume of internal traffic has been increasing rapidly. The city is confronted with the familiar problem of widening streets, building bypasses, and expanding parking facilities.

<u>Valencia.</u> (See Figure A.3.) While industrial growth had begun in Valencia before completion of the first links of the Caracas-Valencia highway, the new road obviously increased the speed of industrialization. The industrial area grew rapidly along the highway and the new southern bypass. In downtown Valencia some skyscraper building had already begun by 1963. The city began to expand in a manner similar to that in Caracas, where a series of new "downtowns" were established as the population pushed eastward along the floor of the Caracas valley. The population of Valencia grew from about 89,000 in 1950 to 234,000 by 1963.

CONCLUSION

The Tejerias-Valencia Highway illustrates the spillover effects of a transport facility upon a region adjacent to a growth center. As was pointed out, the Caracas valley and the Lake Valencia region are adjacent to each other but were separated by geographical barriers which made transport between them expensive. Spillover growth from Caracas (the growth center) to the Maracay-Valencia region was impeded by the congestion of existing transport facilities. However, once a penetrating superhighway was built connecting these two regions, rapid industrial growth took place. The superhighway substantially lowered vehicle operating costs and thereby facilitated the employment of nascent economic forces. The rapidity of this spillover was partly due to the relatively low-cost land and labor in the Lake Valencia region and partly due to the many industries in Caracas seeking expansion to where the expected rate of return was substantially higher. The autopista served mainly to channel this spillover from Caracas into the Lake Valencia area. As such it cannot be viewed as a generator of economic growth. Rather it conditioned the geographical distribution of a well-established overall dynamism.

Connecting links with the expressway will be opened up in 1964 which should serve to maintain or accelerate the pace of economic growth. Furthermore, the vast irrigation projects in the Llanos Altos south of

Maracay and Valencia mean that displaced agriculture in the Aragua valley has a place to move and that potentially rich areas tributary to the Aragua valley will grow and promote both the regional and the national economy.

CHAPTER 6

OTHER TRANSPORT PROJECTS

The five cases just presented were explicitly designed for the present study. A series of other studies of the impact of transportation on economic growth have been assembled. The most pertinent features of these are summarized in the following pages. Criticism of the conclusions, the relationships found, and the methodology of each study are contained in Part II. Needless to say, it has not been possible to check the accuracy or adequacy of the data shown in each study. Therefore, much of the empirical material has been reprinted without comment except where obvious weaknesses or inconsistencies appear or where the authors themselves express serious doubts.

THE FRIENDSHIP HIGHWAY IN THAILAND /

/ Wisit Kasiraksa, Economic Effects of the Friendship Highway, Unpublished Master's thesis prepared for the SEATO Graduate School of Engineering, Bangkok, 1963.

The Friendship Highway, completed in 1958, connects the towns of Saraburi and Korat. (See Figure 13.) It is a paved high-standard highway throughout its 166 kilometers, and it connects with another highway which is passable but still under construction. This highway links Saraburi and Bangkok. Formerly, Saraburi and Korat were connected by an unpaved,

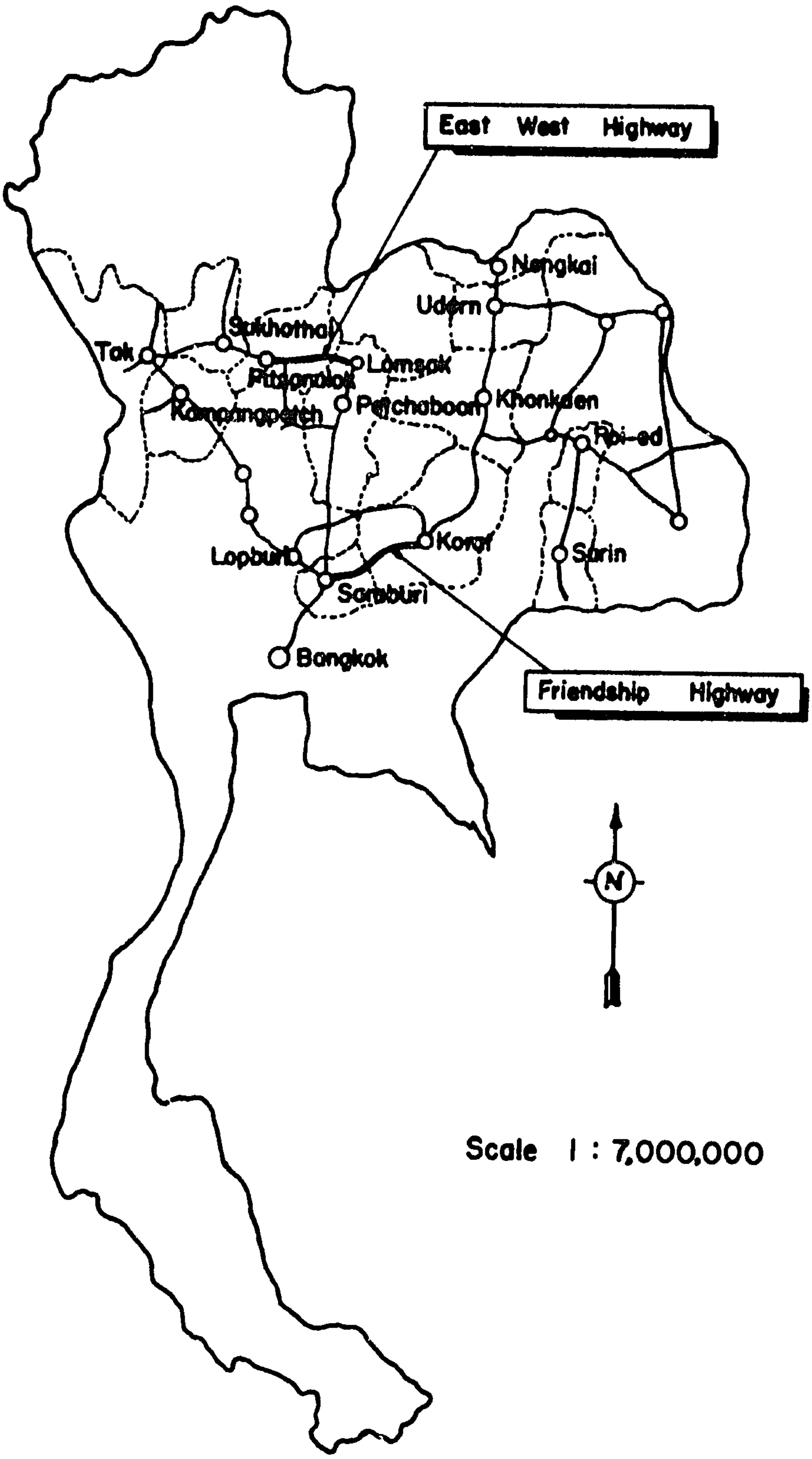

Fig. 13—Map of Thailand showing East—West Highway, Friendship Highway, and boundaries of provinces included in the research.

circuitous route some 340 kilometers in length. It was not usable during the rainy season, and during the dry season its surface was dusty and corrugated. A railroad constructed in the 1890's linked Bangkok to Korat and beyond via Saraburi, thereby providing a direct transport connection between the two ends of the Friendship Highway.

Effects of the Friendship Highway

This study examines the effects of a new, high-standard highway paralleling a railroad and, in this sense at least, is analogous to the Guatemalan and Nicaraguan cases already presented.

Traffic. Traffic studies referring to 1959, only a year and a half after the completion of the highway, are summarized below: /

/ Ibid., pp. 20-21.

> The volume of traffic at the west end of the Friendship Highway is of the order of 1,000 vehicles per day, of which trucks constitute 50 percent, and buses and passenger cars account for about 25 percent each. Traffic is about equally divided by direction. The westbound* vehicles largely originate from Korat and areas along the Friendship Highway; about 60 percent are destined for Bangkok, and most of the remainder for the vicinity of the Saraburi-Lopburi road. The eastbound traffic derives about 60 percent from Bangkok and 40 percent from the area between Saraburi and Lopburi; it terminates largely along the Friendship Highway (40 percent) and in Korat itself (45 percent).
>
> Eastbound traffic diminishes gradually along the Friendship Highway, falling off rapidly after Korat. Only 15 percent of the eastbound traffic entering the Friendship Highway continues beyond Korat. North of Korat, passenger cars represent only 10 to 15 percent of the total traffic volume.

North of Jorhor Junction, 7 kilometers north of Korat, traffic mainly consists of short local trips, the volume depending upon the size of the community and the dispersion of the population in relation to the traffic-counting station.

Between 1957 and 1959, sharp increases in highway traffic were recorded at counting stations to and including Banphai.

*The orientation of the Friendship Highway is more correctly described as NE-SW.

The relatively high volume of traffic along the Friendship Highway suggests that from the user's point of view, there are important time and cost savings as compared with both the old road and the railroad.

It took eleven hours to travel between Saraburi and Korat on the 340 kilometer old road, while it now takes only three hours between the same points on the direct 166 kilometer new highway. At the same time, passenger fares were reduced from 60 bahts on the old road to 10 bahts on the new road. (See Table 18.)

As a result of these significant advantages and despite the absence of information regarding freight rates and costs, it is estimated that about half the total traffic (in terms of vehicles per day) of the old road was diverted to the Friendship Highway. The railroad reported a loss of about 70 tons per day and 50 passengers per day since the new highway was completed. This works out to about 20 vehicles per day using an average truck payload of 4 tons and an average bus load of 29 passengers. Total diverted traffic, however, amounts to only 12 percent of the average daily traffic presently estimated for the Friendship Highway, as indicated in Table 19.

TABLE 18. Comparative Advantages of the Friendship Highway Over the Railroad and Old Highway
(Time in hours; distance in kilometers; fare in bahts[a])

	Travel Time	Passenger Fare	Distance
Saraburi-Korat			
Old highway	11	60	340
Friendship Highway	3	10	166
Reduction:	8	50	174
Bangkok-Korat			
Railroad	7.5	43	284
Friendship Highway	4	20	277
Reduction:	3.5	23	7

[a] 1 baht = U.S. 5 cents.

TABLE 19. Types and Sources of Traffic on the Friendship Highway, 1959

Kind	Source	Average Daily Traffic	Percent
Diverted	Old road[a]	100	10
Converted	Bangkok railroad	20	2
Induced	Local[b]	430	43
Induced	Saraburi-Lopburi	150	15
Induced	Saraburi-Bangkok	300	30
Total traffic:		1,000	100

Source: Royal Thai Highway Department, O-D Survey, 1959. Quoted in Wisit Kasiraksa, Economic Effects of the Friendship Highway.

[a] Includes traffic from north Korat.
[b] Includes traffic from Korat.

Agricultural Production. Evidence of sharp increases in agricultural output in the area served by the Friendship Highway is given in Figure 14, and compared with two other regions described as having "transportation facilities roughly comparable to those existing in the study region prior to the construction of the Friendship Highway." /

/ Ibid., p. 14.

The sharp increase in production of upland crops and vegetables (mainly chili, Chinese mustard, olives, eggplant, cabbage, cow peas, onions and cauliflower), in acreage harvested, and in poultry and swine production immediately following the opening of the highway, is evident in every case. (See Table A.9 .) In addition, the momentum appears to have continued at least through 1961. This contrasts sharply with the Korat-Nongkai area where production and acreage harvested have fluctuated irregularly. The provinces of Surin and Roi-ed exhibit a steady but nonspectacular growth in output of upland crops and vegetables over the same period. As far as this aspect of production is concerned, the changes in output are not related to rainfall variation, the only other variable considered in this study. Rainfall trends are similar in all three areas. Thus the author concludes that "the remarkable increase in production of upland crops and vegetables in Saraburi and Korat changwads (provinces) has been a direct result of the existence of the Friendship Highway." / Comparable con-

/ Ibid., p. 47.

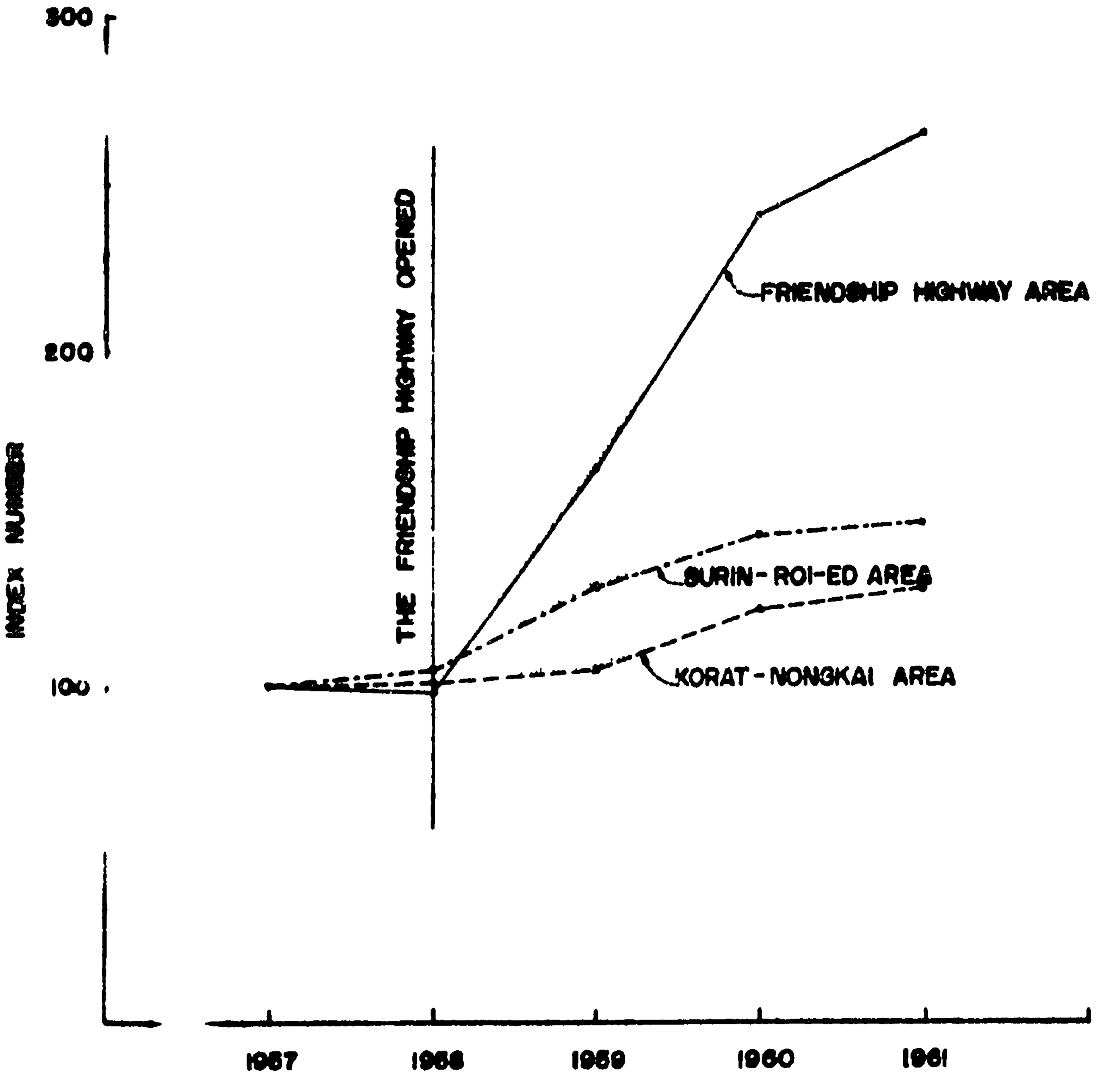

Fig. 14. · PRODUCTION OF UPLAND CROPS AND VEGETABLES.

Source: Wisit Kasiraksa, Economic Effects of the Friendship Highway, Unpublished Master's thesis prepared for the SEATO Graduate School of Engineering, Bangkok, 1963, p. 48.

clusions emerge with respect to poultry and swine.

However, with respect to paddy production, a rather sharp decline occurred in both Saraburi and Korat provinces. (See Table A. 10.) There is some evidence that this was due to a substitution of field crop production for paddy "following repeated rice failure." _/ The study gives no com-

_/ Ibid., p. 54.

parable data for any reference area and concludes that the highway "appears to have played no role in the production of rice. . . . Soil conditions, drought, flood, and other agricultural factors appear to govern the production of rice." _/

_/ Ibid., pp. 57-58.

Conclusions

The general conclusion emerging from this study, as well as comparable analysis of the East-West Highway in Thailand, has been succinctly stated as follows:

"The chief inference to be drawn from this research is that development roads do more than reduce the cost of transport. By opening up new areas, they encourage industry to expand and disperse; in large measure, augmented vehicular traffic is induced by activity which is external to the highway itself. In general, development roads act as a catalyst to accelerate the rate of economic progress of a region." /

/ John Hugh Jones, "Economic Benefits from Development Roads in Thailand," Technical Note No. 15, SEATO Graduate School of Engineering, Bangkok, Thailand, April 15, 1964, p. 31. Professor Jones supervised the preparation of the thesis summarized here and the thesis dealing with the East-West Highway.

THE EAST-WEST HIGHWAY IN THAILAND /

/ Tasana Patanapanich, Economic Effects of the East-West Highway, Unpublished Master's thesis prepared for the SEATO Graduate School of Engineering, Bangkok, 1963.

The East-West Highway links the towns of Pitsanulok and Lomsak in North-Central Thailand, passing through a dense forest area. (See Figure 13 in preceding section.) The 131-kilometer facility was built at a cost of $17.2 million (or $131,000 per kilometer), including right-of-way acquisition and construction. It was completed in 1959 when the final 45 kilometer section connecting Lomsak to the branch extending eastward from Pitsanulok was opened for traffic.

Effects of the Road

This is the only direct link between the two towns. Prior to the East-West Highway the towns were connected by a circuitous gravel road, impassable during the wet season and dusty and corrugated during the dry season. A comparison between the new and old road facilities is given in Table 20. The old route involved a journey of 217 kilometers compared with the 131 kilometers by the new road. Even more important, however, is the fact that prior to 1959 the Pasak valley which supports the main cities of Wichianburi, Petchaboon, and Lomsak was linked to the rest of Thailand mainly by water transport and inadequate roads. Furthermore, there was no direct access from the valley to the rail connection at Pitsanulok. In other words, the valley, which reportedly had substantial economic potential, has been relatively isolated. Penetration into a region of substantial potential justifies the East-West Highway even more than does linking the towns of Pitsanulok and Tomsak.

Traffic

Estimates of average daily traffic along the East-West Highway during 1963 suggest that about 470 vehicles per day utilized the highway near Pitsanulok, with the volume declining to 96 near the midway point and only 37 near Lomsak. The low level at the eastern end reflects the relative inaccessibility and underdevelopment of Lomsak. Studies are now under way on the connection between the East-West and Friendship Highways.

TABLE 20. Road Condition, Pitsanulok to Lomsak (in Kilometers)

Type of Surface	Old Route	East-West Highway
Asphaltic concrete (very good)	17	131
Asphalt (good)	30	-
Laterite	90	-
Stone	40	-
Earth	40	-
Total:	217	131

The author speculates that if the road from Saraburi to Lomsak were improved "the traffic volume along the eastern portion of the East-West Highway would increase to a level at least comparable to that observed at the western end." _/

_/ Ibid., p. 11.

Trucks and buses comprise the bulk of the vehicles. In the Pitsanulok-Wangthong section they accounted for 83 percent of the average daily traffic (excluding buffalo carts and motorized cycles), and over the rest of the highway trucks and buses accounted for about 70 percent of the traffic.

Although the traffic volumes are not especially high as yet, the considerable time and cost savings involved in moving between Pitsanulok and Lomsak should serve to stimulate movement and possibly orient Lomsak more towards the railroad at Pitsanulok. The only evidence on costs presented is the bus fare which over the old highway was Baht 40 between these towns, while over the new connection the fare is only Baht 15._/ The average

_/ One Baht equals U. S. 5 cents.

travel time has been reduced from 11 hours to 2 1/2 hours.

The impact upon the railroad has been favorable as would be expected in view of the fact that the East-West Highway serves primarily as a feeder to the railroad. (If the road connection between the East-West and Friendship Highways--Saraburi-Lomsak--is made, it will be directly competitive with the railroad between Pitsanulok and Bangkok and will then exert a diversionary influence. Metric tons of goods dispatched from the town of Pitsanulok almost doubled in 1960, the year in which the East-West Highway was completed, over 1959. The number of cattle and buffalo dispatched from Pitsanulok increased by about one-third from 1959 to 1960 and by over 40 percent from 1959 to 1962. This contrasts sharply with the rail experience in the Friendship Highway area.

The cost of transporting 100 kilograms of milled rice from Pitsanulok to Bangkok is almost twice as high by road as by rail (Baht 24 by road and Baht 13 by rail), whereas the cost from Korat to Bangkok (the Friendship Highway area) is roughly equal between road and rail._/ The rate and

_/ John Hugh Jones, op. cit., p. 14.

traffic patterns illustrate the complementary nature of the East-West Highway compared to the competitive nature of the Friendship Highway as far as the railway is concerned.

Agriculture. As was the case with the study of the Friendship Highway, data on the major items of agricultural output were compiled showing the situation before and after the highway. The most dramatic increase following the opening of the highway in 1959 was in poultry production (over 7 times) and this higher level of output has been sustained. (See Tables 21 and A. 11.) In every other case the growth since either 1957 or 1959 has been greater in the East-West Highway area than in the reference area, although the trend has not been steady over the six-year period. As far as crops are concerned, data on rainfall do not indicate any relationship to production and this variable is ruled out as having much influence. However, the variation in paddy production is accredited to "alternating drought and flood, resulting from inadequate control of river conditions upstream from the farm lands."_/ As found in the Friendship case, some substitution of crops from paddy to upland crops and vegetables has taken place although the extent of this is not indicated.

_/ Patanapanich, op. cit., p. 27.

Forest Production. Since the East-West Highway traverses a dense forest area, it would be expected that providing access to such a region would stimulate lumber production as well as open up new possibilities for agriculture. Indeed, as far as forests are concerned, lack of easy access may be

TABLE 21. Trends in Agricultural and Forest Production in the East-West Highway and Reference Areas, 1957-62
(Unit in thousands)[a]

Sector	Total in 1962		Percent Change, 1957-62	
	EW[b]	RA[c]	EW[b]	RA[c]
Agricultural Production				
Harvested area[d]	361	50	129	61
Production of upland crops[e]	186	47	244	21
Rice production	344	134	19	(-2)[f]
Poultry	1,033	782	677	86
Forest Production				
Teak wood[g]	6	n.a.	(-24)	n.a.
Non-teak wood	139	26	201	(-60)
Fuel wood	74	15	782	306
Charcoal wood[h]	15,442	6,120	6,286	32

Source: Based on Tables A. 11, A.12 and A.13.

[a]Areas in rai; production in metric tons; poultry in number; and lumber products in volume of cubic meters.

[b]EW refers to East-West Highway area and includes the provinces of Pitsanulok and Petchaboon.

[c]RA refers to the reference area with which the East-West area is compared. It is composed of the provinces of Tak and Kampangpetch for upland crops and vegetables. For poultry, rice and forest products, the reference area includes the provinces of Tak and Sukhothai.

[d]For upland crops and vegetables.

[e]Includes vegetable production.

[f]1958-62 change.

[g]1957-61 data.

[h]1959-61 change.

an absolute barrier to exploitation. (In the Western Montana in Peru, lumber production proved to be closely tied to the presence of roads.) In both Pitsanulok and Petchaboon provinces, there were substantial increases in lumber production (other than teak) in 1960 and 1961. This contrasts with declines or negligible increases in the reference areas. (See Table A.12.) On the other hand, the volume of teak output does not indicate any effect of the new road.

Since the opening of the highway, two other wood products, fuel wood and charcoal, have exhibited dramatic increases that did not occur in the reference area. (See Table A. 13.) The rise in fuel wood output is attributed to the demand by the railway for use in its steam locomotives. The increase in charcoal production has helped satisfy the demand in nearby provinces.

Business Activity. Using the number of various types of business establishments as an index of business activity, the study examines changes in these in each of the terminal cities and makes a comparison with the reference town of Sukhothai. The data are summarized in Tables A. 14, A. 15 and A. 16. Once again the relatively more rapid growth in the towns directly affected by the East-West Highway is apparent.

Land. The study concludes with a comparison of changes in appraised land values along the right-of-way. (See Table A.17.) The evidence shows a rise in land values prior to completion of the highway with little change immediately after except in one or two instances.

MADRAS STATE IN SOUTH EASTERN INDIA [/]

[/] Economic Benefits of Ramnad-Mandapam Road 1959-60, Ministry of Transport and Communications, Department of Transport (Road Wing), Government of India, New Delhi, 1961.

In September, 1955, a stretch of road twenty miles and six furlongs in length, known as the Ramnad-Mandapam road, was completed as part of National Highway No. 49. (See Figure 15.) It is a paved highway (asphaltic concrete), twelve feet wide. It was constructed at a cost of 1.4 million rupees. [/] Before the road was built a narrow path, unusable even as a

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[/] One rupee is equal to U.S. 22 cents.

---

cart track, and a railway joined the towns of Ramnad and Mandapam.

Background

The region involved (approximately 100 square miles) produces such agricultural products as paddy, samai, kumbu, and ragi, while the main "industries" consist of fishing, mat making, and wood chopping. There are forty-seven inhabited villages in the study area which has an overall population density of about 510 per square mile. The study, in short, involves an examination of the impact of a short, all-weather road paralleling a railroad that is one small link terminating at Mandapam in a more extensive highway network.

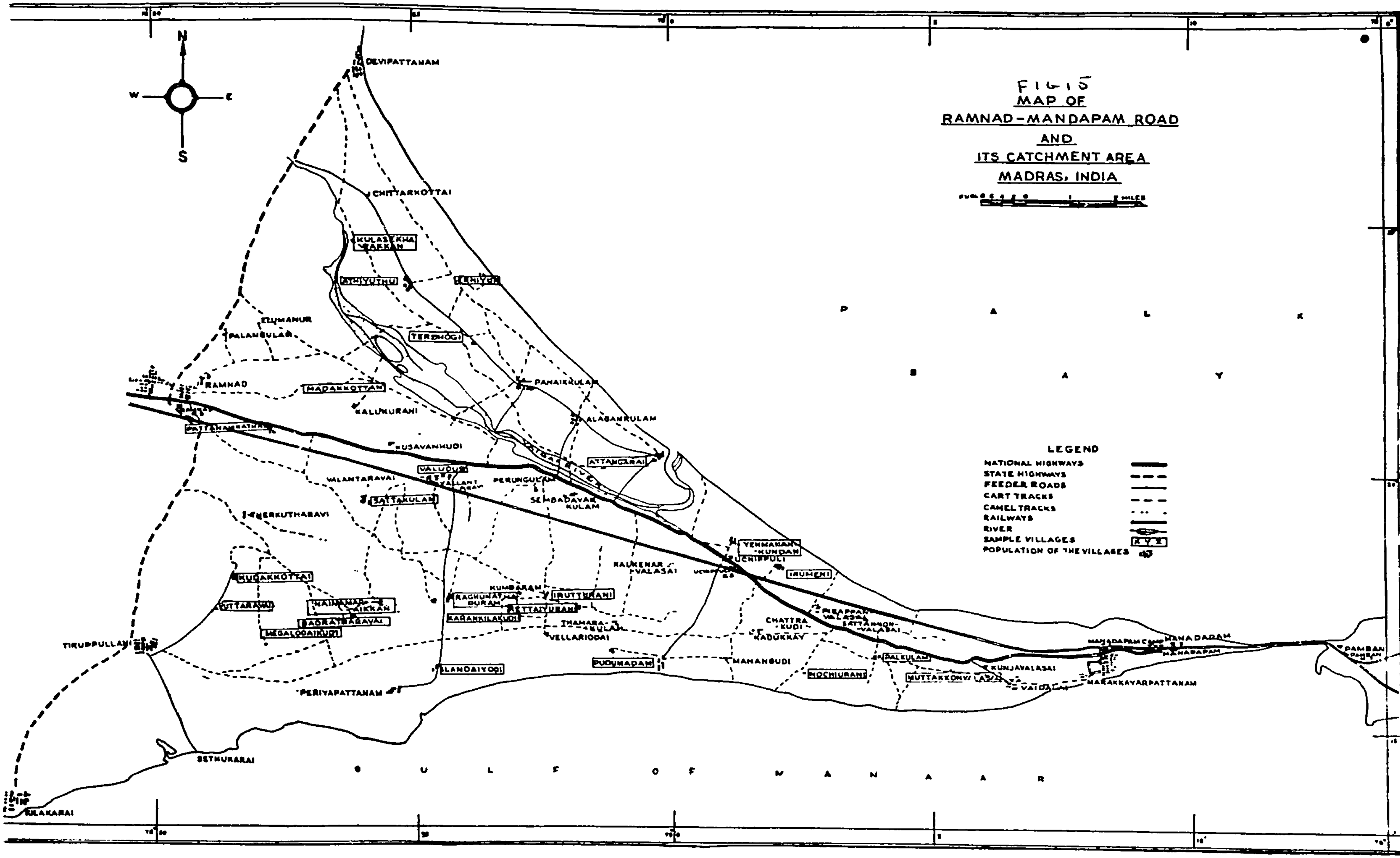
FIG 15
MAP OF
RAMNAD-MANDAPAM ROAD
AND
ITS CATCHMENT AREA
MADRAS, INDIA
LEGEND
NATIONAL HIGHWAYS
STATE HIGHWAYS
FEEDER ROADS
CART TRACKS
CAMEL TRACKS
RAILWAYS
RIVER
SAMPLE VILLAGES
POPULATION OF THE VILLAGES
N
S
W
E
P A L K
B A Y
G U L F O F M A N A A R
DEVIPATTANAM
CHITTARKOTTAI
RAMNAD
PANAIKKULAM
ALAGANKULAM
ATTANGARAI
KUSAVANKUDI
PERUNGULAM
SEMBADAYAR KULAM
UCHIPPULI
IRUMENI
CHATTRA KUDI
MANANGUDI
PUDUMADAM
MANDAPAM
MANDAPAM CAMP
PAMBAN
KUNJAVALASAI
VAIDALAI
MARAKKAYARPATTANAM
MUTTAKKONVALASAI
NOCHIURANI
PERIYAPATTANAM
SETHUKARAI
TIRUPPULLANI
MEGALOOAIKUDI
SADRATSARAVAI
KUDAKKOTTAI
VELLARIODAI
KALKENAR VALASAI
KADUKKAY

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Effects of the Road

Traffic. Traffic counts at three stations along the road and estimates in terms of vehicle, passenger, and ton-miles, and other characteristics are given in Table 22. Cart and cycle traffic prevail especially around the Ramnad area, accounting for almost 300 in number, while average daily traffic by motorized vehicles is very low--less than 100 vehicles per day during the busiest day of the week. The prevalence of passenger traffic is attributable to the large number of tourists and pilgrims who visit Rameswaram, "a famous place of pilgrimage." For such a short stretch of highway, the amount of traffic originating and terminating is surprisingly high no matter how measured.

Details on the movement of commodities along the road are provided in Table A.18. An estimate of goods exported from and imported to the region suggests that a little less than 40 percent (in terms of ton-miles) or about 45 percent (in terms of tons carried) represents imports which consist primarily of rice, bricks, and cement. Exports are chiefly firewood, mats, "fancy goods," and coral stone.

A comparison with rail traffic revealed the following:

"(i) Traffic covering long distances, originating or terminating outside the stretch is mostly moving by railways. Passengers in the region proceeding to places beyond Ramnad by buses have to change over at Ramnad as there is no direct bus service from the region beyond Ramnad and therefore prefer railways to road transport;

TABLE 22. Number of Mean Daily Vehicles Passing Through Ramnad, Uchippuli, and Mandapam, 1959

Type of Vehicles	Ramnad		Uchippuli		Mandapam[a]
	Market Day	Other Days	Market Day	Other Days	
Cycles	110	105	40	25	110
Carts	180	80	35	35	15
Motor cars	30	30	30	20	30
Buses	40	40	40	40	20
Trucks	20	20	15	20	10
Total:	380	275	160	140	180

Source: Government of India, Ministry of Transport and Communications, Economic Benefits of Ramnad-Mandapam Road 1959-1960, (1962), pp. 8 and 12. The O-D survey was conducted during the following periods: December 26-31, 1959 at Ramnad; December 29-31, 1959 at Uchippuli; and December 31, 1959-January 2, 1960 at Mandapam.

[a]The traffic of Mandapam on a market day did not vary much from daily traffic on other days.

Average Daily Traffic on the Ramnad-Mandapam Road, 1959

Ton-miles	1,040
Passenger-miles	11,100
Cycle-miles	840
Cart-miles	960
Car-miles	510
Bus-miles	700
Truck-miles	340

"(ii) Passengers going beyond Mandapam or coming from that side have to travel by railways near that stretch and as such prefer to perform the entire journey by railways excepting those tourists coming from various parts of India by car or buses on contract; and

"(iii) For movement within the stretch people preferred road transport to railways."

The relative importance of rail and road traffic is summarized in Table A.18. Since the rail data exclude through traffic, the preponderance of movement by road is not perhaps surprising. (There is no through road traffic since the highway terminates at Mandapam.) However, the study indicates that there has been no net loss of business by the railroad. Indeed, between 1954 and 1959 rail traffic within the stretch has increased from roughly 4,000 tons in 1954 to about 5,000 tons in 1959. Since there was no good road connection prior to September 1955, the bulk of the traffic presently moving by road may be taken as a net increase. Thus, the study suggests that the "increase in agricultural and industrial production which was due to the road facility has tended to benefit railways also because some of the finished products go long distances by rail." _/

_/ Ibid., p. 19.

Growth of Agriculture. A comparison of production in this area before and after the road is given in Table 23. In almost every case, except paddy, fruits, and tamarind, rather substantial increases in output

TABLE 23. **Estimated Increase in Agricultural Production in the Ramnad-Mandapam Region, 1954/55-1958/59**
(In thousand tons)

Commodity	Total Production		Percent Change
	1954/55	1958/59	1954/55 - 1958/59
Ragi	239	278	40
Kumbu	558	693	135
Paddy	7,084	6,871	-213
Samai	1,301	1,763	462
Vali	103	117	14
Gram	72	104	32
Gingilly	196	279	84
Vegetables	967	1,170	204
Fruits	79	76	(-3)
Chillies	102	142	40
Tamarind	17	16	(-1)
Tobacco	20	21	1
Cotton	3	9	6
Betel leaves	17	19	2
Eggs[a]	68	80	12
Milk	165	244	79

Source: Economic Benefit of Ramnad-Mandapam Road 1959-60, p. 24.

[a]Number in thousands.

have been recorded. The study argues that "the reversal of trends in the yield of paddy. . . may be attributed to the unprecedented floods in 1955. . ." which apparently left the land waterlogged and cut off from normal communications through 1959. _/

_/ _Ibid._, p. 21.

The study also investigated the change in agricultural area and output in sample villages located at varying distances from the highway. As far as cultivated acreage is concerned, the substantial increase in the area farthest from the highway is said to be due to the fact that "the construction of the road has made it profitable to bring under plow the lands which were hitherto marginal or infra-marginal" _/ (See Table 24.)

_/ _Ibid._, p. 20.

However, despite an almost 60 percent increase in acreage under cultivation, the output of cereals and other crops did not rise by anywhere near this amount. Indeed, cereal production increased by only 16 percent. Generally, except for paddy production, output increased at all recorded distances from the road. No clear-cut pattern of the differences in output at varying distances is discernible except that generally the biggest relative increases have occurred in villages three to four miles from the road.

TABLE 24. Percentage Increase in Area Under Cultivation in the Sample Villages, Ramnad-Mandapam Area
(Cultivation area in thousand acres)

Distance from National Highway (miles)	Number of Villages	Cultivated area 1954-55	1958-59	Percentage Increase
0-1	5	2.5	3.0	20
1-2	5	3.6	3.7	3
2-3	5	5.8	6.1	5
3-4	5	3.7	3.8	3
4-5	5	1.2	1.9	58

Source: Economic Benefits of Ramnad-Mandapam Road 1959-60, p. 20.

Industry. As shown in Table 25, there has been an increased output of principal industries in the Ramnad-Mandapam area. This increase was interpreted as being "due mainly to the construction of the new road." _/

_/ Ibid., p. 31.

Summary of Effects. In a sample of twenty-eight villages, the value of agricultural land in twenty-five increased between 1954 and 1959. The exceptions were three villages which apparently were still water-logged from the 1955 floods. The value of land for house construction also increased in about 70 percent of the sample villages.

The total number of shops has risen since the road was completed, and a far greater number of villages have one or more shops. Further-

TABLE 25. Increased P[illegible]n of Principal Industries in the Ramnad-Mandapam Area, 1954/55-19[illegible]

Industry	Production 1954/55	Production 1958/59	Percent Increase
Mat weaving[a]	1,104	1,281	16
Basket making[a]	142	183	29
Pottery[a]	7.5	16.9	125
Rope making[a, c]	38	42	11
Firewood[b]	8,235	10,044	22
Fishery[b]	623	857	38
Jagree[b]	612	810	32
Milling[b]	12	25	108
Fibre[b]	46	51	11

Source: Economic Benefits of the Ramnad-Mandapam Road 1959-60, p. 31.

[a] Number in thousands.

[b] In tons.

[c] Average length of a rope is 15 feet.

more, there has been an increase in the number of elementary schools and student enrollment. In 1958-1959 there were six post offices compared with three in 1954-1955; a number of dispensaries have been opened; and the Marine Fishing Research Institute has begun to provide advice beyond the coastal region on fish culture and improvement. In general, the area now receives a greater variety of goods and services in more convenient locations.

Finally, the trend in prices of selected items for which data were collected indicates a steady decrease in the differences among prices in three centers. A network of feeder roads, partly induced by the highway itself, has helped bring prices in many villages more closely in line with those prevailing at the Ramnad market.

The data on rates pertain mostly to passenger transport and apply to travel within the region. The passenger fare from Uchippuli to Ramnad (13 miles) is 44 nP (100 naye paise (nP) = 1 rupee = U.S. 21 cents) and from Ramnad to Mandapam is about 75 nP, compared with rail fares of 37 nP and 65 nP, respectively. There is no regular goods service by truck but the average for-hire charge is estimated at about 45 nP per ton-mile, including loading, unloading, and feeder charges. This charge compares with 90 nP for the railway. This sharp difference refers only to intraregional traffic and is not surprising in view of the very short rail haul.

The study concludes with a brief computation of a cost-benefit ratio for the highway which is summarized in Table A.19. The rate of return for the Ramnad-Mandapam road project was computed at 57 percent per year on capital outlay within 4 years of its construction.

NORTH BORNEO /

/ R. S. P. Bonney, The Place of Transport Particularly Road Transport in the Economic and Social Development in North Borneo, United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas, E/Conf. 39/E/37, 15 Oct. 1962.

Background

North Borneo (now Sabah), with a population of about 454,000 produces mainly agricultural products. The most important product is rubber, although the largest single export at the time of this study was timber. Other important crops are coconuts, hemp, and cocoa. Since there is virtually no industry, the transport facilities are almost entirely concerned with moving agricultural exports and manufactured and rice imports. The most extensive transport facilities are roads, and until recently there were only about 500 miles of isolated networks within the total land area of North Borneo, about 29,000 square miles. These networks are being linked together and improved by expenditures totaling 28 percent of the development plan. (For location and detail of transport network, see Figure 16.)

Given these circumstances, Bonney concludes that the main advances for the economy of North Borneo will take place in "smallholder agriculture and in marketing." _/ He then discusses the relationship between road

_/ Ibid., p. 2.

transport facilities and three factors: (i) demand for land, (ii) utilization of land and (iii) social forces. He examines the changes in these factors over a 14-year period from 1947 to 1960.

Effects of Improved Transport

Land. The effective demand for land, as measured by the number of applications, is assumed to depend upon three main factors--population growth, prices of major crops, and improvements in accessibility by road. The changes in these factors during 1947-1960 period is shown in Figure 17. Bonney concludes that the "correlation of land demand with rubber prices between 1947 and 1953 is strong (0.96) but thereafter it weakens appreciably although rubber prices still affect demand to some extent." After 1953 the effect of a rubber price rise on land demand was on an average greater and the effect of a price fall less than in the earlier period. Land demand between 1954 and 1960 was two and one-fourth times that for the period 1947 to 1953. " The most satisfactory explanation of

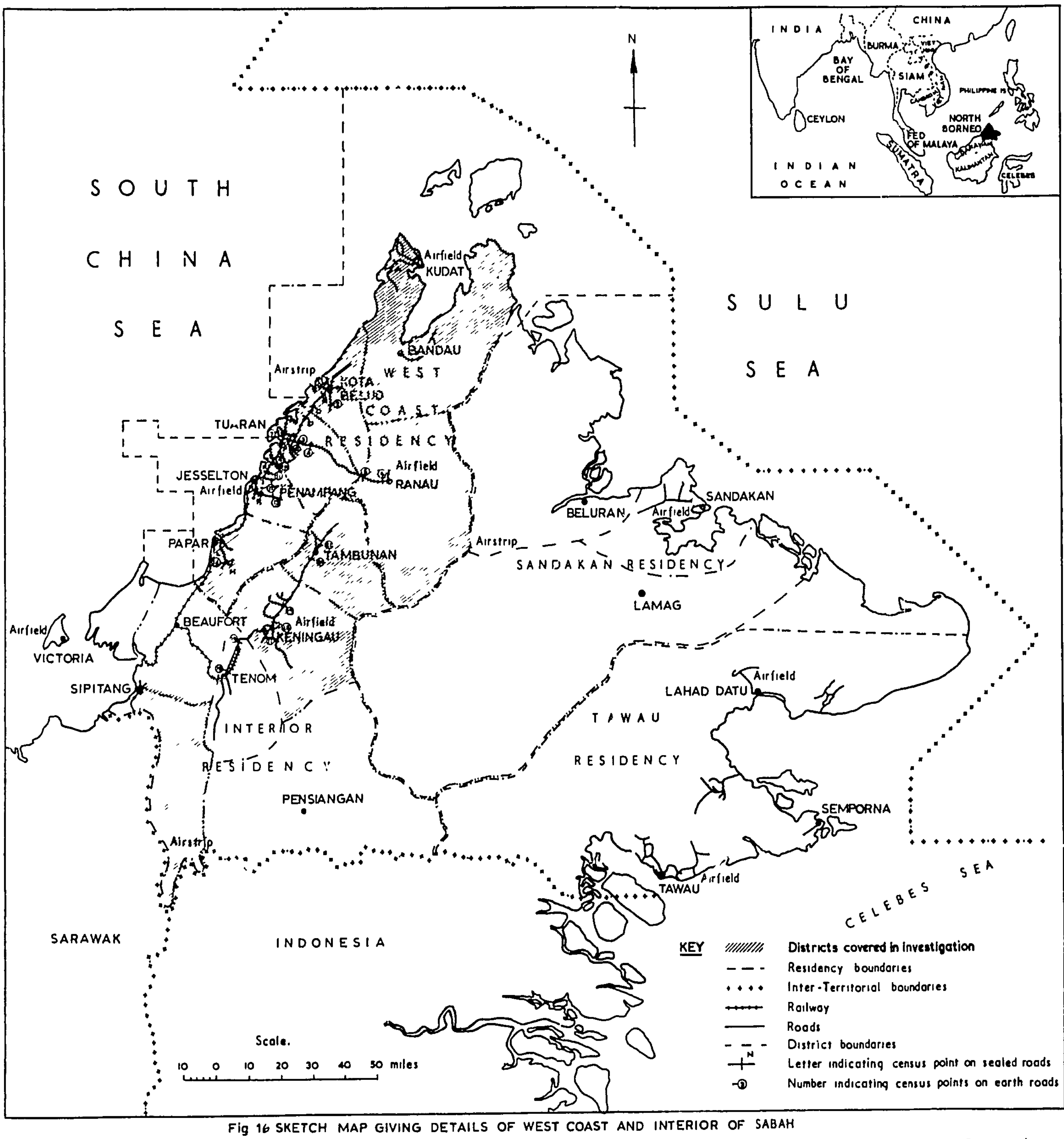

Fig 16 SKETCH MAP GIVING DETAILS OF WEST COAST AND INTERIOR OF SABAH

Dept of Scientific & Industrial Research
Road Research Laboratory

RSPB

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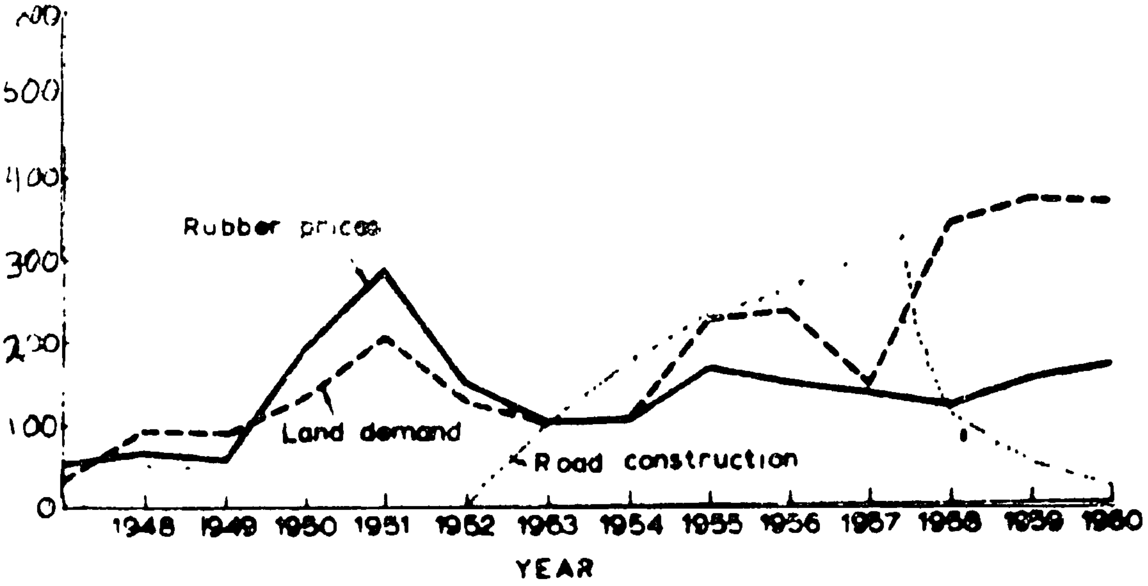


Figure 17. Land Demand. Rubber Prices and Total Road Construction 1947-1960.

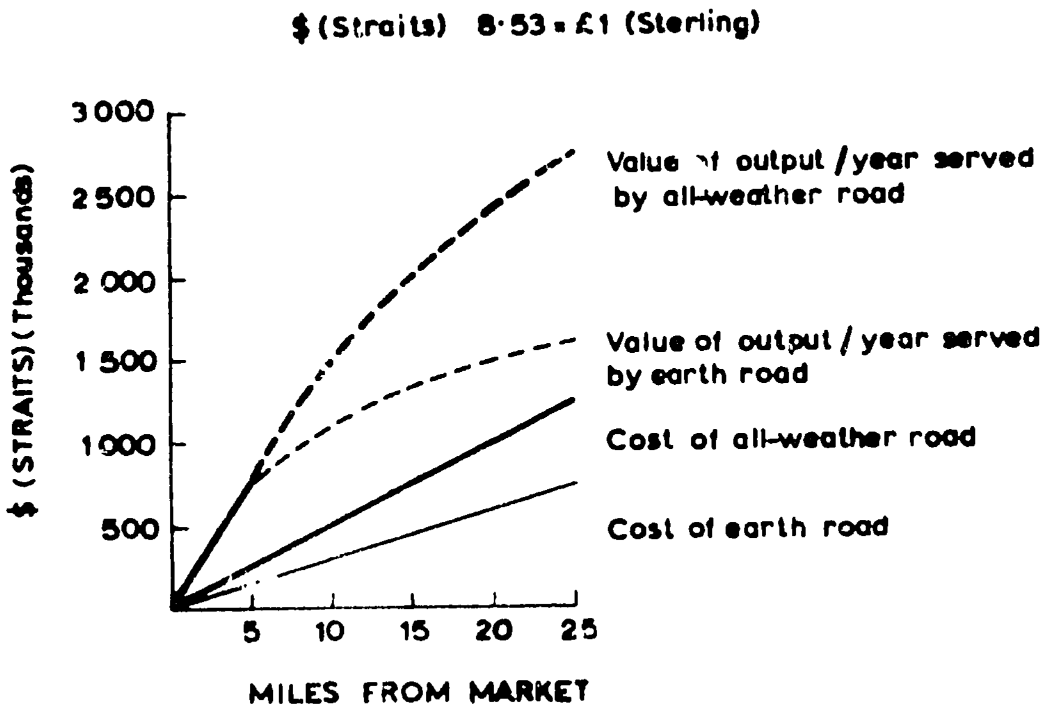


Figure 18. Diagrammatic Comparison of All-Weather and Earth Roads and Respective Values of Development

these changes after 1953 is the programme of feeder-road construction which took place despite the weak correlation between land demand and road construction." _/

_/ Ibid., p. 2.

Since the amount of land held per capita was roughly the same in 1947 as in 1960 and since population grew steadily at roughly 2.5 percent per year, it is believed that a long-term correlation between "natural demand" and population growth exists. But fluctuations in effective demand about this long-term trend are occasioned by price changes and road construction. However, Bonney believes that the tendency is for effective demand and natural demand to move towards equilibrium, but the rate at which effective demand for land tends towards a rate that is a simple function of population growth is determined by fluctuations in (rubber) prices and improvements in accessibility. Nevertheless, land taken up because of improved access has more stable and lasting benefits than land taken up because of high prices that may later decline.

The utilization of land refers to two main factors: (1) the value of crop production and (2) the distance of developments from the market. Both of these are found to vary with the standard of the road and its location with respect to surrounding terrain and areas of population pressure.

Value of Output. The standard of the road has a direct influence upon the value of output at varying distances from the market. Figure 18 indicates the differing results and compares these with the costs of constructing roads of different standards. The evidence suggests that all-weather roads lead to development up to 25 miles from the market, and the impact of the earth road falls off sharply between 5 to 10 miles from the market, in terms of value of output. Bonney suggests that "small holders are deterred from development when they have the prospect of transporting cash crops over more than about 8 miles of roads which are frequently difficult to traverse and may well be closed in periods of bad weather." _/ A close relationship was observed between the extent of

_/ Ibid., p. 5.

cash crop production compared to subsistence farming and the standard of the road. This is all the more significant in countries where evenly distributed rainfall permits the growing of crops that are harvested the year round or crops that are perishable. (In other situations, the standard of road may be of little consequence. See the Uganda case for a contrasting set of circumstances.)

The location of the road is of significance in hilly terrain. Bonney points out that a road built along a steep ridge is unlikely to stimulate much development beyond a narrow strip of poorer roadside land. This in turn requires more extensive feeder roads to tap additional land remote from the highway. Again, should traffic develop, it is more costly to upgrade a ridge road than would be the case of a road in the valley.

Population. If there is population pressure in one area, roads are obviously important to induce or permit easier movement to alternative locations. But in North Borneo, Bonney finds that "there is no general desire to move for economic reasons, except perhaps to move nearer the larger towns, despite considerable pressure on land." Even when people are assisted in various ways the results are not encouraging. However, he concludes less pessimistically that when a road is constructed between an overpopulated area and another area suitable for development, "a natural movement often occurs and this type of movement does have a much more stable basis and produces more satisfactory results." _/

_/ Ibid., p. 6.

Ethnic Differences. The report concludes with a brief illustration of how social considerations can modify the expected economic results of road construction. Arguing that the inhabitants of North Borneo do not appear any less hard working than people in more temperate climates, the author nonetheless notes that certain ethnic groups "within a country respond to a lesser extent than others to the opportunities of development which road access brings."_/ Furthermore, a poor response is not solely

_/ Ibid.

due to lack of education. The following illustration is provided.

"In the Kota Belud district, the variation in response to development is clearly shown where the two races of Dusuns and Bajaus occupy adjacent areas. The area in which the Dusuns are settled is hilly country and is served by one road. The Bajau area is served by a small network of roads and is much easier country. Nearly 100 percent of rubber planted in the Kota Belud district is in the Dusun area and the road is well used. The Bajaus, however, have continued to cultivate padi fields and to rear buffaloes, the return from these being lower than that from rubber, and the work only occupies about four months of the year, the roads barely being used. In fact, it is doubtful if road access in the Bajau area has led to any increased local development at all. Certainly although there may be sound administrative reasons for these roads there is little economic justification for them. In such areas, which are generally indicated by a fundamental lack of initiative, other measures together with road access must be employed to institute development, and unless such an area is particularly required for development it will have a low priority for investment." _/

_/ Ibid.

A comparable situation was found by the present author near the village of Raub near Kuala Lumpur, Malaysia, where two penetration roads in similar territory led to vastly different economic results. The apparent reason was that one area was taken over by immigrant Chinese while the other area, served by a far superior road, went through territory occupied by Malays. In the previous case of the Western Montana in Central Peru, ethnic or cultural differences again proved significant especially when the Pozuzo area is compared with Satipo.

Conclusions

The implications of the study, aside from the empirical relationships deduced, emphasize that more than accessibility is frequently required to stimulate economic growth. Aside from the different effects of varying road standards in the North Borneo climate, Bonney specifically mentions a survey taken among families with small children. It shows that in areas not served by roads few ever travelled to the larger towns, crops were poorer, there was little appreciation of the benefits from planting higher-yield crops, the provision of schooling on a more fragmented basis virtually doubled the cost per class unit, and the benefits of centralized, well-organized agricultural training centers were lost. _/

_/ Ibid., p. 7.

THE WESTERN MONTANA IN CENTRAL PERU [/]

[/] Wolfram U. Drewes, The Economic Development of the Western Montana of Central Peru as Related to Transportation (Lima, 1958).

The intent of this study is to examine the influence of transportation on stable settlement in the Montana and the rate of economic growth. The approach, however, is unlike the one used in the preceding cases.

Drewes examines four areas in the Western Montana of Central Peru that are both physiographically similar to and oriented to the major market in Lima. (See Figures 19 and 20.) Because each area differs greatly in the nature of its transportation facilities, each differs in the degree of accessibility to Lima. The author then analyzes the extent to which present and past characteristics of each area (with respect to population, levels of living, patterns of production, imports and exports) are related to the differences in transportation facilities.

The population and land size of each area are given in Table 26. The table must be used with caution. The land area "claimed" does not coincide with the areas sketched out on Figure 19, especially as far as Pozuzo is concerned, and the population figures are rough estimates at best. The evidence does, however, indicate a general lack of overcrowding and significant size disparities among the areas.

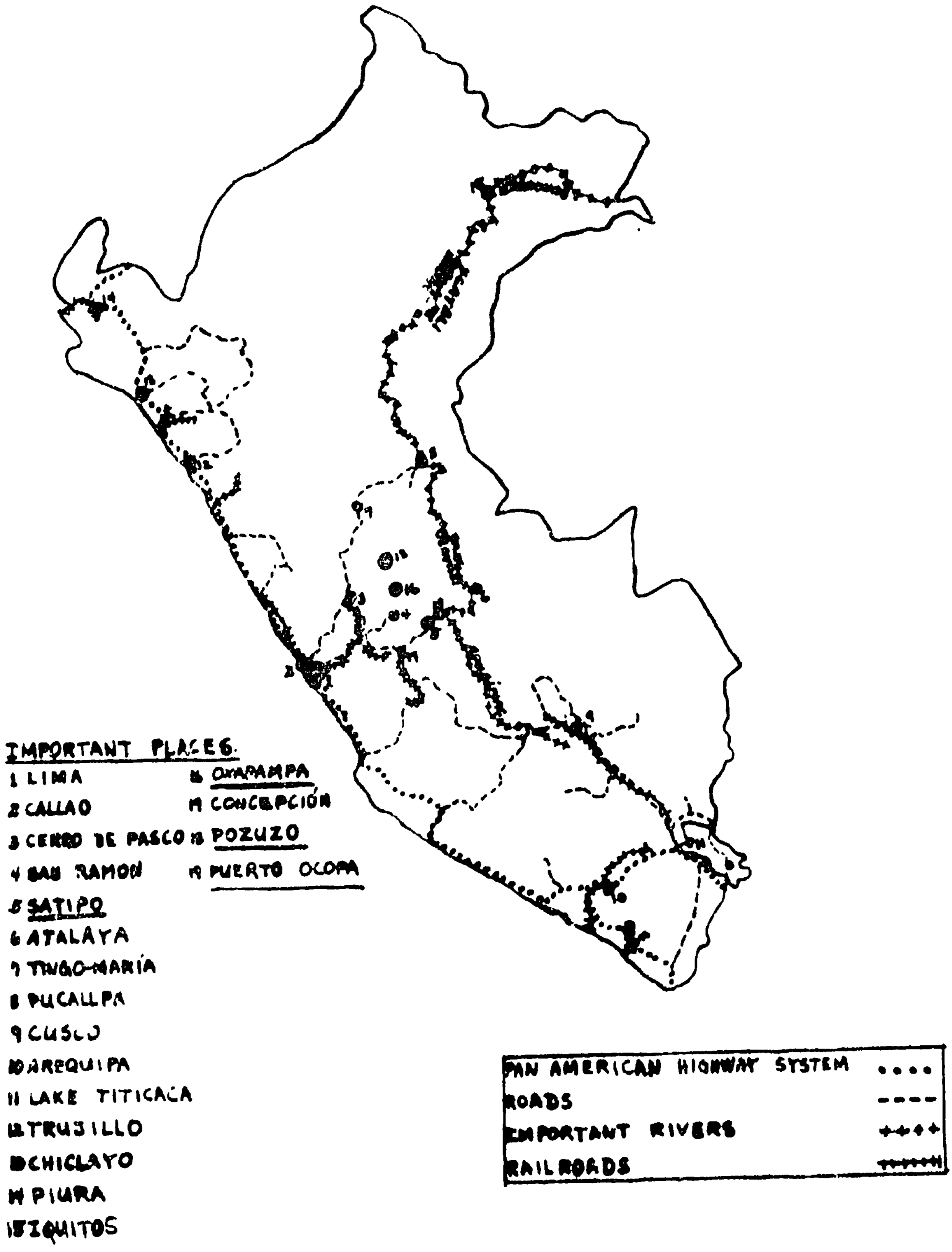


Figure 19. Map of Peru

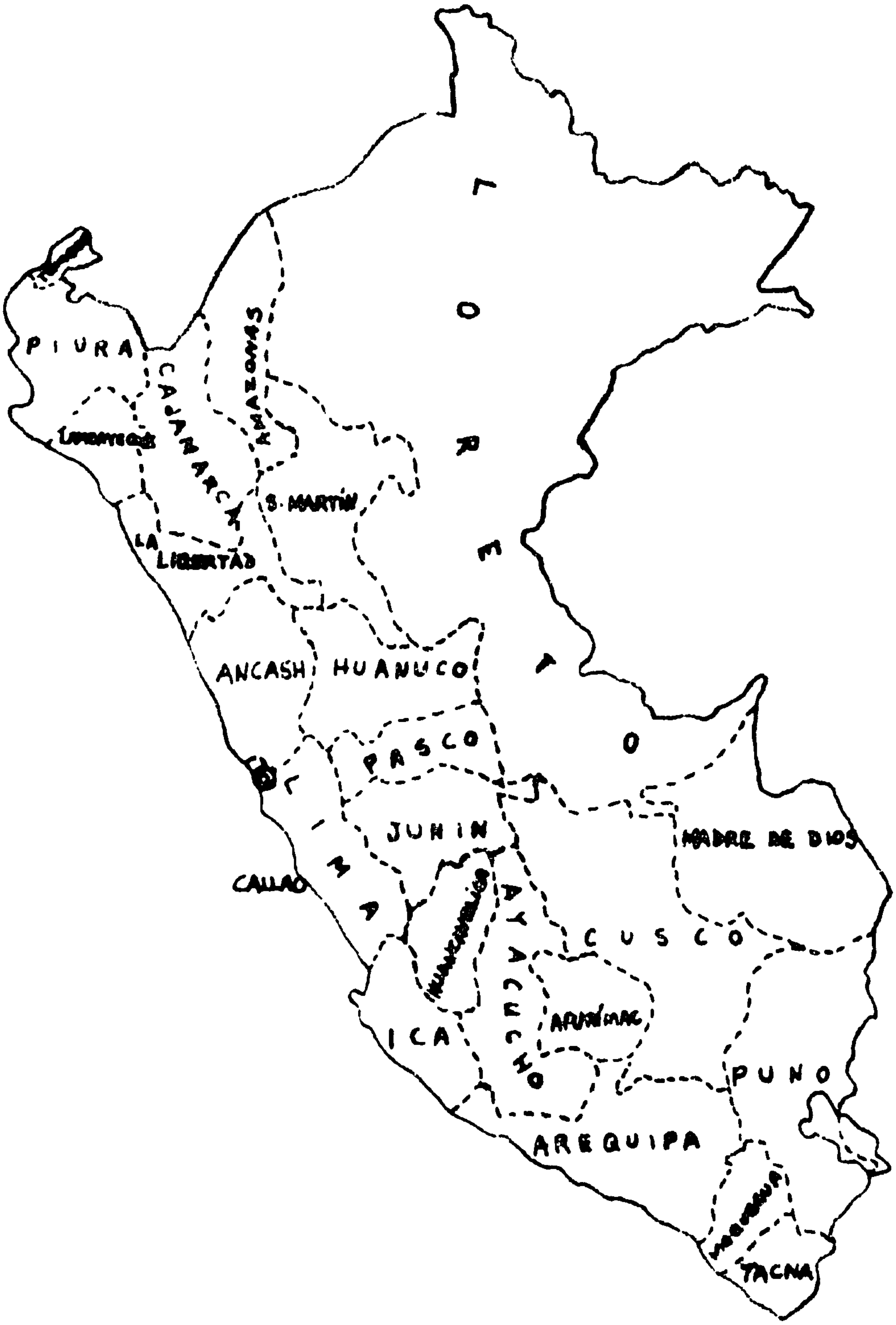


Figure 20. Political Divisions of Peru

TABLE 26. Population and Area Cultivated in the Four Regions, 1954 (Population in thousands; area in thousand hectares)

Area	Population 1954	Land Area Claimed	Cultivated Land[a] Per Head
Tingo Maria-Pucallpa	42.5	190	1/3
Oxapampa-San Ramon	23.2	85	1/3
Satipo	3.0	65	1
Pozuzo	1.8	5	1

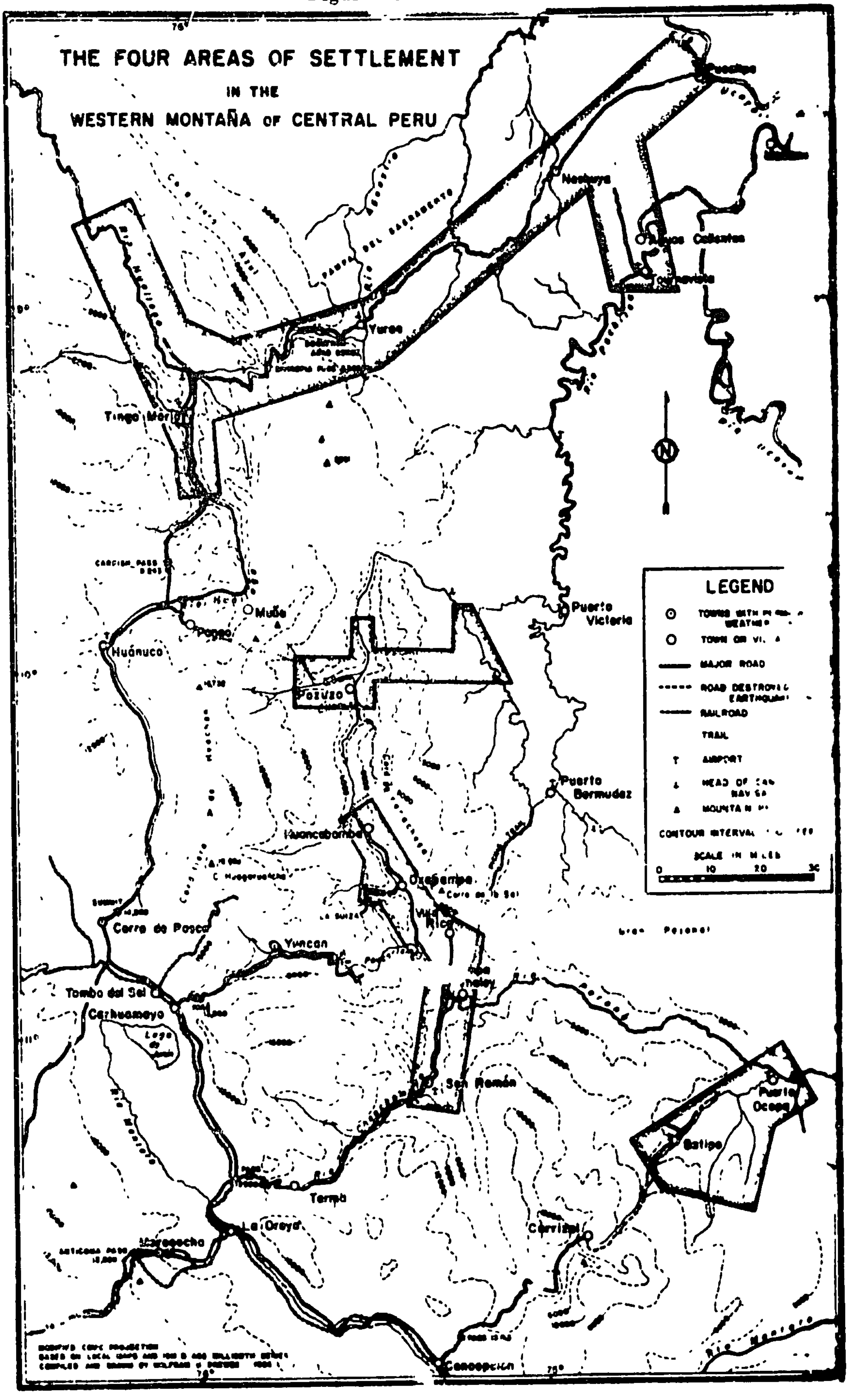
Source: Wolfram U. Drewes, The Economic Development of the Western Montana of Central Peru as Related to Transportation (Peruvian Times, 1958), derived from Figure 48, p. 38.

[a] In hectares.

Relative Accessibility of the Four Areas

The four areas of settlement and their transportation routes are shown in Figure 21. Pozuzo, the most poorly served in terms of transportation, is virtually isolated. Only a jungle trail suitable for mule trains links Pozuzo to the road-head some 48 miles distant. Satipo was served by a road between 1940 and 1947, but an earthquake in 1947 destroyed the road, and it had not been rebuilt at the time of Drewes's analysis. Therefore, Satipo has been virtually isolated since 1947. In this respect Satipo resembles Pozuzo except that it has an airport which is used to send produce to San Ramon for transshipment to Lima. The San Ramon-Oxapampa area is well served by what are called "major"

Figure 21


THE FOUR AREAS OF SETTLEMENT
IN THE
WESTERN MONTAÑA OF CENTRAL PERU
Nesheya
Yurac
Tingo María
Huánuco
Muña
Panao
Pozuzo
Puerto Victoria
Puerto Bermudez
Huancabamba
Oxapampa
Villa Rica
Cerro de Pasco
Yuncan
Tombo del Sol
Carhuamayo
San Ramón
Puerto Ocopa
Satipo
Tarma
La Oroya
Morococha
Concepción
LEGEND
MAJOR ROAD
RAILROAD
TRAIL
AIRPORT
MOUNTAIN
CONTOUR INTERVAL
SCALE IN MILES
0
10
20
Gran Pajonal

roads and has the advantage of proximity to Lima. The large area from Tingo to Pucallpa also possesses good highway facilities but is much further from the Lima market. Water transport is available within some areas, but is important mainly for movement within the Tingo Maria-Pucallpa area _/ and for carrying raw materials to Pucallpa via the

_/ Drewes, op. cit., p. 34.

Ucayali River and its tributaries. The relative accessibility of the major centers in each region is reflected in costs and time involved. The cost of shipping one metric ton of coffee from San Ramon to Lima is 130 soles, while the comparable figure is over 1,000 soles when shipped from Pozuzo. On the basis of the evidence shown in Table 27, Pozuzo and Satipo are at a distinct transportation disadvantage compared to Tingo Maria and, especially, San Ramon.

Having established the relative accessibility of the four areas in terms of cost, time, and distance, Drewes then examines three other factors that might influence the economic development of each area. These are referred to as: (1) attitudes, objectives and technical abilities, (2) age of settlement, and (3) governmental policies.

Attitudes, Objectives and Technical Abilities

The settlers of Pozuzo originally came from Germany. They are described as hard working, skillful, resourceful, with a strong community spirit but with no interest whatever in affairs beyond their small settlement.

TABLE 27. Time and Cost of Transporting Coffee to Lima

Producing Center	Distance (Miles)	Time (Hours)	Cost[a] (Soles)
San Ramon	185	13	130
Tingo Maria	350	20	460
Satipo (via San Ramon)	235	14[b]	630
Satipo (by road 1947)	313	23	266
Pozuzo	305	58	1,090

Source: Wolfram U. Drewes, The Economic Development of the Western Montana of Central Peru as Related to Transportation (Peruvian Times, 1958), p. 35.

[a] Cost of shipping one metric ton of coffee, S. 19.20 = U. S. $ 1.00 (1955). The comparative transport costs by different modes of carrier are shown in Table A.20.

[b] The rapid time of transit apparent here refers to shipments by air from Satipo to San Ramon and thence by road to Lima. Cost-wise this is very expensive as the last column of the table indicates and little moves by this combination as is evident from the export and import data shown in Table 28 .

The settlers in the Satipo area are Peruvian farmers who moved in when the area was accessible. Since the destruction of the road, the area has virtually stagnated partly because of what Drewes refers to as the inability of the people to adapt and their lethargy and lack of initiative. Some land has recently (1955) been purchased by absentee speculators in Lima expecting to reap a "very large unearned increment" _/ once the

_/ Ibid., p. 35.

road is reconstructed.

The people of the Chanchamayo valley region, in which San Ramon is located, are described as being more energetic than the Satipo residents but less resourceful than the Pozuzinos. The settler in the valley came with the intention of growing cash crops for Lima and the highlands. However, Drewes suggests that "the greater part of his profits leave the valley. He does not intend to make the valley his home and spends the proceeds from his investment in Lima." _/ At the time of the study,

_/ *Ibid.*, p. 35.

small farmers were beginning to settle in the valley and had already "laid the foundations of community awareness." _/ In the section

_/ *Ibid.*

surrounding Oxapampa, the settlers have shifted from farming to lumbering and have reinvested the profits from timber in trucks and larger concessions. Drewes also refers to a few English families at Pampa Whaley who hold administrative posts. There are some Italians, now assimilated, and a Chinese colony in San Ramon still "somewhat isolated....because of a certain amount of envy among the Peruvians because of the favorable economic position which he [the Chinese] has attained through hard work, cautious investment and frugality." _/

_/ *Ibid.*

The typical colonist in the Tingo Maria-Pucallpa area is viewed as somewhat "unsure of his purpose" but is also described as "energetic and interested in the development of [his] area." _/

_/ Ibid.

Age of Settlement and Government Policies

The Satipo and Tingo Maria-Pucallpa areas were settled mainly within the last two or three decades while settlement of the other areas began in the nineteenth century. Government policies regarding settlement and immigration have varied greatly over the past century, and because the areas were settled at different times the extent of governmental assistance provided has likewise varied among the areas. Generally, the colonist of the Tingo Maria-Pucallpa area has been liberally treated. From the beginning, he received land free or at a nominal price as well as seeds, implements, and money through the first harvest season. He also received advice and assistance in the event of a plant disease and had access to credit facilities at an agricultural bank. Schools and hospitals were also provided. On the other hand, neither Pozuzo nor Satipo received much in the way of government assistance. Drewes states that the Chanchamayo-Oxapampa had not received "an overabundance of federal aid." _/

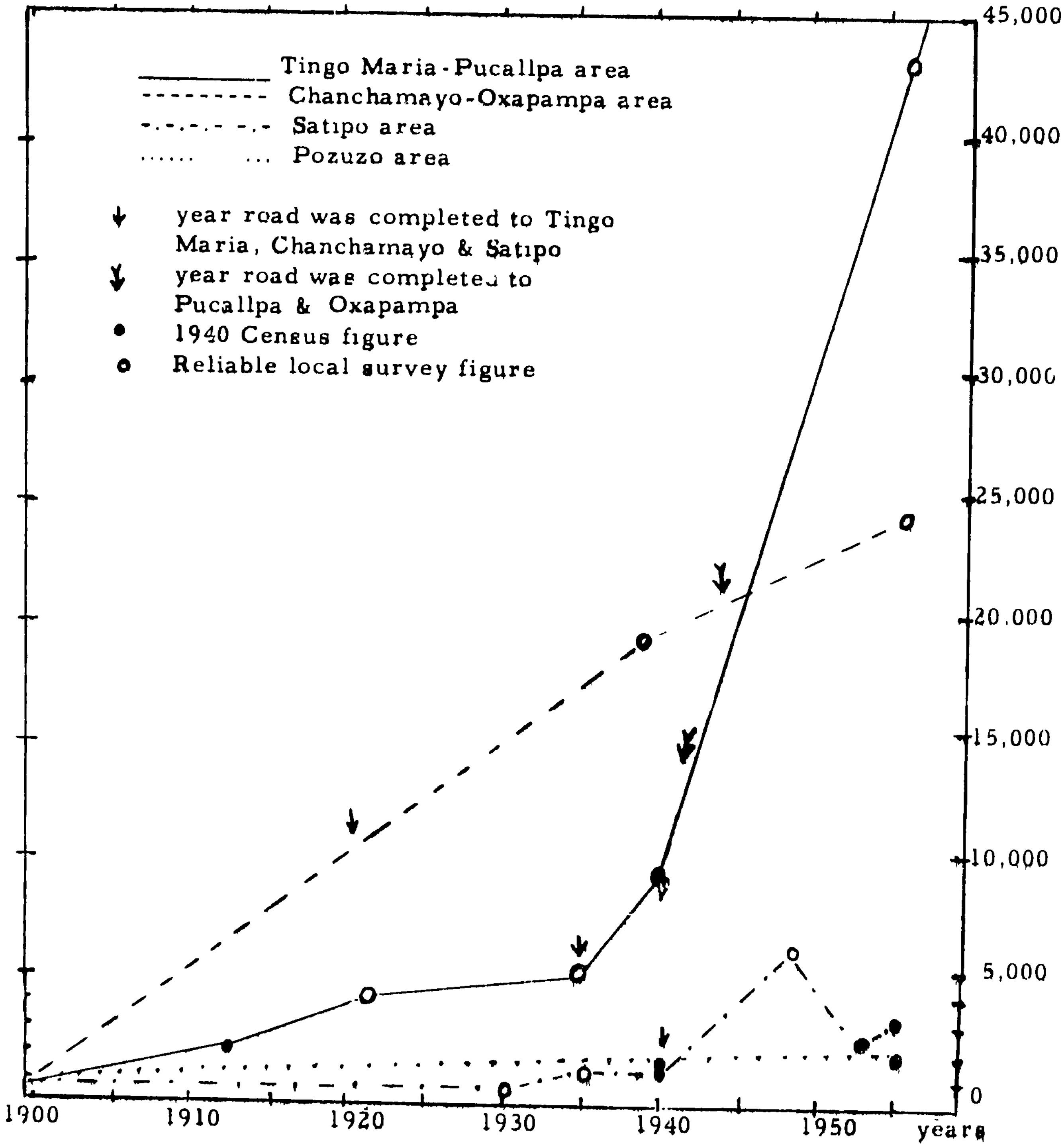
_/ Ibid., p. 3(

Economic Characteristics

Despite the impressionistic nature of the foregoing, Drewes seeks to explain the differing economic characteristics of each area as it existed in the mid-1950's, in terms of accessibility, "cultural" differences, and government policies, although primary attention is paid to the first two factors. (The influence of age of settlement is ruled out.) The specific characteristics he isolates and the variation of each among the areas are examined below.

Population. The relevant information is shown in Figure 22 and suggests a close correlation, especially in Satipo, between accessibility and the rate of population growth.

Levels of Living. Drewes splits this variable into two parts, public and private. Both variables must be interpreted carefully because no attempt to estimate regional income or consumption per head or in the aggregate has been made. Public facilities include such things as hotels, theaters, libraries, restaurants, stores, social clubs, hospitals, schools, banks, and so on. Since the quality, as well as the quantity of these is so important, no attempt has been made at any other than an impressionistic statement. On these grounds it is concluded that while there is a general dearth in all areas compared to most Sierra and coastal towns, Pozuzo and Satipo are most poorly endowed with "public facilities" and Tingo Maria-Pucallpa has far superior facilities. Even they are inadequate by most standards.



POPULATION IN THE FOUR AREAS OF SETTLEMENT
1900 - 1950

FIGURE 22

As far as "private living conditions" are concerned, Pozuzo stands alone not so much in terms of the level of living as construed in terms of physical consumption per head, but in the sense that the Pozuzino family makes its own clothing, shoes, home, and so on. There are no hired laborers and each able-bodied person devotes eighteen days a year to community projects. Pozuzo has little internal exchange or division of labor and even less contact with the world outside. Pozuzinos have "a well-balanced diet, live in large, dry houses raised well above ground and wear handmade boots.... The residents of the other areas all too often have starchy diets, live in small houses or huts with dirt floors, and usually go barefoot." This latter statement refers to the laborers, not the so-called "upper class" in the other three areas. _/

_/ _Ibid._, p. 43.

The residents in each of the other areas have "a level of living that is very similar [to each other] and in marked contrast to the Pozuzo area." _/ Drewes makes no attempt to compare levels of living among the

_/ _Ibid._, p. 37.

three areas and simply distinguishes between living conditions of the two distinct societies, laborers (_peones_) and the "upper class," as they exist in all three areas taken together. For the purposes of the present study it is not germane to describe these.

Industries and Agriculture. To infer levels of economic activity analogous to real output per head, we must examine the differences in manufacturing, extractive industries, and agriculture which are all related to exports and imports.

Manufacturing in all four areas takes the form of small-scale processing of local raw materials. But the number and variety of such activities differ sharply. At the time of writing (1955), Drewes reports that Pozuzo had only one small brick factory while Satipo had only a small furniture plant. The Chanchamayo-Oxapampa area had only one cola beverage plant, one wood flooring plant, and one ore concentration plant at the Pachita Caluga mine (lead-zinc) near San Ramon. By contrast, Tingo Maria-Pucallpa has an oil refinery, "three rosewood oil factories, five rice mills, a banana dehydration plant, two tea factories, an ice plant, a brick factory and a cola bottling plant." _/

_/ Ibid., p. 37.

Of the extractive industries, lumbering is the most important and is concentrated along transport routes. It is not surprising, therefore, that Tingo Maria-Pucallpa with relatively extensive transport facilities has substantial lumbering activities and an estimated thirty-four sawmills. For similar reasons the Oxapampa section of the Oxapampa-San Ramon area "is noted for its lumber production" _/ and supports more

_/ Ibid., p. 38.

than a dozen sawmills. Satipo lost its lumber industry after the road was destroyed, and Pozuzo never had one that catered to anything beyond local needs for which one sawmill is adequate.

As already mentioned, there is the Pachita Caluga mine near San Ramon and there are four small mines near Oxapampa. Petroleum has so far been found only in the Tingo Maria-Pucallpa area.

As for the relative extent and variety of industrialization, the ranking of the four areas is consistent with the present (1955) size of their respective populations. This applies also to agriculture in terms of variety of products, degree of mechanization, and extent of cash crop orientation. As a result of these differences, there are substantial variations in the quantity and variety of exports and imports among the four areas. Although no figures on value of imports and exports are given, some estimates in terms of weight that have been made are shown in Table 28. The Tingo Maria-Pucallpa area is outstanding in terms of the comparatively large volume of its trade, accounting for over 63 million kilograms of exports and 20 million kilograms of imports in 1954. By way of contrast, the volume of trade in the Pozuzo area is negligible, accounting for only 60 thousand kilograms of imports and exports combined. As would be expected, agriculture and lumbering predominate in the export sector. (See Figure 23.) The lumber production trends shown in Figure 24 suggest a close relationship with the availability of transport facilities.

TABLE 28. Volume of Imports and Exports of the Four Regions, 1954 (Totals in thousand kilograms)

Area	Total Export	Exports Per Capita[a]	Total Imports	Imports Per Capita[a]
Tingo Maria-Pucallpa	63,480	1,493	20,195	475
Chanchamayo-Oxapampa	33,845	1,460	8,274	375
Satipo	436	145	436	145[b]
Pozuzo	30	16	30	16[c]

Source: Wolfram U. Drewes, The Economic Development of the Western Montana of Central Peru as Related to Transportation (Peruvian Times, May 1958), tables 9 and 10, pp. 41 and 42.

[a]Per capita in kilograms.

[b]Imports equal, or at least approach, export tonnages to make the air transport operations feasible. Since full load capacity on imports is not always maintained, however, the figure is probably somewhat less than 145.

[c]Imports equal, or nearly equal export tonnages to make the long, strenuous trip by mule worthwhile. Imports equal in value to the exports do not always weigh as much as the exports, so that the figure may be somewhat too high.

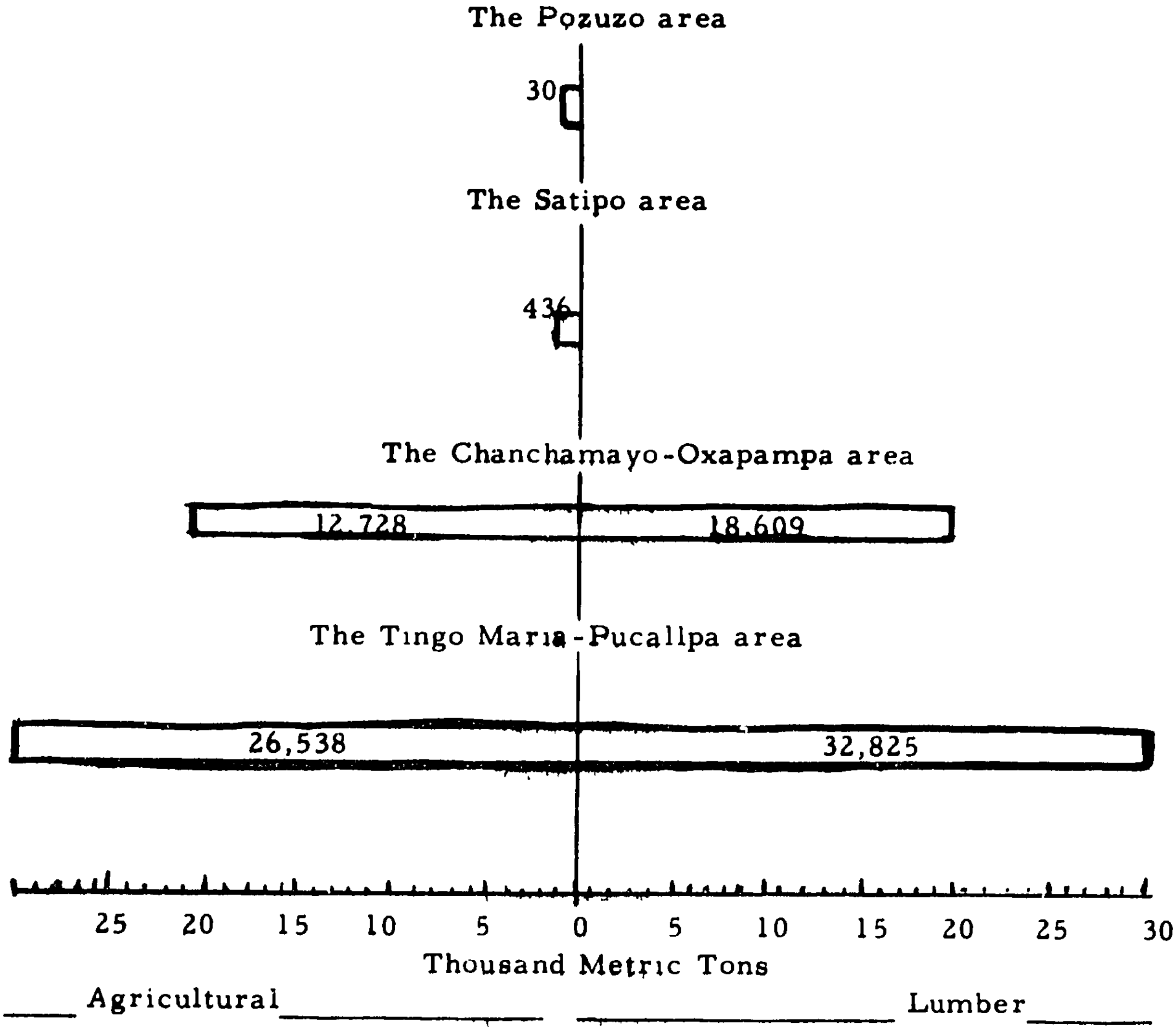
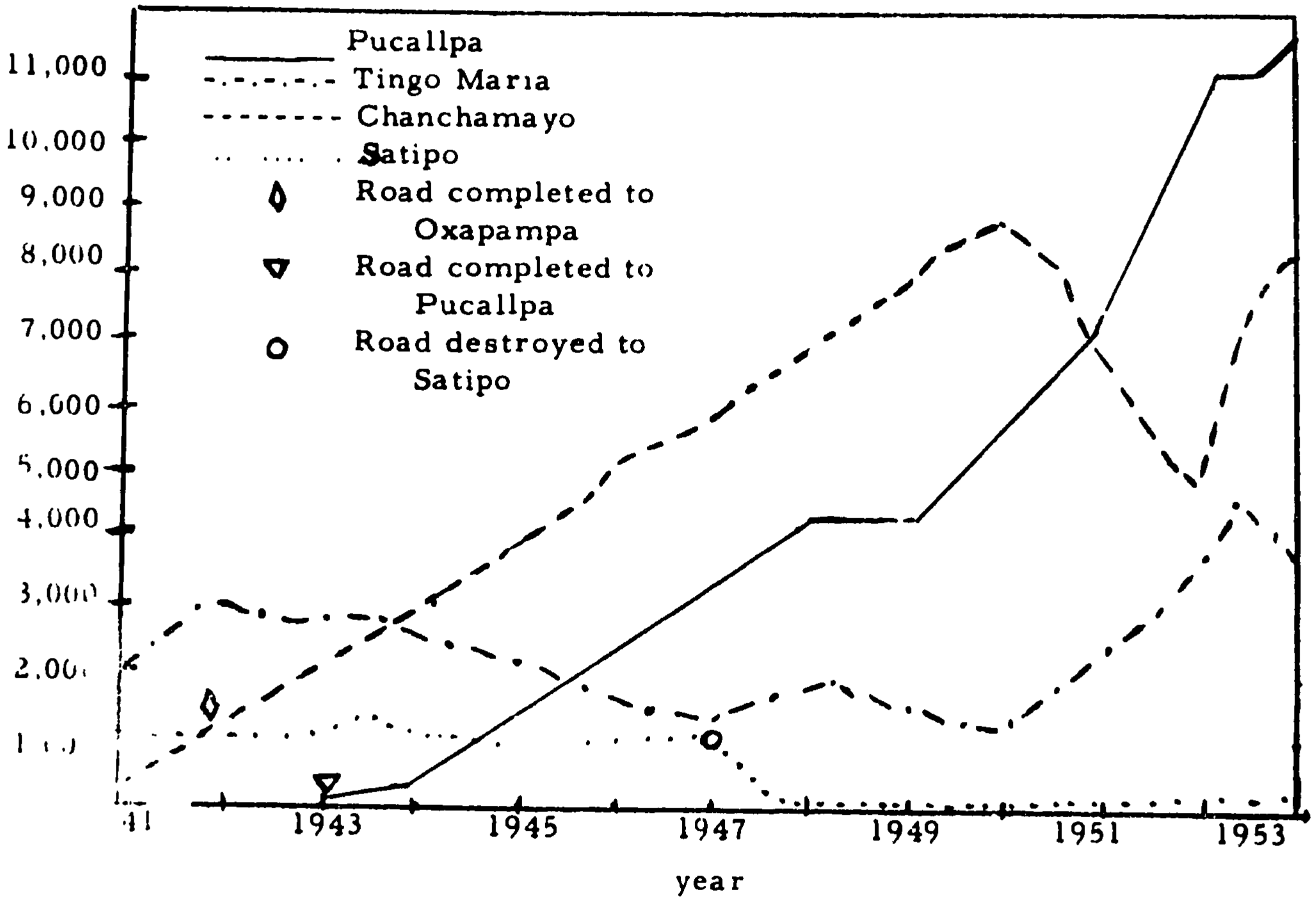


Figure 4. A comparison of agricultural exports and lumber exports for 1954 from the four areas of settlement. The information is based on data from official sources except for Pozuzo, where the data are based on estimates of town officials. Lumber export figures are based on lumber production since only negligible amounts are used locally and export data are not available.



Lumber production in P... Tingo María, Chanchamayo, Oxapampa, and Satipo.

Figure 1

All areas import the same general type of goods; machinery, implements, cloth or clothing, paint, medicines, and some food products. On a per capita basis, the weight of imports follows the same ranking as exports.

Conclusions

The conclusions drawn by Drewes are as follows: Transportation exerts a direct influence upon population growth as well as the amount and variety of cash crop production which in turn generates exportable surpluses and the ability to import a greater amount and variety of goods. But these things by themselves do not necessarily influence the levels of living as much as "attitudes, objectives and technical abilities" (e.g. Pozuzo). Nor is transport closely related to the extent and variety of public and private services. Government policies are deemed to be more important in this connection. "The final conclusion reached....is that modern transportation is indispensable to the economic development and successful settlement of the Western Montana of central Peru. But other factors are just as indispensable. Without colonists with favorable attitudes and technical abilities, or without favorable government policies that provide public services as well as the incentive for private services, the development of the Western Montana is severely hindered." _/

_/ Ibid., p. 43.

WEST NILE AREA IN UGANDA /

/ N. D. S. Smith, A Pilot Study in Uganda of the Effects upon Economic Development of the Construction of Feeder Roads. Research Note No. RN/3408/NDSS. Department of Scientific and Industrial Research, Road Research Laboratory, England, 1959 (unpublished).

This brief study selects three areas for comparison for the period roughly between 1946 and 1956. The areas are Terego, Madi, and Jonam located in Uganda's West Nile district as shown in Figure 25. The West Nile district has a population density of less than 150 inhabitants per square mile, abundant rainfall (40-60 inches per year) and a distinct wet and dry season. It is considered to be a good cotton growing area. These three territories differed during this period primarily in terms of feeder road construction. Between 1948 and 1952 Madi and Jonam had a series of feeder roads built. These roads were of varying lengths (from 6 to 32 miles), and about 10 to 12 feet wide. They were all dirt roads, generally unusable during the rainy season beginning in April. However, the main crop, cotton, is harvested between December and February and is not perishable, so dirt roads are adequate to get the cotton out. Terego had no new roads built until 1956.

The study examines the changes in population, in cotton acreage per head, and in incomes from cotton for each of the three areas. During the period of the study the main difference between Madi and Jonam on the

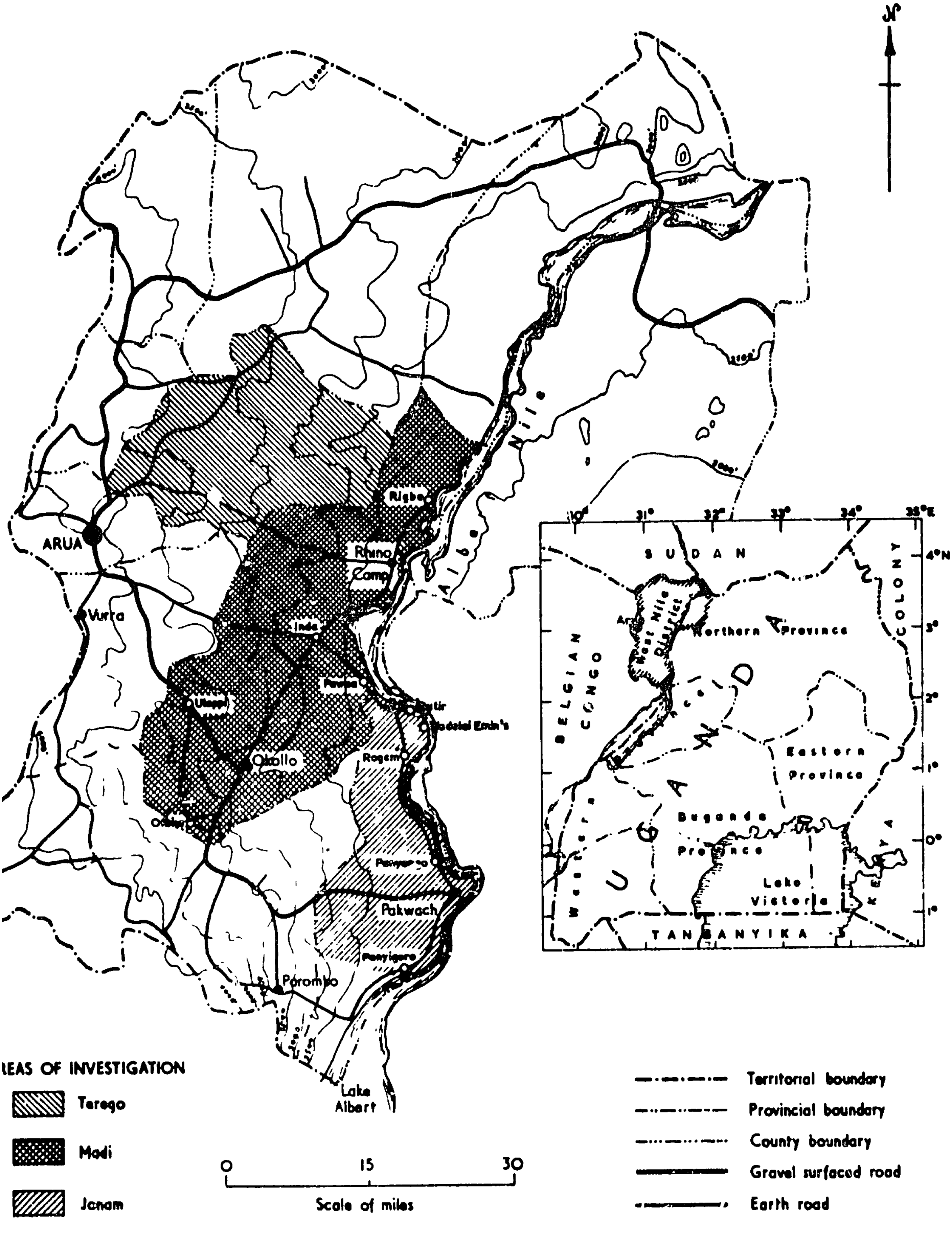


Fig. 25. WEST NILE DISTRICT OF UGANDA

one hand and Terego on the other was the feeder road construction in the first two. Table 29 summarizes the results.

The change in feeder road mileage was consistently associated with changes in population, acreage per head and income from cotton. That is, each of the three variables showed relative rates of increase according to the rate of growth of road mileage. The increase in income from cotton was partly due to a sharp rise in cotton prices which virtually doubled between 1948-49 and 1955-56, but this does not change the general consistency of the rates of change with road investments. It helps mainly to explain the increase in income from cotton in Terego despite a 38 percent reduction in acreage per head with only a 12 percent rise in population.

The study attempts no further conclusions on the basis of the evidence just cited and was designed mainly to illustrate "the use of the statistical approach to this type of problem." _/ It was, in short, a pilot study.

_/ Smith, Ibid., p. 7.

TABLE 29. Percent Change in Road Mileage, Population, and Cotton Production in the Three Regions, Uganda

Area	Road Mileage (1946-56)	Population (1948-55)	Cotton Acreage Per Head (1946-56)	Income From Cotton (1948-56)
Jonam	400	70	380	525
Madi	200	22	364	373
Terego	0	12	-38	230

Source: N. D. S. Smith, A Pilot Study in Uganda of the Effects upon Economic Development of the Construction of Feeder Roads. Research Note No. RN/3408/NDSS. Department of Scientific and Industrial Research, Road Research Laboratory, England, 1959 (unpublished).

PART II

ANALYSIS OF THE CASES

CHAPTER 7

CONCEPTS AND APPROACHES: A CRITIQUE

An examination of the conceptual, statistical and methodological aspects of the cases will clarify certain points before the more detailed analysis and general interpretation in Chapter 8. Much of what is said here has relevance to the entire field of the economics of growth as applied to underdeveloped countries although it is directly related to the cases in Part I..

Conceptual Ambiguity

The purpose of the case studies was to record and interpret the events following the construction of additional transport capacity in order to shed some light on the relationship of transport to economic development. In general, a functional relationship between these variables, and others, is presumed, of which more will be said later. But the variables themselves are not free from ambiguity. The notion of additional or improved transportation capacity is capable of a wide variety of interpretations. Since the cases deal mainly with roads, this narrows somewhat the extent of variation. Yet the roads are of different kinds with different physical and economic capacity. The notion of capacity depends not only on the highway itself but also on the types of vehicles available to utilize it as well as the prospects of acquiring and using vehicles of different qualities. This is especially important in underdeveloped economies suffering from balance of payments difficulties. While it is true that all of these considerations will be reflected to some degree in relative transport costs, rates, and services, the extent to which this is true will depend upon the degree of competitiveness that actually emerges. This in turn depends upon the response of producers to improved access, rates, and service. Both the vehicles and the right-of-way determine the amount and kind of capacity created, to say nothing of storage facilities, managerial quality, and so on. Depending upon these and other factors, the actual capacity generated (in terms of both vehicles and right-of-way) is itself a variable item and as shown below, is not closely related to the cost of the highway.

But of more importance is the meaning of the much-abused term "economic development." Even if it is equated with rising output per head, an overly simplified definition of a complex notion, there are related problems of income remission from the nation or region and all the difficulties involving the distinction between incomes from productive activity accruing to normal residents and output within the confines of a geographical area, which are especially vexing when dealing with segments of a single nation. All of these problems are in addition to the lack of reliable statistics. Even in the narrow sense of rising income or output per head the concept of economic development abstracts from income distribution effects and other criteria of economic welfare, to say nothing of the noneconomic aspects of development.

The intent of the cases to throw some light on the relationship between transport and development, faces certain inevitable ambiguities that cannot be summed up neatly by some variant of "benefits" relative to costs. Furthermore, all of the cases are beset with the problem of "time," that vexatious variable which renders much of economic analysis especially complex. Since all of the benefits and costs do not occur simultaneously but are spread out into the future in widely varying amounts, making them comparable requires some rate of discount and some notion of the "value of time." No good evidence was presented in any of the cases on this point nor would it be easy to come by, even if the same rate of discount could be expected to prevail in each future time period.

Difficult as this problem is, the fact that each case analyzes the situation for periods of only two or three to ten years after road construction is of greater significance. Still unanswered and subject to substantial guesswork are the future prospects which are essential for final evaluation. Though a particular investment may not appear to have done much in economic terms immediately upon completion, it may have stimulated those subtle changes that will later pave the way for rapid and sustainable growth. On the other hand, an apparent immediate success, manifest by a sharp increase in output and traffic, may soon fizzle because of the failure to trigger other strategic changes essential for sustained dynamism. In every case it is necessary to raise the question whether a really fruitful succession or complex of changes has taken place or whether a marked dampening effect is to be expected. And to a large extent, this is a product of exogenous circumstances such as government policy, natural phenomena, and changes in world markets. None of these circumstances are neatly predictable, particularly in terms of their impact on a regional distribution of economic activity that is predominantly agricultural. With adequate data, however, some meaningful interpretations and forecasts could be attempted and reaction patterns more reasonably assessed. Yet the paucity of reliable evidence precludes derivation of coefficients of various kinds and leaves the interpretation necessarily impressionistic.

The Problem of Statistics

It is a commonplace to complain about the unreliability and dearth of factual information for underdeveloped countries. Although most of them have national accounts, price and production data, they are frequently unreliable, and the figures are often revised at a later date without explanation. But rough as the statistics are that pertain to the nation as a whole, they are more so for regions. For example, the data in the Thailand cases dealing with agricultural production in the regions affected by the road were changed between the time of the initial investigation and a follow-up analysis one year later. Nor can it be assumed that this would not be found in a later follow-up of the other cases.

Political boundaries seldom coincide with economic regions, and even less coincidence is to be expected in the ill-defined region deemed to be "affected by" the new transport capacity. It is therefore not surprising that few of the cases attempt computations of regional incomes on any basis. It will be noted that many of them refer to volumes of production, usually in terms of weight, which has a rather ambiguous economic connotation. Nor, except for El Salvador, is there much evidence on additional investments, especially in the agricultural areas deemed to be most influenced by the new transport capacity.

Data on freight rates and costs of transportation are rough guesses in all of the cases. Even when rates were taken from published tariffs the extent to which these are actually followed is unclear. In the Guatemala case, for example, there was a strong suspicion that rebates were being given after the price accord between the railway and trucking interests. The information on costs is even more suspect and spotty. Thus functional relationships between volume handled and unit costs, even related to such crude units as ton-miles or passenger-miles, are conspicuous by their absence.

The profitability of the transport firms involved remains a significant unknown in any precise sense. Even for the railroads which parallel roads in several of the cases, the evidence is poor largely because the railroad accounts are kept on the basis of divisions which do not coincide with the area concerned. Where some evidence on these matters is presented, it is often based on heroic assumptions about average relationships found to pertain in a different context or upon general impressions formed on the spot by the investigator.

Population estimates are likewise subject to an unknown degree of error especially on a local or regional basis. Traffic along the highways has generally been estimated by traffic counts at particular points during the course of one or more days or weeks per year. They are subject to wide variation in interpretation particularly since little information on commodity flows or seasonality is given.

Finally we may mention the well-known discrepancies between accounting data (i.e. actual prices paid, costs incurred, and so on) and economic categories. While the existence of the former may be a necessary condition for estimating the latter, their equivalence cannot be assumed without close scrutiny. This is especially important where markets are highly imperfect and some forms of subsidy, tax or protection are so distorting, that they make product and factor prices inadequate measures of relative satisfactions and scarcity. Nor is there an adequate basis for estimating the extent of divergence between private and social costs. It is not therefore possible to determine the extent to which "reality," as presented in the cases, is a function of the individual investigator or a valid portrayal of the situation as it exists. The general lack of reliable data (even of the private accounting type) capable of being checked through independent calculations creates an aura of speculation that is inevitable in this type of investigation. The evidence presented and its interpretation as to content and meaning is heavily dependent upon those who carried out the particular investigation.

Methodology of the Cases

Each of the cases utilizes a combination of cross-section and time-series analysis, with heavier emphasis on the latter. Each of these two general approaches has substantial, though different, types of shortcomings. In combination they may either offset or accentuate the difficulties of each taken separately.

The cross-section approach refers to all those comparisons with other regions or the nation as a whole. The main problem associated with cross-sectional analysis involves the question of the homogeneity of the regions compared in all aspects save those whose variance is being investigated. In the present study which attempts to assess the impact of transport on economic development the relationship sought takes the general form:

$$D = f(T).$$

where D refers to economic development and T refers to transport capacity. But in no instance where cross-sectional comparisons are involved were the regions homogeneous in every respect save transport. In Drewes' study, the only one relying almost exclusively on this method, the areas differ in size, population, types of people, public policy, and to a lesser extent natural resources.

Indeed, one could make a case that the differences in population alone "explain" all the variables mentioned, except natural resources. The greater the number of people, the greater the ability to specialize and the larger the total output; and, given the resource base, the greater the volume of exports and imports even on a per capita basis. The observed relationship between population growth and transport facilities does not,per se, demonstrate that improved transport causes population growth. It is equally plausible to argue that the greater the population, the more necessary it is to provide better access and the greater the incentive, on strict economic grounds, to ensure accessibility. Since the decision to improve transportation is normally a political one, even if it is based on cost-benefit analysis, it is clear that causation is not one way and that both transport and population are interrelated as cause and consequence of each other. The isolation of Pozuzo in Peru is as much due to its small size as to its inaccessibility which makes it economically undesirable and perhaps politically unnecessary to provide all-weather connections. The population growth and decline in response to the road situation in Satipo, Peru, can also be attributed to a small population which did not agitate vigorously for restoration of the road after its collapse. Size and quality of population are both cause and consequence of all the other economic variables as well. Drewes' analysis recognizes this but tends to impute unidirectional causation to factors that are interdependent and mutually determining. It is well to recall with Alfred Marshall that no one of the balls in the bowl determines the position of them all. Furthermore, as already pointed out, the data are neither sufficiently reliable nor extensive to warrant computation of coefficients of determination using one or more explanatory variables. Even if they were, questions would still have to be faced regarding the form of the regression function employed as well as the fact that correlation does not prove causation and that quantitative measurement of some of the variables is difficult if not impossible.

In addition, extreme care must be used when a variable representing "attitudes, incentives, and abilities" is introduced. Since these qualities cannot be measured in any unambiguous sense, it is always tempting to ascribe varying results, which cannot be explained in terms of other quantifiable evidence, to these amorphous factors. The whole discussion thereupon becomes tautological in the sense that observed variations in economic development, which itself is not subject to precise meaning or measurement, are ascribed to whatever is quantifiable and "everything else" which is then equated with "attitudes, incentives and abilities." The analysis, in short, can be used to explain everything which means that it explains nothing. _/

_/ Malthus' population thesis is subject to similar strictures, as is

Rostow's notion of "preconditions" for take-off. As Kuznets says of the latter: "I do not know what a 'political, social, and institutional framework which exploits the impulses to expansion in the modern sector, etc.' is; or how to identify such a framework except by hindsight and conjecture; or how to specify the empirical evidence that would have to be brought to bear to ascertain whether such a framework is 'in existence or in quick emergence.'" It seems to me that the passage just cited defines these social phenomena as a complex that produces the effect Professor Rostow wishes to explain; and then he treats this definition as if it were a meaningful identification. Simon Kuznets, "Notes on the Take-Off," Chapter 2 of W. W. Rostow (ed.), The Economics of Take-Off into Sustained Growth, (St. Martin's Press, 1963), p. 28.

The two cases in Thailand refer to "reference areas" and compare specific types of production trends with areas (in both cases provinces, or changwads) deemed to be affected by the two highways. Little attempt is made to assess the degree of comparability, except for rainfall. The crucial difference is simply stated to be transport. No reference is made to relative population, geographical size, resources, freight rates, or the distribution of production by types in the reference areas. In terms of weight of production of, for example, upland crops and vegetables, there is a vast discrepancy in amount when each reference area is compared to the primary area affected by the highway. Since no figures on value of output nor product distribution for the reference areas are given, it is difficult to interpret the economic significance of the fact that over a four or five year period, the weight of production in the reference areas grew more slowly than in the areas affected by the highways. The most that can validly be said, as in the Uganda case, is that increased output was associated with the expanded transportation capacity; that some unspecified relationship appears to exist, the nature of which requires further examination.

The other cases make cross-sectional comparisons on a less systematic basis and for the most part they are used to support or modify conclusions already reached through time-series analysis.

Ideally, the time-series approach analyzes the economic conditions in a particular region over a time period during which an exogenous factor, such as increased transportation capacity, is introduced. It then compares the conditions subsequent to the exogenous factor with those prevailing before its introduction. If all other things remain equal, the differences are attributed to the exogenous factor. But it is precisely the stubborn refusal of other things to remain the same that complicates the imputation of causality to this exogenous factor. In the first place we cannot be sure that the earlier conditions would in fact have remained stable without the disturbance introduced. Thus some of the observed changes occurring later in time might well have taken place anyway and the creation of new transport capacity might then either thwart such changes or accentuate them. The relative significance of the investment is then difficult to assess.

Again, during any lengthy time period, there is usually more than one exogenous influence at work, and the observed changes are due to a complex of exogenous factors occurring within the given set of conditions. Attributing changes to any one of them is a very slippery endeavor, especially where reliable data are lacking. Indeed, it is this weakness of time-series analysis that makes cross-sectional comparisons more appealing just as the problem of homogeneity in the latter suggests the advantages of the former.

In short, both approaches have their own peculiar strengths and weaknesses. Which one is adopted is frequently a pragmatic decision, especially in the present set of case studies, dictated by the kinds of evidence available. Where no usable time-series data exist, the only alternative, short of attempting to derive such data, is to study several areas at a particular time. On the other hand, when "reasonably comparable" regions are hard to find, investigators may use the time-series approach with whatever data may be available. The choice of approach is less the result of compelling logic or careful calculation than a matter of expediency. This consideration along with the dearth of reliable evidence and problems of comparability invokes the use of both approaches in the same case. The problem of combining the two is that one is never certain whether the result combines the best or worst features of both.

Case Studies as a Method of Analysis

On a more general level it is worthwhile commenting on some of the virtues and defects of a case study approach to an analysis of economic growth and transportation. In the Introduction, I noted some of the weaknesses of excessive aggregation, and the emphasis upon the nation as an economic unit. Piercing beneath the totals and focussing upon the "reality" of regional life may provide a healthy supplement to the broad approach which has been so heavily emphasized. If economic growth is really a question of people, then the aggregative, national approach might miss the essence of the process of development. Tying the analysis to specific industries and regions should permit closer contact with individual response mechanisms essential to a fuller comprehension of economic growth. The more microscopic approach gets closer to reality, to the way people live, behave, and react in specific circumstances. After all, economic and social activity takes place in particular places, in specific industries and occupations and with a particular set of social contacts. In a country with low mobility, these particularities are more real and vital to an individual than the broader national society. Thus to plan sensible developmental strategy and, more important, to implement it, requires a disaggregated approach in determining what particular investments to make, where to locate them, and when to make them. As Albert Hirschman once put it "generalizations involving large aggregates of the economic system have somehow seemed to be lacking in ready applicability to the specific problems that confront the practical planner." _/ Of course, this is not the purpose of the

_/ Albert Hirschman in Investment Criteria and Economic Growth, Papers presented at a Conference sponsored by the Center for International Studies and the Social Science Research Council, Massachusetts Institute of Technology, Cambridge, Mass., December, 1955, p. 36.

general theory of economy growth. But it must be remembered that underdeveloped countries are seldom united, economically or politically, within a national boundary. One of the attributes of underdevelopment is a high degree of regional isolation, separateness, and self-sufficiency to which national aggregates have little relevance. For these reasons, the case study approach appeared to have great merit.

However, despite a closer contact with reality, as construed above, the case study approach is beset with unique problems that are avoided at higher levels of aggregations. Aggregative analysis deals with a smaller number of variables. Individual differences often wash out in the process of aggregations thereby facilitating discovery of meaningful relationships. Some degree of generalization and abstraction is essential else one comes up against the very diversity to be explained.

Furthermore, a regional case study is beset with the problem of statistical gaps. Interregional transactions, for example, are not recorded on a regular basis in anything like the degree of precision that international transactions are. The same applies to population movements. Nor would anyone seriously suggest that international procedures and red tape be applied internally. The point is simply that the development of regional statistics is a more difficult and costly task than is the case with national data. The preoccupation with aggregates is both cause and consequence of this fact.

Even assuming availibility of data, the knowledge gained from a single case study has relevance only to the set of conditions actually examined. There is, however, a predisposition on the part of those intimately acquainted with a particular situation to impute these characteristics to larger areas or to other circumstances where their relevance is remote. If we should be wary of applying aggregative relationships to specific instances we should be equally concerned about the reverse imputation. A road may have facilitated significant development in Nicaragua or El Salvador but may have had little noticeable impact in Guatemala or Bolivia. In this sense each case is unique. As the cases summarized in Part I imply, the selection of any one of them as generally applicable in other circumstances would be dangerously misleading in many respects..

But using a set of cases may suggest certain uniformities and permit a wider degree of generalization. As Gould suggests, "the more studies of transportation development . . . we have, the easier it will be to pick out some of the constantly recurring themes . . ." _/ It is in this

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_/ Peter R. Gould, The Development of the Transportation Pattern in Ghana, Studies in Geography, No. 5. Northwestern University, Evanston, Illinois, April 1960, p. 163.

spirit that the cases are presented, despite their heterogeneity, difference in approach, and variation in the kind and quality of evidence. Nevertheless, there are weaknesses even in using a set of cases, as anthropologists and business historians are quick to acknowledge. The divergences between the case and aggregative approaches have been neatly summarized in the following comparison between anthropology and economics:

> The method of anthropology--intensive, first-hand field study of small social units within the larger society--means that its primary contribution to the understanding of economic development must inevitably lie in a relatively microscopic and circumstantial analysis of a wide range of social processes as they appear in concrete form in this village, or that town, or the other social class; the theoretical framework of the economist almost as inevitably trains his interest on the society as a whole and on the aggregate implications for the entire economy of the processes the anthropologist studies in miniature. One result of this division of labor has been that anthropological studies of development have tended to consist of a set of more or less disconnected examples of the various social forces which "somehow" play a part in development with little or no indication as to how they play this part or how they effect the overall functioning of the economy; economic studies of development tend to consist of general statements about the implications of various sorts of relationships among technically defined aggregate economic variables for growth, with little or no indication of how the social forces determining the value of these variables can be expected to behave. On the one hand you have a sociological eclecticism. . ., on the other, an economic formalism. . . _/

_/ Clifford Geertz, Peddlers and Princes (Social Change and Economic Modernization in Two Indonesian Towns.) (University of Chicago Press, 1963), pp. 4-5.

In the next chapter we examine the constantly recurring themes from the disconnected cases and seek to chart a course somewhere between eclecticism and formalism.

CHAPTER 8

WHAT THE CASES SHOW

The cases confirm the belief that additional capital, whatever its form, may be a necessary but not a sufficient condition to induce economic growth. In every instance, even where rapid development ensued, it was a combination of circumstances which, in conjunction with the highway or road, occasioned the growth of output. In some instances, the road was a response to population pressure or higher prices which would have brought new lands and crops into production even without the road, although possibly not to the same extent. In these cases, the road accelerated an existing trend but can scarcely be deemed causal. For example, in North Borneo and Uganda the population increase induced the taking up of new land and there is no doubt that whether easy access were provided or not, such expansion would have ensued. Rising prices for cotton and rubber accentuated this trend _/ which was rendered all

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_/ The actual price trends are rather ambiguous, however. In the Uganda case, evidence was cited showing prices of first-grade cotton in 1948-49 of 29 shillings per 100 pounds and 54 shillings in 1955-56, while the prices for second-grade cotton were reported as 13 and 23 shillings, respectively. (A Pilot Study in Uganda, loc. cit., Table VI, p. 7, mimeographed.) In terms of seed prices paid to growers, other data also indicate that they roughly doubled between 1948-49 and 1955-56. (See, for example, the Annual Report of the Lint Marketing Board, Year Ended 31st Oct. 1962, Uganda). However, other evidence suggests that cotton prices either fell, using annual averages for "U.S. Middling 1 inch c.i.f. Liverpool" between these two dates or rose slightly in terms of "seed cotton, price to growers BP 52 variety." Data from IBRD, The Economic Development of Uganda, Baltimore: Johns Hopkins Press, 1962, Chart2, p. 156.

Rubber prices, on the other hand, rosé sharply between 1949 and 1951 then declined and remained relatively stable from 1953 through 1960 but at somewhat higher levels than existed in 1947 through 1949. (See above, Figure 17 on page 153.)

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the more essential since the ability to raise yields on presently cultivated acreage is limited by failure to use fertilizer, at least in Uganda. Furthermore, the ease of road construction in Uganda made the feeder road program a rather simple and natural response to the demand for land. The World Bank study of Uganda states that the "spread of cotton cultivation . . . created a demand for roads, mainly secondary and feeder" and that their construction was made easier by the general availability of excellent road building material (murram) and an "old tradition of road building [as well as] the application of luwalo, a customary law which gave the option to the African taxpayer to choose between payment of local government tax in cash or community work." _/ In the case of either cotton or rubber, the

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_/ The Economic Development of Uganda, loc. cit., p. 310.

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road facilities cannot be interpreted as "opening up" new areas; they were responses to a set of forces that would have led to new settlement and increased output in any event. The observed relationship between roads and production in Uganda does not imply that the roads were the cause of greater production. In fact, the opposite is more nearly the truth.

The same is only slightly less true in Nicaragua and El Salvador. In the region affected by the Pacific Littoral Highway in Nicaragua (the Departments of Chinandega and Leon), the area planted in cotton and total output were both increasing well before the highway was completed. This trend would doubtless have continued without it because cotton prices increased in recent years and more efficient production techniques were adopted.

This situation has direct relevance to the notion of "leading sectors" and so-called "preconditions" for take-off as far as the role of transport is concerned. In these two cases, transport, instead of being a necessary precondition or even a leading sector, was a response to pressures generated both from without (rising commodity prices) and from within (growing population). Of course, the whole notion of take-off and stages of growth, to which the "leading sectors" notion applies, is fraught with ambiguity. _/

_/ W. W. Rostow (ed.), The Economics of Take-Off into Sustained Growth, (St. Martin's Press, 1963), Introduction, Epilogue, Chapters 2, 15.

Bolivia is somewhat different despite population pressure in the highlands. New lands were not easily settled; hence the population pressure built up a need for new lands that could not be satisfied in the area, and mobility out of the region was stifled by physical and perhaps psychological barriers. A kind of pent-up demand arose to which the highway was one form of response. But unlike the other cases mentioned, this response was to latent demands which would otherwise have been frustrated. In this sense the Bolivian road has more causal implications with respect to actual or potential development.

In other instances, the prevalence of easily exploitable natural resources was a necessary adjunct to whatever degree of success followed the completion of the highway. For example, the East-West Highway in Thailand served to open up the lush Pasak Valley, especially to timber production. The Friendship Highway also passes through a region most of which is suitable for agriculture as the sharp increases in output testify. In the Western Montaña of Central Peru, the close relationship of lumbering to road access is significant. We have already noted the suitability of the soil in Uganda, North Borneo, and Nicaragua, without which little use of the highway would have ensued. The relative failure of the Guatemalan road (and to a lesser extent the Cochabamba-Santa Cruz highway in Bolivia) to generate much new traffic is in large part attributed to the dearth of natural resources along the right-of-way.

In many cases, such as Bolivia, Guatemala, the two areas in Thailand, Peru and India, whatever development there was would not have occurred, and certainly not in its present location, without the highway. The highway along with other investments, policies, and natural resources did not merely facilitate a line of development that would have unfolded anyway. It was part of an initiating cluster of change and deserves recognition as one of the causal agents.

But the existence of readily exploitable resources, even if they could be developed by using available skills and equipment, is not enough. There is a more basic prerequisite for development, namely, a willingness and ability to identify and exploit a new economic opportunity. This is the great intangible and we shall be forced to examine it explicitly at a later stage. But the point here is that the stimulus to growth requires a set of conditions of which the transport capacity is but one even in those cases where it may be deemed causal in some degree.

The search for a single source of economic growth, for a particular catalyst that will work in every instance is doomed to failure. It is not merely a higher rate of savings and investment, or the creation of a class of entrepreneurs, or improved labor quality or political stability or "adequate" infrastructure taken separately. It is all these things and more besides. Economic growth is due to a "combination of social, cultural, political and economic changes." _/ It is not possible to isolate

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_/ P. T. Bauer and Basil Yamey, The Economics of Under-Developed Countries, (University of Chicago Press, 1957), p. 128.

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a single prime mover and ascribe all else to it alone. At particular stages of growth and under a given set of circumstances, one particular policy or investment may emerge as seemingly more crucial than others but this is true only at this stage and under the given conditions. Transport may be a serious bottleneck at one time; its payoff then becomes as great as it is obvious (as in the Venezuela case). This does not mean that for the economy as a whole, considering all investment options, the decision to construct the autopista in Venezuela was the best one. All that is implied here is that the benefits exceeded costs. But even in this case, the actual payoff is a result of all those factors causing the bottleneck to appear as well as the enlarged transport capacity designed to relieve it.

A much more skeptical attitude toward transport appears essential and far more attention devoted to the set of circumstances surrounding the expansion of transport capacity. The cases in the present volume illustrate this point despite the fact that most of them appear to be "successes" in one way or another.

Each case, though different in many respects, is not unique. The following discussion of what the cases show is designed to narrow down the apparent variations among them and indicate the path toward some meaningful generalizations.

What the Cases Show

1. Traffic. In every case there was a rise in traffic along the new facility which in most instances represented a net increase in total mobility, not merely a diversion. Where no previous connection existed, the traffic on the highway represented a net increase in movement. But in most instances, even where rail connections were paralleled, the rise in highway movement implied a net increase. For example, only 12 percent of the total traffic along the Friendship Highway was believed to have been diverted from the railway, and along the Ramnad-Mandapam road, and the coastal highway in El Salvador, rail traffic increased following its completion. The same is true of the autopista in Venezuela. Along the portion of the highway in Nicaragua closely paralleling the railroad, rail traffic declined but the rise in trucking more than offset this. Even in the case of the Guatemalan road, some net increase in mobility was recorded although this was slight and mainly attributable to other factors.

In general, however, the total volume of traffic in the region or country increased and the extent of diversion from parallel facilities, other than indigenous forms of transport, _/was not significant compared

_/ The decline of primitive forms of transport is illustrated in the Nicaraguan case. As late as 1954, almost all cargo to Telica was carried by oxcart. With the highway, trucks now carry all except strictly local traffic. A similar, though less pronounced diversion is also evident in the case of the Ramnad-Mandapam road in India.

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to the growth along the new capacity. Even where diversion occurred, this proved to be a more rational allocation of traffic.

In every case, local traffic was almost completely captured by truck transport except for heavy, bulky low-valued commodities such as bricks, tiles, gravel, timber, etc., which continue to move by rail where this is a possible alternative. In Guatemala, for example, local traffic by rail is estimated to have declined by almost 50 percent. In Nicaragua local traffic by rail fell sharply between 1954 and 1962. In this period it accounted for only one-third of total rail and truck short-haul or local traffic. We have already noted the decline of indigenous forms of transport which were entirely short-haul.

Longer-haul or through traffic also showed a shift to truck from rail but for the most part this represented movement of the increased production in the region, and the extent of diversion from alternative forms of transport was relatively small.

Passenger traffic, however, shifted more dramatically to bus service once the road was completed. In Guatemala, bus service even replaced an airline between Guatemala City and Puerto Barrios. Large reductions in rail passenger traffic were generally reported despite a rise in total passenger movement. It is clear from the cases that bus transport captured much of the previous passenger business and was responsible for practically all of the increase.

2. Production. The net increase in mobility implied an increase in both the tonnage of freight and number of people moved during any time period and, in some instances, a lengthening of the average distance traveled. As both cause and consequence of this, a sharp rise in production (mostly agricultural) took place with a growing emphasis on production for the market rather than for subsistence. In other words, the rise in mobility was not simply more movement over longer distances of existing annual volumes of production. In virtually every case, the greater mobility represented a net increase in physical output as well as a higher value of output per unit of weight as substitutions for both low-valued cash crops and subsistence crops ensued. The extent of growth of new output was particularly striking in the area affected by the Friendship Highway, and the Nicaragua and El Salvador Littoral Highways. (The 1962 decline in upland crop production in Thailand is believed to have been a result of a locust plague and does not represent a reversion to production levels before the highway.) In the Department of Chinandega, Nicaragua, the area cultivated increased by over 70 percent as much pasture land was converted to crops, while the estimated value of output almost tripled between 1951-52 and 1962-63. The sharp rise in value per unit of cultivated land is attributable to a substantial shift from low-valued crops to cotton and sugarcane as well as rising yields, especially in cotton. For example, while the total number of manzanas (1 manzana = 1.73 acres) cultivated increased by about 40,000, the area devoted to cotton alone increased by

over 52,000 manzanas. The area devoted to such lower-yielding crops as rice, beans, corn, and sesame declined between these two dates. Physical yields in cotton increased steadily from about 6 quintales per manzana (1 quintal = 100 pounds) in 1952-53 to over 12 in 1962-63, with the result that a tenfold increase in value of cotton output occurred. A similar though less pronounced pattern of new lands and substantial substitution of cotton for other crops also typified the Department of Leon.

Even in Guatemala, where the area affected by the road was not extensive, and conditions along the right-of-way were not propitious, some net increase in cash crop production for sale in Guatemala City was reported and this implied a substitution for subsistence crops.

But the most dramatic change occurred in the El Salvador case where cotton output increased more than seven times in the decade following 1953-1954. Indeed, the conversion of a relatively substantial region from subsistence to market-oriented production probably went further in El Salvador than in any other region examined in this volume.

We have already noted the sharp response in timber production following completion of penetrating transport facilities (and negatively when they collapsed as near Satipo, Peru, in 1947) in Peru and the Pasak Valley in Thailand. Slightly less dramatic were the production increases in the Ramnad-Mandapam area of India, North Borneo, Uganda, and the Aragua Valley in Venezuela. Only the Guatemalan road and the Cochabamba-Santa Cruz highway in Bolivia have failed to trigger much new production largely for reasons already indicated and to be discussed later. Most of the increases in output constituted a net growth for the economy as a whole and did not simply represent a relocation of productive activity.

The substitution of cash for subsistence crops was especially apparent in North Borneo, El Salvador, Nicaragua, Thailand, the Santa Cruz area in Bolivia, and the Western Montaña in Peru. This implies not only a greater volume of output but a higher unit and total value as well. More importantly it permits greater specialization and provides an essential integration of market-oriented economic activity over a more extensive area.

In most instances the transport facility served directly or indirectly to bring more land into productive use, although the extent of this varied widely. It was obviously dependent upon the type and length of road as well as the quality of the soils or forests through which the road went or to which it provided easier access. Yet there is no relationship between the cost of the highway per mile and the developmental impact.

Excluding the autopista in Venezuela, which is a very special case, the most expensive road was that constructed in Guatemala which cost over $260,000 per mile. The East-West highway in Thailand cost about $210,000 per mile, and the others in Latin America cost between $100,000 and $150,000 per mile. The Ramnad-Mandapam road and the unpaved roads in North Borneo cost less than $20,000 per mile. There is no relationship between these amounts and traffic estimates several years later which varied from less than 150 vehicles per day for the highway in Bolivia and the roads in North Borneo and Uganda, between 400 to 700 on the Guatemalan and East-West highways to almost 1,000 on the Friendship Highway and portions of the coastal highway in El Salvador. (See Table 35.) There are obvious features of noncomparability in these cost estimates such as the degree of inflation (since the highways were constructed at different times), the variations in the exchange rate of local currencies for U.S. dollars, and, of course, the nature of the terrain and standard of road built. But even considering these sources of cost variations, the kind of road and its cost per mile is not associated with the degree of success, however measured. _/

_/ It is interesting to compare these cost data with data for Tanganyika where the following road types for varying traffic levels have been estimated:

Vehicles Per Day	Type of Road	Construction Cost Per Mile (U.S. Dollars)
Under 60	Earth feeder roads, permanent bridges	1,400-7,000
60-150	Earth or gravel	14,000-22,400
150-1200	Bituminous surface 20 feet wide	33,600
Over 1200	Bituminous surface over 20 feet wide	56,000

Source: IBRD, The Economic Development of Tanganyika, (Baltimore: Johns Hopkins Press, 1961), p. 279.

If these figures have any relevance at all outside of Tanganyika, the construction costs in the Latin American and Thailand cases are clearly excessive. Independently of the general applicability of these estimates, however, the point is that road costs and standards vary considerably and without any apparent relationship to the subsequent economic effects.

There are many other factors of more crucial significance as we have already noted. Indeed, as shown in the Uganda case, when the time of harvest coincides with the dry season or a time of year when dirt roads are passable, all-weather or surfaced facilities are not essential for inducing sustainable increases in output of crops, especially if they are not subject to serious damage through rough transport (e.g. cotton). On the other hand, all-weather roads are important where these circumstances do not exist. The only specific example of this is in North Borneo where a positive relationship was shown to exist between all-weather roads and the value of crop production at varying distances from the market. (See Chapter 6, Figure 18, page 153.) It is reasonable to assume that a similar, though less pronounced, relationship holds for improvements up to and beyond paved facilities, although the data available do not permit specifying its precise nature.

Furthermore, where constant attention must be paid to crops during the growing season, accessibility at all times during the year, and not merely to transport the harvest from the fields, is important as the Nicaragua and El Salvador cases suggest. This is especially true when landowners or their agents reside in towns or villages more or less remote from the growing area.

TABLE 35. Selected Data from the Cases

	Vehicles Per Day, 2 to 5 Years after Construction	Average Annual Change in Production in Areas Affected[a] (Percent)	Approximate Cost of Road Per Mile (U.S. Dollars)
Bolivia	102-120	20	134,000
El Salvador	150-1200	80	165,000
Guatemala	400-700	5	261,000
India	Under 100	5	14,000
Nicaragua	770-1500	45	100,000
North Borneo	N.A.[a]	35	10,000-17,000
Peru	N.A.[a]	75	N.A.[a]
Thailand: Friendship	700-1000	40	150,000
East-West	40-470	50	210,000
Uganda	N.A.[a]	65	N.A.[a]
Venezuela	Over 5,000	30	1,600,000

Sources: Case Studies. Data refer to simple average annual increases, not compound rates of growth, rounded to the nearest 5 percent. The production estimates were derived as follows:

Bolivia: tonnage of rice and sugar production 1950-58.
El Salvador: tonnage of cotton production, 1953-54 to 1963-64.
Guatemala: estimated from tonnage handled at the ports influenced by the highway 1953-1962.
India: weight of agricultural output excluding paddy, in the study area 1954/55-1958/59.
Nicaragua: average of weight of cotton and sugar output for Departments of Chinandega and Leon, 1951/52-1962/63.
North Borneo: land demand, 1953-1960.
Peru: board feet of lumber production in the Chinchamayo-Oxapampa area, 1942-1951.
Thailand: Friendship, weight of output of upland crops and vegetables, 1957-1961, in provinces affected.
East-West, weight of output of upland crops and vegetables, 1957-1962, in provinces affected.
Uganda: average of weight of cotton output for Madi and Jonam, 1948/49-1955/56.
Venezuela: production index average for Department of Aragua and Carabobo, 1954-1960.

[a]N.A. means not available.

3. Rates and Service. The mechanism that served to stimulate additional output, cultivation of new lands, and more passenger travel was in every case except that of El Salvador a rather sharp decrease in freight and passenger charges from levels prevailing prior to the new facility as well as improved service. This, however, did not happen spontaneously. Moreover, some commodities and segments of the region benefited more than others. Nor was there much uniformity in the extent of average rate decreases among the cases as would be expected. As far as penetration facilities are concerned, it is not proper to speak of rate decreases since no previous service existed, but in most cases there were alternative connections more or less devious and hazardous, and the rate change as a consequence more or less significant. Rough estimates suggest that rates for most of the commodities involved dropped by about 50 percent in the Guatemalan, Bolivian and Indian cases and by even more than this on the Friendship and Nicaraguan Pacific Littoral highways. However, in El Salvador, both passenger and freight rates on the railroad which paralleled the road for part of its distance did not drop. Furthermore, for the Friendship highway it is estimated that the cost of moving maize from Korat to Bangkok is about the same whether by rail or road. It is not clear whether the rail rate prior to the highway was much higher than at present. Data on rates for the other cases are either not available or indicate a mixed pattern. Even these rate changes hide a wide variety of changes as among commodities with import rates, where relevant, falling more than export rates, and rates for local traffic declining more than for through traffic.

The difference in the extent of rate reduction between imports and exports reflects the typical situation of an underdeveloped country. Bulky, low unit value agricultural commodities predominate among export commodities; and high unit value manufactured goods constitute the major porportion of total imports. This meant that before road competition, the rail rate from the ports was significantly higher than the rate to the ports, since "value of service" rate-making principles typify most rail networks. Furthermore, the import traffic in general is more suited to truck transport than is the export traffic. Thus, the import rate by rail was especially vulnerable to truck competition. It is not surprising that when road facilities were made available, the prime target was the import traffic. In the Nicaraguan case, rail rates on imported goods from Corinto to Managua declined by well over 50 percent while export rates on cotton and coffee were reduced by only 11 and 19 percent respectively. The rail rate from Puerto Barrios to Guatemala City in the Atlantic Highway case exhibited a somewhat similar pattern. The export rates for sugar and coffee were reduced by about 10 and 50 percent respectively, between 1958 and 1963, while import rates on truck competitive traffic were generally halved.

On the other hand, the even more drastic rate reductions for local traffic were less a result of "excessive" rail rates, where rail transport was an alternative, than the high cost of indigenous forms of transport and vigorous competition among the large number of independent truckers who suddenly emerged.

For example, the short-haul cotton traffic from the field to the cotton gin in Nicaragua was estimated to cost 35 cents per ton kilometer by oxcart and only 10 cents by truck. In the Western Montaña of Central Peru, costs by mule per ton-mile are more than double those by air and many times higher than truck where these forms of transport are possible.

Except for El Salvador, in places where rail competition existed. rates on local traffic declined very sharply. (In the Guatemala case, the rail rate for general merchandise was reduced from almost $2.00 per hundred weight in 1957 to $0.40 in 1963.) This put additional pressure on truck charges aside from the vigorous competition among the truckers themselves. However, the marked service advantage of motor transport over rail, especially for short hauls, meant that a substantial diversion from rail to truck could not be prevented. Indeed, the railway in Guatemala acknowledged that shippers "definitely prefer truck service" for export cotton. _/ Short-haul truck rates up to 50 percent above the corresponding

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_/ Cited in unpublished report by Martin S. Klein for the Brookings Institution, 1964, p. 38, mimeographed.

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rail rate did not prevent the loss of local traffic to trucks.

But no rate change was possible without the creation of excess capacity in transport and relative freedom to set whatever rates seemed necessary to utilize such capacity. Where some type of restriction on entry into the trucking business was in force (e g. Guatemala), the results were among the poorest of all the examples given, although some evasion of the law and lack of enforcement offset the importance of the restrictions. Again, in the Bolivian case part of the lack of success, at least during the early years, has been attributed to monopolistic tariffs due to "restrictive practices of the Cochabamba and Santa Cruz road haulers' federations." _/

_/ J. Colin Crossley, "Santa Cruz at the Cross-Roads, A Study of Development in Eastern Bolivia," Tijdschrift voor Economische en Sociale Geographie, August 1961, p. 204. The income from a round trip, Cochabamba to Santa Cruz, in 1958 was estimated at $185, while costs were only $110. Ibid.

The excess capacity was a direct result of a rather sudden influx of trucks and buses on a for-hire basis. In other words, one precondition for rate changes was the rise or expansion of entrepreneurial activity in the provision of transport service and an absence of direct or indirect restrictions. Despite a sharp decline in rates charged, new or existing transport firms still found it sufficiently profitable, at least in the short run, to initiate or expand service to the area served by the new right-of-way. In all cases, the transport industry received an influx of small-scale operators in response to the new economic opportunity, and the low-level instability of rates and service typical of this kind of operation naturally ensued. Vehicle registrations in the areas directly affected increased more rapidly than the national average, and the number of vehicles utilizing the highway rose even faster as trucks, buses, and automobiles were diverted from other, more costly, routes.

In Nicaragua an economic slump occurred between 1957 and 1962, occasioned by declining coffee and cotton prices. Despite the fact that the slump led to a contraction in the purchase of vehicles, traffic along the completed portion of the Pacific Littoral Highway rose steadily from 277 vehicles per day (counted at a station 30 kilometers north of Managua) to 1200 in 1963. This suggests some diversion from other routes as well as increased utilization of the existing stock of vehicles.

In the Santa Cruz area of Bolivia, it is reported that campesinos were entering the local trucking business in response to agricultural growth. These new truckers purchase Japanese trucks with two-year loans which suggests that financing is readily available. Partly due to the increased production in Santa Cruz, traffic along the Cochabamba-Santa Cruz highway is believed to have risen from 102 vehicles per day in 1959 to 120 in 1962. _/

_/ See unpublished report by Barbara R. Berman for the Brookings Institution, 1964, p. 20, mimeographed. The data are subject to some serious shortcomings. A "most conservative estimate" covering the period from December 1961 to September 1962 puts the vehicles per day at only about 80 (see Ibid. p. 20) while another estimate for 1960 suggests a figure of 135 (Ibid., p. 36.)

Even in the less successful Guatemalan case, it is reported that "as soon as the paved highway. . . was completed, trucking interests commenced to operate to and from the port," _/ precipitating a serious

_/ Klein, op. cit., p. 26.

rate war. Since there was no significant increase in the size of the country's vehicle fleet, this represented mostly a reallocation of motor transport in response to the increased profit potentials created by the highway. That the response was substantial is indicated by the fact that 18 bus companies (during 1963) were operating over the entire length of the highway while 89 others were licensed to operate over routes which require the use of portions of the road. Thirty-seven larger trucking firms used the highway, and although data are lacking, it is believed that several times this number operate as small independent or owner-operators. _/

_/ Ibid., pp. 40 and 87.

Vehicle registration in the provinces directly affected by the Friendship and East-West highways in Thailand, showed markedly faster rates of growth than for all of Thailand. Evidence also exists which suggests that the number of vehicles per day is continuing to rise, although no data are presented regarding the number and type of transport firms operating along these highways.

Although similar data are not available for all of the other cases, it is clear that something of the same type of phenomenon must have occurred in response to the production increases.

At the same time that rates decreased, the service became faster, and accommodations for small shipments over relatively short distances were improved.

Time in transit was sharply reduced compared with previous alternatives in almost all cases. Before the road in Bolivia was completed, travel between Cochabamba and Santa Cruz even during the dry season took from two to four days. It is now a matter of about half a day to a day during all seasons. On both the East-West and Friendship highways in Thailand, time savings of over 50 percent, compared to the next best alternative between important points, were recorded. The same is true of the several areas in the Peruvian Western Montaña with respect to travel time to Lima. Time savings in the Nicaragua case amount to about one-third although this was not directly attributable to the road since the railways had installed better equipment in 1955 which improved speeds by this amount.

But of greater importance, especially to local traffic and small holders, is both the increased flexibility of service and the ability to transport smaller amounts at reduced rates. Average loads with few exceptions run from barely four to ten tons, depending on the country and nature of the vehicle, and these are well below the cut-off points for carload rates by rail. Door to door service also eliminates the time and extra cost of transshipment.

Furthermore, truck transport is inherently more capable of tailoring service to specific needs, especially of small-scale producers. This refers not only to more frequent scheduling of service or providing service on demand, but also to the fact that truck drivers sometimes assist in loading and perform other services for small individual producers that a railroad could not. It is not surprising that the bulk of short-haul, local traffic now moves by truck in virtually all the cases examined which is, of course, consistent with the technology and economics of road vis-a-vis rail transportation.

Because of the nature of these changes, substantial benefits accrued to smallholders located near the highway relatively close to the market as well as to middlemen who handle small quantities at any one time. Where the highway paralleled a rail connection, the relative advantage was even greater since there was no need to transship and smaller loads could be moved more efficiently. In all such cases a more rational traffic allocation ensued. The less-than-carload, short distance traffic which was highly rated by rail was captured by the trucks. This permitted, or forced, the railroad to concentrate more on the type of traffic for which it has an "inherent advantage." The importance of this traffic shift was particularly pronounced in those instances where the railroad was operating at or beyond full economic capacity.

The effect, in short, of a net increase in mobility was to bring about an improved utilization of an expanded transport capacity. Both the former users of alternative modes of transport as well as the new users benefited. At the same time, fewer resources were used up than would otherwise have been the case. More traffic was carried at lower per unit real costs (as well as rates) as a result of the new facility and increase of vehicles.

4. Population. Even in the absence of information concerning regional demographic trends, a positive relationship between new transport capacity and population was evident. This does not imply any relationship at the aggregative level where, in fact, transport would represent more of a response to population growth. But for particular regions, transport facilities are both cause and consequence of population growth. When transport creates new economic opportunity, it attracts people to the area. Increases in output usually require more labor; higher incomes attract new settlers; and a demand for services, shops and so on emerges. So long as markets remain favorable and the resource base undepleted, this process becomes self-reinforcing and the rate of population growth in the region affected is accelerated.

One of the most striking illustrations of what improved access means in terms of population growth is provided by Drewes' comparison of the four areas in central Peru, although as already noted, cause and effect are not readily separated. The slowest and steadiest growth of population was recorded in Pozuzo which has been virtually isolated since

1900 and grew almost entirely without immigration. On the other hand, population grew sharply in the Tingo Maria-Pucallpa area after completion of the road connection to Lima. Satipo indicates the volatility induced first by improved access in 1940 when the population increased sharply after decades of stagnation and then decreased just as sharply after the road was destroyed in 1947. (See Chapter 6, Figure 21 on page 168.)

But the complexity of the interrelationships between improved access and population growth is suggested by the Bolivian and Guatemalan cases. It is true that the city of Santa Cruz grew at a rate well above the national average between 1950 and 1962 but this is due to a complex of factors only one of which is the Cochabamba-Santa Cruz highway. Furthermore, the Department of Santa Cruz recorded a rate of population growth below the national average and only one-fourth that of the city of Santa Cruz. In the Guatemala case, little migration has occurred and the overall demographic impact has been negligible.

Improvements in health, resettlement schemes, and relative economic potential of particular areas are more significant than access, per se, regardless of the fact that access of some sort is a necessary condition for effective attacks on disease and resettlement (e.g. El Salvador) as well as exploitation of economic opportunity. Just as in the case of the growth of production, population responds differently to new transport capacity depending upon a complex of conditions.

Conclusion

In every case, the extent of new traffic generated depended mainly upon the availability of easily exploitable natural resources. The lowest levels of traffic, omitting the earth roads in Uganda and North Borneo for which traffic estimates are lacking, were associated with highways traversing a territory poor in resources. The Guatemalan, Bolivian and Indian experience typify this situation. The largest traffic volumes or those growing most rapidly involved highways through areas rich in forest reserves or with good soil conditions for cash crops. This was especially true in Nicaragua, El Salvador, Venezuela, Peru and Thailand. Additional inducements to open up new lands were population pressure, rising prices for the crops concerned, reduced transport charges, and improved service. In short, the highest traffic volumes were fairly consistently associated with rising net receipts to producers of agricultural products. No adequate details of actual or possible profit prospects were provided, but the inference is clear that they created a powerful inducement to raise output and sell a greater proportion of it in local, sectional, or world markets. Some of the evidence on production changes is presented in Table 35, column 3. The data are not strictly comparable nor can they be assumed accurate in all cases. Details of their computation are given in the notes to the table. But with all their weaknesses, they do suggest the radically different impact on production between the Guatemalan, Indian and to some extent Bolivian cases and all the others. With appropriate qualifications, these data may be construed as rough indicators of the relative degree of success. Using this criterion, even considering the costs per mile and amount of traffic, the least successful roads, up to the present, are those in the three countries just mentioned. It cannot, however, be stressed too much that this evidence by itself, even ignoring its frail statistical basis, is inconclusive for the reasons already discussed. Nor has it been possible to deduce a consistent set of calculations yielding a meaningful and comparable benefit-cost ratio. (See Appendix 1.) But the inferences deduced from the behavior of production in the affected areas are consistent with the impressionistic evidence concerning relative profitability which itself is closely associated with the availability of natural resources in the regions.

As far as causation is concerned, we have noted the role of the highways in Bolivia, Guatemala, and India (even if there was not much in the way of development according to production indicators), as well as in both areas in Thailand, Peru and probably El Salvador. For the other cases, the highway or road is best construed as a response to a development that would probably have occurred in any event although not necessarily in the same manner nor to the same extent. The role of transport in the latter cases was more one of facilitating a dynamism already underway. In the former group the road was at least a partial initiator, inducing a development that would not otherwise be expected to occur. The relative lack of success to date in three of these instances does not detract completely from the importance of the road. Indeed, in Guatemala, not only was there a large expansion in truck transport, but a new type of transport using refrigeration equipment appeared, and its future prospects appear bright. In Bolivia, the future success of the colonization scheme lies partly in the existence of a good connection between the highlands and the Santa Cruz area, to say nothing of the political significance of tying together two regions of a country hitherto separated physically and psychologically. Furthermore, recent evidence on domestic production of rice and sugar, most of which comes from the Santa Cruz area, suggests a continued acceleration. From 1950 through 1962, the average rate of growth of these products combined is more than double the figure given in Table 35 column 3. Preliminary data for 1963 show an even more rapid increase. /

/ Sugar production in recent years is estimated as follows:

1961	41,200 metric tons
1962	44,000 metric tons
1963	72,800 metric tons

[See Statistical Bulletin of the International Sugar Council, March 1964] The figure for 1962 differs somewhat from the estimate in Table 5 of the Bolivian case presented in Chapter 1 but all other data for previous years are the same in both sources. Rice production is estimated as follows:

1950	10,000 metric tons
1958	13,500 metric tons
1962	30,000 metric tons
1963	40,000 metric tons

[Ministerio de Agricultura, cited in Diario La Nacion, March 1964] These estimates differ significantly from those cited in Berman, op. cit., p. 24. However, the trends are comparable.

Even in the Indian case, the growing number of market areas, a narrowing of regional price differentials, and the rapid expansion of some key products might well pave the way for accelerated growth in the future. However, data are not available to demonstrate what in fact has occurred more recently in the Ramnad-Mandapam area.

What these three examples suggest is that, given a relatively static or deteriorating situation prior to the new transportation capacity, along with few readily exploitable natural resources, the task of initiating sustainable growth is both more difficult and protracted which implies the necessity of combining transport investment with other policies if important changes are to occur.

Furthermore, the three countries with the slowest rates of overall growth, as indicated in the Introduction to Part I, coincide with the three relatively unsuccessful cases just mentioned. This would suggest that where there is a <u>general</u> lack of dynamism there is also a greater probability that a specific investment will not become much of a success. Where there is a high degree of overall dynamism, on the other hand, a specific investment is apt to become an apparent success for two reasons: (1) the greater the general rate of growth, the more likely it is that any investment will appear as a necessary response to prevent or alleviate a bottleneck situation; or (2) even in the absence of an actual or incipient bottleneck, a rapid rate of expansion is associated with an environment where additional economic opportunity is not only more assiduously sought but more rigorously exploited. The opposite typifies a situation of persistent overall stagnation.

In the next section a more general interpretation of these apparent results is made. There follows an attempt to assess the broader implications of the importance of transportation to economic growth and what the cases suggest in terms of the theory of economic growth.

CHAPTER 9

TOWARD A THEORY OF TRANSPORT AND DEVELOPMENT

The general pattern that emerges from the cases may be summarized as follows: construction of a new right-of-way reduced the costs of operating vehicles. This induced additional transportation capacity which led to a reduction in freight and passenger charges between actual, or potential, production and market centers. Reduced charges in turn increased profit prospects for new or traditional products and induced an expansion of output destined for cash sale in local or foreign markets. The initial impact was to lower costs of distribution which was supplemented in several cases by prior or subsequent increases in demand for major commodities or by improved production techniques. In general, this is what would be expected. But the important point requiring further analysis is the extent of variation in the observed results.

Essentially the variation is to be explained by two main factors: (1) the economic opportunity created and (2) the response to it. The first depends upon the quality and quantity of developable resources in the region served, the actual change in rates and service, and commodity price levels. The second depends upon an awareness of the opportunity and what may be broadly defined as attitudes toward economic change.

(1) The Extent of Economic Opportunity Created

The extent of the economic opportunity created has two main dimensions, both of which are functions of natural resources and the rate and service changes in the transport sector. (The discussion ignores human resources at this point since these are discussed later.)

The Resource Base. The first dimension refers to productive activity aside from transport. Obviously, the more extensive the resource base and the better its quality, the greater the economic potential. For most of the cases, agricultural or forestry resources provided the main productive outlets. In every case where a road opened up new territory, the soil or forest conditions in the area determined not only the type of activity but also much of the increase in output. The suitability of the soils without much additional investment or where additional improvements had already been made (as in Nicaragua, El Salvador, Uganda, North Borneo and to some extent in the Santa Cruz area of Bolivia), especially when coupled with feeder roads, is mainly responsible for the sharp increases in production that took place. Indeed the soil conditions were generally better than the national average in yields per acre and per man.

Profit prospects for agriculture and forestry widened appreciably in most of the cases because of a combination of higher yields in the areas, rising prices, and/or declining freight rates. Even where prices of the major products were declining (or stable) over the period under review, the increase in yields combined with reduced freight charges and improved service, increased growers' net receipts. For the most part, prices were determined in markets outside the local area, which meant that rising local supplies exerted little or no influence on price. The general picture thus fits a model of perfect competition with the demand schedule perfectly elastic at the externally determined, though variable, price. The stimulus to production is due to declining unit costs of production and distribution, accentuated in some cases by rising prices or partially offset by declining prices. Where prices were falling and yields not increasing, the key to development was the decline in transportation costs. In a situation with improving yields or rising prices, reduced freight rates merely provided a further stimulus and the new transport capacity was permissive and responsive rather than causal. To sum up, we can distinguish between those cases where the behavior of freight rates alone created whatever profit prospects there were and those cases where freight rates merely augmented a prior increase in profitability occasioned by higher prices or higher yields.

A causal role has been imputed to transport in the following countries: Thailand, Peru, Guatemala, India, Bolivia, and probably El Salvador. In Thailand and Peru, the exploitation of high yielding crops and forests was held back by limited access. Because no data on price trends were presented, we cannot be sure that production in the affected areas would not have been stimulated without the highways. (The contrast among the four areas in Peru, however, suggests that little increase in production would have taken place without the additional access provided.) But it is reasonable to attribute a causal role to transport. Furthermore, the sharp contrast between the Thailand and Peruvian cases and the Guatemalan, Indian and Bolivian cases is explicable in terms of the very high yields in areas influenced by the highways in Peru and Thailand which, indeed, required the highways to permit their effective exploitation. Nor was there much prior incentive to exploit the latent opportunities in the affected regions of Thailand and Peru because of population pressure or economic spillover from a central city. It is thus reasonable to interpret the rise in profit potential almost entirely in terms of reduced freight and passenger charges.

In the other cases, the combination of rising yields and prices produced the incentive in advance of the highway whose provision then accentuated the already existing and rising profit potentials. However, the provision of improved transportation is important in other ways. Without cheaper access, cultivation of previously marginal or submarginal lands in response to price increases leads to serious problems when prices later decline. Reduced transport costs provide at least some hedge against erosion of net incomes proportionate to any subsequent price reductions. As Bonney puts it--"of the two forces influencing land supply, road construction results in more stable and lasting benefits than do price changes. Land taken up when high prices reduce the deterrent of inaccessibility can quickly become sub-marginal when prices decline, giving rise to both economic and social problems and making orderly development with the optimum use of resources difficult." _/

_/ R. S P. Bonney, *op. cit.*, p. 4.

The Transport Sector. The second dimension of economic opportunity refers to the transport sector itself. Clearly, the profit potential here depends upon the resource base (i.e. the production potential and hence the expected demand for transport) in the same way as in the nontransport sectors. But the relationship to rate and service changes is the opposite of the nontransport sectors. The degree of profitability in the latter varies inversely with rates and positively with service while profits in transport vary directly with rates and (possibly) inversely with quality of service. The latter, of course, raises questions about the behavior of costs in transport as volume and density of loading changes, and, particularly, about the interrelationships among rates, costs, quality, and volume. Since little is known about these relations even in developed economies, it is not surprising that evidence in the cases presented here is almost completely lacking. To repeat, even where cost and rate figures are provided, they must be taken with a large grain of salt. Nowhere are the data sufficiently accurate or extensive to warrant any sophisticated correlations or the derivation of cost functions in transport. Thus, the degree of actual or potential economic opportunity in transport itself must be largely conjectural.

Yet the belief in its profit prospects must have been strongly felt, for in every case a significant expansion of motor transport followed completion of the road. Where vigorous competition ensued following the expansion of vehicle capacity in the region, rates were sharply reduced.

In summary, then, the extent of apparent economic opportunity in both the transport and nontransport sectors is a direct function of the natural resources which are made more accessible. But there may be divergent effects between the sectors due to rate and quality changes. The extent of the negative impact on transport of lower rates depends upon the elasticity of demand for transport and the behavior of unit costs with changes in volume about which little is known in the situations investigated here. (Except that for local truck traffic a high degree of demand inelasticity for trucking is apparent.) On balance, it is probably fair to say that the total amount of economic opportunity created varies inversely with rate levels since the stimulating impact upon the volume of production probably more than compensates for any possible increase in per unit costs of providing transport service. Indeed, if unit costs decline with volume, as seems likely, and assuming appropriately high demand elasticities, lower rates may benefit both producers of commodities and suppliers of transport. However, the immediate result, as shown in most of the cases, was that an excess capacity in vehicles was created, and probably depressed rates below levels that would be sustainable over time. The very large number of owner-operator trucking firms gave rise to a level of rates that can only mean bankruptcy for many of them, so that later upward revisions of rates are to be expected. This already appears to have happened in the Guatemalan situation.

The excess capacity may, however, have a lasting advantage. In the first place, it provides some experience in business enterprise that, while discouraging to some, might prove salutary to others. Second, the sharp stimulus to production and new settlement was due in most cases to other factors as well as to unduly low rates. Thus the gains appear to be sustainable even in the face of later rate increases. The initial dynamism would tend to carry over even though the rate of profit might decline. It is even possible that lower net income per unit of agricultural output, once production was established, would induce greater output to maintain the producer's overall income, although this is by no means certain. Better still, it might encourage the use of fertilizers or other improvements which lead to lower unit costs. These improvements would have a much more permanent influence on yields and, in a sense, they would coerce adoption of improved methods.

Although data adequate to permit a reasonable assessment of the profit prospects associated with the new transport capacity were not available, the foregoing discussion suggests that the least potential appeared in the cases of India, Guatemala, and Bolivia and the greatest in the cases of Venezuela, Nicaragua, El Salvador, and Thailand. The strategic factors appear to have been the natural resources made more accessible and the influence of other policies or investments making exploitation of them easier. The Venezuelan case is an example of a true bottleneck situation occasioned by the spillover dynamism from Caracas. In Nicaragua and El Salvador there is evidence of much prior investment or expenditures in the form of irrigation facilities, pesticides, and so on.

As previously noted, the present relative lack of success of the roads in India, Guatemala, and Bolivia points up the far greater difficulty of inducing economic change in a stagnating or deteriorating situation. Even with the encouragement to migration in Bolivia and the investment activities and good resources in the Santa Cruz region, the results to date, while promising, leave much to be desired. There is no evidence of substantial supplements in either the Indian or Guatemalan cases. Indeed, in Guatemala the rate increases recently agreed upon and the vacillation of government policy with respect to road use provided active deterrents to exploitation of whatever new opportunities were created by the highway.

This appraisal has been couched entirely in economic terms. As such, it provides only a partial explanation of the results. We now turn to an examination of those factors that might induce positive, neutral, or negative responses to the creation of economic opportunity. This examination is especially important for the present microscopic, regional approach to the role of transportation in either facilitating or inducing economic growth.

(2) Responses to Economic Opportunity: The Problem of Attitudes and Awareness

By attitudes and awareness is meant the complex of conditions that influence the response of individuals to the creation of economic opportunity. The response may be zero, negative, or positive in terms of developmental impact and is broadly bound up with aspects of culture, social relationships, individual psychology, levels of well-being, and so on. It is here that the discussion steps gingerly into that overflowing category of "other things" in the qualification "all other things being equal." Indeed, formal economic models make little reference to these reactions and presume responses roughly applicable to institutions mainly relevant to western economic systems. Despite serious guilt feelings by some, _/ the bulk of growth

_/ For example, "in those countries where growth seems most essential for human welfare, problems outside the conventional limits of economics are surely paramount. Indeed, a strong argument can be made that the problem of underdevelopment will not be solved until economics has achieved a more compatible marriage than now prevails with other social sciences." Bert F. Hoselitz and others, Theories of Economic Growth. The Free Press of Glencoe, 1960, p. 242. Many other statements in a similar vein could be cited.

theory continues to be overly schematic, general and aggregative. Some economists have turned completely to noneconomic explanations or have raised serious questions whether economic development has much to do with economic matters at all, at least in the form of contemporary micro- and macro-analysis developed in the West.

My purpose here is not to analyze the (rightly) growing guilt feelings of economists in (understandably) de-emphasizing institutional factors but to suggest that a meaningful interpretation, especially of localized growth, cannot ignore them. In the cases three situations have been noted where ethnic differences appear crucial (e.g. North Borneo and Peru; see Chapter 6 for these cases.) It cannot be assumed that the other cases are immune from such influences.

In considering the question of attitudes which influence the response to economic or any other type of change, the economist must tread warily. Yet tread he must if he is to derive relevant conclusions and make useful policy suggestions. It is, however, neither possible nor necessary in the present study to examine this vast area. Essentially, the question is: under what circumstances and to what extent will economic opportunity be exploited in such a way that net output per head rises? Additional transport capacity generates new opportunities for pecuniary gain. But there is no apparent consistency in the extent to which such opportunities are seized nor in the apparent consequences.

The main factors influencing the response to new transport capacity are the following: (a) awareness of its potential, (b), the magnitude of the possible benefits relative to alternative investment options, and (c) the degree of disturbance of existing institutions.

(a) Awareness of the New Potential

Obviously, to evoke any response people must know that new economic opportunity has developed. The extent of awareness of the consequences of additional transport capacity depends in large part upon the number of people who are directly influenced. The greater the population in the area through which the new or improved facility runs, the more extensive is the knowledge of what it might accomplish. More people can sense the fact that something new has happened that may be of benefit to them. In areas where communication is defective, this kind of immediacy is obviously important. But beyond the mere numbers of people affected, there is the question of accessibility. A pipeline traversing a heavily populated area cannot evoke much response, whereas an unlimited-access road can. The unlimited access of roads in the early stages of development of any region has an awareness effect that serves to induce a larger number of people to take advantage of new economic potential. This contrasts with the direct economic stimulus of limited-access highways where congestion or local bottlenecks slow down traffic and raise the costs of transport. Indeed, it is this feature that underlies the frequent assertions that the indirect or spillover effects of road transport are more important than the direct reductions in user costs and faster transit. _/ The so-called

_/ For example, R. S. Millard argues that unlike developed countries, in overseas territories, "the benefits from road construction are almost entirely in the form of new development from the traffic which the new road will generate." R. S. Millard, "Road Development in the Overseas Territories," Journal of the Royal Society of Arts, March 1959, p. 275.

"openness of roads" _/ acts as a kind of advertisement for its own economic

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_/ This suggestive phrase is from Edwin T. Haefele, "Road Construction as a Means of Developing Areas Served," Document No. 57, Ninth Pan American Highway Congress, Organization of American States, Washington, D. C., May 6-18, 1963.

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potential to which many individuals may respond since it is not a private nor a closed public facility accessible to only a handful of owners or employees. Railroads are in a peculiar situation in this regard. To increase accessibility requires more stations along the line and hence shorter hauls and more frequent stops, which is inconsistent with economical operation. Increased accessibility for railroads is thus purchased at the expense of higher costs which in turn requires higher rates if the facility is to be self-supporting. While increased accessibility is stimulating in itself, the higher rates reduce the magnitude of economic opportunity created and thereby offset to a greater or lesser extent the stimulus to development due to improved access. Where railroads have been most successful is in moving large amounts of goods from a specific region to a port or major consuming center over long distances. The developmental impact along the right-of-way is generally far less than for facilities that are more open.

i) Effects of Different Kinds of Investment. In underdeveloped economies, there are important variations in the kind of impact to be expected from alternative investments in the field of transportation and elsewhere. Some types of capital formation have spillover effects, in addition to direct effects, that differ greatly from others. Indeed, it is precisely these varying possibilities that economic planners seek to exploit in attempting to maximize the rate of growth of output. But economic analysis ranks investment projects by some version of "expected rate of return" or benefit-cost ratio, both of which typically ignore many indirect and noneconomic effects. Yet the creation of economic capacity is only permissive. Effective utilization and augmentation requires attitudes, abilities, and incentives that cannot be taken for granted in most underdeveloped economies. It has often been stressed that the key to sustainable economic growth is a change in attitudes toward work, business, thrift, and so on. Therefore, another way of ranking investment projects is by their effect upon attitudes. In this respect certain investments may provide a greater catalytic effect than others whose immediate payoff in increased output is far superior.

Thus investment outlets might usefully be construed in terms of their relative influence on attitudes vis-a-vis labor productivity through an increase in the capital-labor ratio. The first refers to a qualitative change in the labor input while the latter refers to a quantitative change in the amount of capital relative to the quantity of labor. Both affect productivity although in different ways. Changes in attitudes may positively influence productivity with no increase in physical capital--i.e.,by altering the duration and intensity of labor or stimulating entrepreneurial activity. Likewise, it is possible to raise efficiency by additional machinery without changing attitudes, through adaptation of the equipment to contemporary customs and attitudes. These are, of course, extremes. In most instances some degree of attitudinal change will be induced by additional equipment--i.e., workers and management will have to adjust somewhat to new techniques or even to an extension of existing facilities, and these in turn may partly be arranged to suit existing attitudes.

But the point is that it is possible to array alternative investment possibilities in terms of their direct impact upon efficiency through their effects on the quantity of directly productive capital on the one hand and their influence upon attitudes on the other.

Investments in health, education, and propaganda, for example, are direct attacks on attitudes and abilities that do not create capital for directly productive activities. At the other extreme is investment in a particular factory which may have no influence on attitudes or at best only influence those directly employed. It also appears that the overall incidence of these two extremes, in terms of numbers of people affected by the investments, is significantly different. Investments in directly productive facilities usually affect a far smaller number of people than investments in health, education, or general communications.

Between these two extremes are a series of other investment options that influence attitudes and either facilitate the development of directly productive activities or are a form of such activity themselves. We may therefore place particular kinds of investment along a continuum as portrayed in Figure 25. At one extreme (A) are those investments that affect only attitudes but have no impact on efficiency directly, while at the other extreme

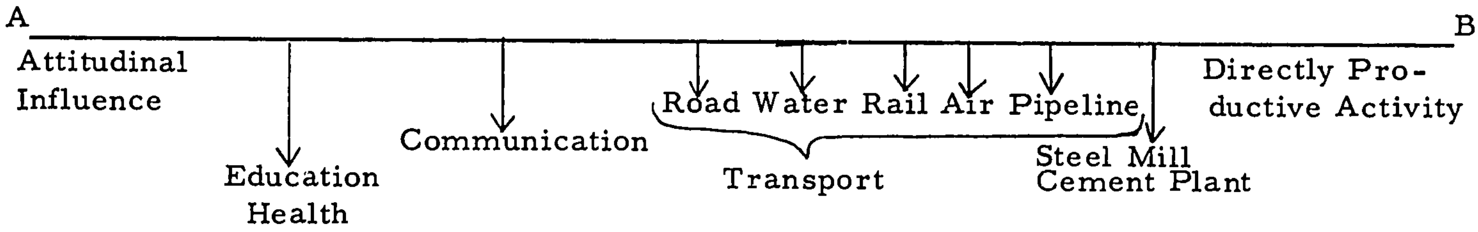

Figure 25.

are investments that only have such an impact. As one moves from A to B, the relative importance of the direct influence on efficiency through a change in the capital-labor ratio increases vis-a-vis the attitudinal impact and conversely when moving from B to A. The particular investments arrayed on the scale are based on intuitive judgment for the most part. However, the discussion will examine the position of transport investments as a whole and the position of particular forms of transportation on this continuum.

This taxonomy does not suggest that if an investment is placed closer to B than to A it necessarily loses so much of its influence on attitudes. It is only the ratio that varies as one moves along the scale. There is no attempt to apply isoquant analysis nor to suggest the substitution possibilities between investments in qualitative change in labor inputs and quantitative change in (directly productive) equipment. The nature of the relative payoffs are too intangible and amorphous to warrant application of the isoquant approach. Furthermore, the isoquant approach is concerned with an efficient allocation of capital and other resources *a priori* whereas our interest here centers on the explanation of events following a given investment.

Harvey Leibenstein has adopted an approach bearing some affinity to the above, but since his interests were on optimal allocation criteria, his use of the distinctions between the two types of investment, which he calls "human" and "capital goods," is quite different from that in this study. Leibenstein's critique of the "social marginal productivity" criteria is consistent with the views expressed above. However, his use of a standard involving effects upon the supply of entrepreneurship, future savings habits, population growth, and so on in the form of the familiar isoquant approach implies a degree of possible quantification that seems quite unrealistic. _/ In this sense, Hirschman's comment that Leibenstein's

/ Harvey Leibenstein, Economic Backwardness and Economic Growth, John Wiley & Sons, New York, May 1957, Chapter 15.

"criticism seems likely to result in an agnostic 'it all depends' attitude since it seriously impairs the usefulness of the SMP [social marginal productivity] criterion without replacing it by a manageable new instrument" seems valid. / But Leibenstein's critique of SMP is valid enough--

/ Hirschman, op. cit., p. 77.

it is only his substitute criteria that seem defective.

Rosenberg has pointed to a classification roughly analogous to that in the text. For example, he argues that

> "Economic growth is, in many important respects, a learning process, a process whereby the human factor acquires new skills, aptitudes, capabilities and aspirations. And the pattern of resource use which may maximize output from a given stock of resources may or may not generate the qualitative changes in the human agent which are most conducive to the growth of output in subsequent time periods.
>
> "Neo-classical economics fails to capture much of the explanation for the growth in productivity because of the failure to consider a variety of feedback mechanisms. We fail to consider, for example, the impact upon productivity of certain kinds of economic activities as opposed to others--such as manufacturing vs. agriculture. Different kinds of economic activities have different kinds of effects upon the productivity of the human agent. . . ." /

/ Nathan Rosenberg, "Neglected Dimensions in the Analysis of Economic

Change," Bulletin of the Oxford University Institute of Economics and Statistics, Vol. 26, No. 1, February 1964, p. 61.

In other words our present aim is to analyze further the results of the case studies in Part I by examining the extent to which the investments had influence on attitudes aside from their direct technical efficiency.

Figure 25 implies that transport investments lie intermediate on the scale between A and B. This position requires some comment. Investments in transportation have a wider geographical dimension than almost any other. Therefore, they affect a far greater number of people and in a more intimate fashion than a factory or other facility requiring a specific location. Furthermore, the access to the latter types of investment is limited mainly to employees, although their products may be widely distributed. But even wide distribution of products will not affect attitudes nor give rise to much additional economic opportunity unless the product is a producer's good in which case it will be acquired mostly by people already "developed" in an entrepreneurial or business sense.

Perhaps location in a densely populated area may increase the exposure for a new investment. However, it is in urban areas where one finds a dense population and the greatest degree of development and the widest range of economic opportunity already existing. It is in the more traditional rural areas that change must take place, since generally the bulk of the population is rural. Thus, a steel mill in an urban complex will not have much influence on attitudes despite the fact that large numbers of people are aware of it. Transport facilities, on the other hand, not only can be used directly by many people, but when extended into rural areas can bring a greater proportion of the most traditional aspects of a society into direct contact with new phenomena. Transport investment brings greater opportunity to extensive areas most in need of it. If freight rates and passenger fares are reduced substantially, transport could, and in most cases does, stimulate use--as the cases amply demonstrate. At the same time an acute awareness of new capabilities is communicated to a large number of people, possibly more than from any other form of investment.

The point of this kind of classification is to emphasize a different set of options from the ones traditional theory distinguishes and to stress the point that investments differ in the extent to which they affect both attitudes and technical productivity. Yields from an investment that affect mainly productivity are specific, quantifiable, and may be substantial and immediate. On the other hand, the payoff from education, for example, is diffuse. It may also be substantial, but it is normally remote in time and nonquantifiable. Since it is agreed that for sustainable economic growth attitudes must change and efficiency of employed resources must rise (the two being related in an as yet ill-understood fashion), economic planners in reality have a range of investment and expenditure options more general than that implied in the traditional rate-of-return calculus.

ii) Transport and Accessibility. Since our main concern in this study is with transportation investment, it is important to stress the degree to which the several forms of transport influence both attitudes and directly productive activities. In general, the extent of awareness of new investments and their potential noneconomic effects are a direct function of the degree of accessibility to them. Within the range of possible transport investments we have at the one extreme pipelines which, though having a geographic dimension, have few effects of the indirect type indicated above. Indeed, a pipeline is better viewed as part of the investment in the industry it serves; it is part of a directly productive activity. At the other extreme is investment in road right-of-way.

Because of a higher degree of accessibility, a road permits use of relatively small and inexpensive units of capital (trucks, buses, cars) under independent ownership without serious economic penalty, since the evidence tends to support the belief that there are no economies of scale in motor transport. There is thus little need for, and less possibility of, large-scale, remote, or alien ownership of trucking facilities than is the case with other modes of transport. This permits a greater number of small, local entrepreneurs to enter the industry and provides experience in management that may be widely shared and readily grasped. Motor transport has few of the problems associated with persistent income remission to other areas or resentment of a foreign-owned enterprise. Repair and maintenance of vehicles is not technically difficult and can be learned quickly by almost anyone willing to make the attempt. The ability to transport small shipments more efficiently than other modes of transport is especially important in the early stages of development when trading is highly individualized and individual sales are relatively small. The greater number of participants in the trucking industry implies a more competitive outcome with the result that cost reductions are passed on to shippers to a greater extent than for other, more monopolistic transport enterprises. There is also contact with other types of business which may broaden the truckers' horizons and induce entry into new fields.

There are other advantages of a political and social nature. Centralized control of the highway system is not required to the same extent as it is in the case of rail, water, air, and pipelines. This permits a higher degree of local participation in both construction and maintenance. Local participation has its special problems, but it imparts experience in administration and control. Socially and culturally, road transport permits, and usually generates, a higher degree of personal contact than trains that pass by or planes that fly overhead. As Haefele puts it, "the combination of rail and trail holds far less promise for social development than does a road net. . . . Trains go by and trucks stop--an essential difference when viewed as carriers of culture instead of freight." _/

_/ *Op. cit.*, p. 7.

Thus the technology of road transport is such that it has greater potentiality for involvement of more people in a wider variety of endeavors than any other form of transport. It, therefore, has an influence on attitudes and abilities that cannot be captured in any calculation of net benefits. In the final analysis this may be more important than the direct economic benefits.

Others have pointed out the possible "teaching" effects of motor carriers. A statement from the Pan American Union argues that road transportation is "a medium that can be organized into small companies, thereby helping to create. . .a group of entrepreneurs worthy of consideration. In this connection, the carrier with small resources is distinguished from the small tradesman in that, whereas the latter is concerned only with the use of working capital, the former, because he is using fixed capital, has to cope with the more complex problems relating to depreciation, obsolescence, and maintenance. That is why the small carrier has been assigned considerable importance as a future industrial entrepreneur." _/

_/ Pan American Union, General Problems of Transportation in Latin America, Washington, 1963, p. 31.

The conclusion is that the greater the accessibility or openness and the more people directly influenced by the facility, the greater the probability of development, so long as costs of transport are substantially reduced. This does not mean that rail or other facilities designed to exploit a large mineral deposit or extensive plantations do not have significant effects. Rather, in such cases, much of the railroad investment is better construed as part of the overall investment associated with exploitation of the relatively localized productive activity.

iii) Classification of Transport Investments. This in turn suggests that lumping all transport capacity together under the heading of social overhead capital may be seriously misleading. Some proportion of each form of transportation is specific in the sense that in reality it is geared to a particular industry; its developmental potential is then intimately associated with the industry in question. In such cases it is no more meaningful to talk about the relationship of transportation to economic development than it is to refer to the relationship of any industry to growth. It is frequently suggested that transport facilities serve a wide variety of industries and it is this aspect (as well as others) that makes them "social overhead" and that often leads to the common carrier obligation. On an overall, or aggregative,basis this is no doubt valid, but in the process of disaggregation the validity of this aspect of transport is considerably reduced. Furthermore, in an underdeveloped economy with a small, undiversified manufacturing sector and a large agricultural sector specializing in one or a few crops, the transportation facilities are bound to be far more specific and less "social." At the same time, the carriers function less as common carriers regardless of their legal status. In general, the lower the level of economic development, the higher the degree of transport specificity even for modes that in other more developed and diversified economies are in fact, as well as by law, common carriers. In short, it seems preferable to treat much of transport capacity as part of the main industry it serves, especially in underdeveloped economies. An oil pipeline is an obvious example, but a railway or road which passes through barren territory to connect an isolated natural resource to a local market or port is not very different. The social nature of any transport increases as the degree of resource isolation diminishes and the territory along the right-of-way improves; that is to say, as the level and extent of economic development rises. In the cases examined here virtually all of the roads serve a single sector, agriculture, and even within that sector the major traffic is a single export crop. Generally, the longer the highway, the less specific it is (depending, of course, upon the nature of the territory along the right-of-way which will influence the extent and diversity of possible ribbon development) and likewise the higher the level of economic development the less specific the highway. The Venezuelan autopista and the Friendship Highway contrast sharply with, say, the Ramnad-Mandapam road, and the penetration roads in Uganda and North Borneo.

In other words, as soon as we distinguish among types of transport in terms of degree of attachment to a particular industry or product, we can then decide whether it is more valid to lump the transport investment with the industry and then examine the developmental impact of that industry as compared with transport in general. As Paul H. Cootner puts it, "instead of lumping all railroad investment in social overhead capital, we can treat the construction of transcontinental railroads separately from investment which involves short spur lines to serve additional plants at lower cost, or double tracking, or new equipment. A new farm in a settled area need not be treated as identical with a farm on the frontier which depends on the construction of a railroad to be profitable." _/

_/ Paul H. Cootner, "Social Overhead Capital and Economic Growth," in W. W. Rostow (ed.), The Economics of Take-Off into Sustained Growth, New York: St. Martin's Press, 1963, p. 267. In another context, I have urged restraint in treating all aspects of investment even in a particular mode of transport as a homogeneous blob. See my Essays on Some Unsettled Questions in the Economics of Transportation, Foundation for Economic and Business Studies, Indiana University, Bloomington, Indiana, 1962, pp. 142-143. From a developmental point of view, this disaggregation seems particularly relevant.

The roads that have been classified as merely permissive and responsive to already established trends represent part of the investment in the particular industries whose activity induced their construction. In the Venezuelan case, however, where the dynamism was more general, it is not correct to attribute the autopista expenditure to any single industry, which is consistent with the relatively advanced state of the Venezuelan economy and the region near Caracas in particular. But in the other, non-causal situations, the road construction, being responsive to already rising profit prospects, is uniquely associated with them. As far as awareness in these cases is concerned, accessibility and numbers of people, while still important, are not the strategic factors in inducing favorable economic responses. The awareness was already there. In the other cases, these factors are much more significant as inducements to change.

iv) The Problem of Entrepreneurship. Aside from the extent of awareness, which may be taken as a direct function of numbers of people affected and degree of access, there is the further problem of the kind of people influenced. This raises the issue of entrepreneurship and its distribution both geographically and among the population in terms of ethnic distinctions, income, education and so on. Few of the cases here present other than very impressionistic evidence on any of these points and, indeed, there is no general agreement on the distribution of entrepreneurial talents. The limited use of the Cochabamba-Santa Cruz highway in Bolivia has been ascribed by some to the inherent lethargy of the highland people. At the same time, this view is vigorously denied by others who point to the colonization of lowlands. (See Chapter 1.) Drewes' discussion of the relatively high level of living in the isolated community of Pozuzo in Peru leads him to attribute crucial significance to the abilities and attitudes toward work of the Pozuzinos as compared with the "lethargic" Peruvian farmers in Satipo. Mention was made of the striking difference in economic development of two penetration roads near Raub in Malaysia. (See Chapter 6, p. 158.) The difference was explained in part by the characteristics of two groups, Chinese and Malay. Bonney has also drawn attention to different responses between two ethnic groups in the Kota Belud district of North Borneo.

In the literature on development there are frequent references to "pariah entrepreneurship" which attribute great significance to alien minorities, such as the Chinese and Indian traders in Southeast Asia, the Lebanese and Indians in Africa, and the Jews in Western Europe and the United States during various periods of history. The universality of such pariah entrepreneurship and its peculiar incidence among minority groups is often debated. This study makes no contribution to this debate but simply notes that divergent opinion persists.

Aside from the different cultural backgrounds of those living in the Bolivian highlands as compared with the people of the Santa Cruz area, the attitudes of the dominant group in the làtter region have been described as follows: "Land is more highly regarded for its prestige value than its economic possibilities... .the desire for self-improvement and economic gain is at a minimum whilst leisure-time is at a premium. . .the peasant prefers subsistence agriculture and being his own master to working for some large commercial agricultural enterprise. These attitudes are reflected in. . .absenteeism, a lack of responsibility, the large number of holidays taken and in the inefficiency of the average labourer. . . . [A typical Japanese colonist collects 150 lbs. of cotton per day while his Bolivian counterpart collects only 50 pounds.]" _/

_/ J. Colin Crossley, "Santa Cruz at the Cross-Roads, A Study of Development in Eastern Bolivia," Tijdschrift voor Economische en Sociale Geographie, August 1961, pp. 231 and 240.

But in almost all of the present cases, the transport facilities directly affected rural environments and, except for the examples in Peru, Bolivia, and North Borneo, there was no apparent ethnic or cultural divergence among those living in or near the affected localities. There were doubtless important differences in income distribution which may correlate in some fashion with both willingness and ability to respond to economic opportunity, _/ but no good evidence of this appeared. Thus,

_/ See Foster, *op. cit.*, who argues that the people who are most receptive to new economic opportunity "are neither at the top or the bottom of the local socio-economic scale," (p. 172); Hagen, *op. cit.*, p. 30; and Millikan and Blackmer, *op. cit.*, p. 38, also suggest something akin to Foster's view.

as far as the present set of cases is concerned, it seems reasonable to assume that among them the receptivity of and response to new economic opportunities does not differ significantly. If this is a valid inference, it follows that as far as the response is concerned, we may interpret this strictly in terms of "awareness" which we have already equated with accessibility and numbers of people.

Yet there remain nagging doubts about such a cavalier dismissal. The fact that few specific examples show up in the cases does not prove uniformity of attitudes. Furthermore, the different effects earlier ascribed to the technologies of rail and road, may not be completely technological after all. In almost all underdeveloped countries the railroads are owned by the government with key positions held by members of the dominant ethnic group. In some countries access to positions of responsibility is denied to minority groups. In the realm of transport this encourages the latter, who frequently are far more aggressive, to enter the trucking business where individual enterprise is more feasible anyway. There is, accordingly, in some countries, an ethnic distinction in terms of ownership and operation of different modes of transport which correlates with variations in the degree of initiative, aggressiveness, and success. Some part of the observed developmental impact of road versus rail is doubtless attributable to this kind of ethnic phenomenon, especially in Thailand, and possibly, although to a lesser extent, in parts of Africa and Latin America. The dearth of evidence on this score, both within and beyond the transport sector, impels us to neglect its significance as far as the cases in Part I are concerned. The point is raised to suggest that this may be of some importance in particular regions and worthy of more careful investigation.

v) <u>The Availability of Finance.</u> There is one additional factor of importance: the ability to respond. It is one thing to argue that knowledge of economic opportunity is intimately related to accessibility and numbers of people (assuming that entrepreneurial talents are randomly distributed or that in any given population the proportion of those responsive is roughly comparable as far as the cases presented here is concerned). It is quite another matter to suggest that the ability exists to make the necessary investments either in providing transport or in expanding nontransport capacity. Indeed, in the transport sector, the extension of service was usually done by nonresidents of the area affected. Similarly, since part of the resources in the region were owned by nonresidents, the expansion of regional productive capacity likewise depended upon the awareness and financial position of extraregional entrepreneurs. In Nicaragua, El Salvador and Bolivia, there is direct evidence that much of the development was due to nonresident (either public or private) responses to economic opportunity. A simple relationship between numbers of people in or near the region affected is not to be expected. Yet in every economy, regardless of how poor or underdeveloped, there are always some people with the means to respond to new opportunities wherever they may be located. The crucial consideration in such cases is the productivity (private, or social, in the case of public investment) of the opportunity created by additional transport relative to other alternatives. Without a knowledge of the entire set of investment outlets, it is impossible to predict the importance of nonresident or exogenous responses in a particular region.

Furthermore, it is unlikely that the total response will come from such sources although in some instances it may be very significant in inducing further development of the area along lines suggested by Schumpeter's "herd of imitators." In short, while the numbers of people aware of new opportunities and capable of responding may be widely dispersed geographically, it has not been possible from the cases analyzed here, to account for this in any general sense. The model thus relies mainly on the variables of accessibility and population affected, as measured by some index of regional population. That variations may exist due to nonresident participation is freely acknowledged and indeed is exemplified by the "agricultural entrepreneurs" in El Salvador.

But in a more general developmental sense, the availability of finance, like so much else, is permissive only. If those possessing the liquid capital choose to purchase land for speculation, to acquire existing assets or foreign securities, there will be no development stimulated in the country where they reside. What is required is a set of arrangements designed to induce productive use of supernumerary income or wealth. If governments invest in transportation facilities in the hopes of developing a particular region, it is then incumbent upon them to create favorable conditions for success. Governments may do this themselves or, if this is not possible or desirable, provide inducements that make private entrepreneurs respond in the desired fashion. The latter method may take the form either of making unattractive uses of funds that have no productive value to the nation or region or of increasing the profitability of private investments of the productive type. Certainly the use of new highways should not be vitiated by high user charges, heavy taxation, or restriction on imports of vehicles, parts, or other capital equipment that is needed for effective exploitation of whatever new potential is created. Bold, daring entrepreneurs possessing wealth may devote their energies, time, talents, and money to a wide variety of activities which do almost nothing to raise the net national product but which are privately rewarding in prestige or money. As has been said, "What may be a source of income creation for the individual need not be a means of income creation as seen by the community at large." _/ The function of any public policy not

_/ Leibenstein, _op. cit._, p. 113.

totally committed to a goal of _public_ enterprise, is to create those arrangements that make "private vice" coalesce with "public virtue," as Adam Smith long ago argued. The mere existence of economic surplus does not dictate that it will be used productively in an economic sense. Much depends upon the set of options, and their costs, available to those with the ability to undertake them.

(b) The Magnitude of Benefits

The problem of determining the amount of potential benefit has been discussed earlier. At this point it is worth stressing that unless potential benefit is large compared to existing alternatives, it is unlikely to evoke much response. Regardless of motivation, little can be expected in the way of development unless relatively large profit prospects are made available. In this sense, response to economic opportunity is closely related to its amount.

(c) Disturbance of Existing Institutions

It has frequently been suggested that investments which involve the least change in institutions or, what is the same thing, investments that are readily adaptable to present techniques, abilities, and incentives, have the greatest likelihood of success. _/ A. E. Kahn argues that

_/ Foster, *op. cit.*, p. 145.

"modest projects which employ relatively little capital and attempt. . . a minimal disruption of settled habits of thinking and living are more likely to succeed than those which involve a mass frontal assault on nonwestern patterns of culture." _/

_/ "Investment Criteria in Development Programs," *Quarterly Journal of Economics*, February 1951, p. 51. See also R. S. P. Bonney, *op. cit.*, p. 6.

On the other hand, without a change in institutions or even in people themselves, _/ there are few prospects of achieving sustainable growth.

_/ Leibenstein, *op. cit.*, p. 113; Millikan and Blackmer, *op. cit.*, p. 23; Hagen, *op. cit.* ; Bauer and Yamey, *op. cit.*, pp. 366-67.

What is required, therefore, is something intermediate between a massive assault on culture and those investments that leave all else completely unchanged. This has direct relevance to road transport. In almost every case, the accessibility of roads, the ease of entry into trucking, as well as the prestige aspects of vehicle ownership, largely account for the sudden growth of motorized for-hire transport which tends to insure that lower costs of transport are passed on to users.

There is another aspect to the issue of institutional disturbance--the reaction of those whose economic and even social position may be undercut by the new transport capacity. If such groups are unable to impede the use of the new facility, the probability of its success is sharply increased. Yet resistance to technological change has been manifest in all societies in the past and has achieved varying degrees of success over fairly long periods of time. There is no reason to expect that such resistance will be any less vigorous in the future, especially in underdeveloped countries where neither the range of alternatives nor the resources for compensation are very substantial.

In none of the cases was there any major assault on habits or institutional arrangements. But the impact on economic positions of some types of occupation was substantial. Alternative forms of transport, notably rail and bullock carts, immediately come to mind. The latter were, however, in no position to protest effectively, and except in Guatemala, the railways were not seriously threatened by the new highways. No important nontransportation enterprise with the power to block or impede highway use appears in any of the cases, so the problem of institutional disturbance may be neglected in the present discussion. This is especially true of penetration facilities.

Application to the Cases

The number of people affected by each of the roads is very difficult to estimate. Population figures relate normally to large geographical units, not all parts of which are influenced by the highway nor are various parts influenced to the same extent. The problem of cities is even more difficult since all the people in a given urban complex cannot be presumed to feel the impact of one particular highway. There are, however, some rough calculations of what is deemed to be the size of the population affected by each road. (See Table 36.)

Assuming the figures to be even vaguely relevant to present purposes, it is clear that no close relationship exists between population size and the developmental impact of the road.

It is not possible to rank each road by its relative degree of accessibility although intuitively it would appear that those traversing rugged terrain or dense forest areas would be most inaccessible (e.g. roads in Bolivia and Peru and the East-West Highway in Thailand). It is not possible to go beyond this with any degree of objectivity.

If we combine the population size with what little can be said about accessibility, these two factors do not appear as crucial as the previous discussion implied. But the results are most inconclusive and can neither be interpreted as confirming nor invalidating the general model of growth which was made to depend upon three factors: (1) The extent of economic opportunity created or opened up; (2) population size; and (3) accessibility. Only population is readily measured and even this measurement has serious defects. The other variables, themselves dependent upon some intangibles, cannot be measured with any degree of accuracy. But despite this conceptual, methodological and empirical fuzziness, we are impressed with the importance of natural resources. In the three cases characterized by a relative lack of success to date, the resource potential along the right-of-way was poor; in all the other cases, good land or forest resources characterized the major areas through which the highways were built. Beyond this we are unable to go in terms of the cases presented in Part I.

TABLE 36. Estimates of Population in Areas Deemed to be Affected by the Roads
(In thousands)

Location	Population Mid 1950's
India: Ramnad-Mandapam area	51
El Salvador	450
Uganda	40
Peru: Tingo Maria Pucallpo area	43
Oxapampa-San Ramon area	23
Bolivia	500
Guatemala	400
Thailand: East-West Highway area	600
Friendship Highway area	800
Nicaragua	250
Venezuela	over 1 million

Sources:

Bolivia — (a) Direccion General de Estadisticas. Resultados Generales del Censo de Poblacion de la Republica Levantado el dia 5 de Septiembre de 1950, La Paz, Bolivia, p. 31. (b) Direccion General de Estadisticas y Censos. Proyecc ion de la Poblacion 1950-62, La Paz, Bolivia, pp. 19 and 20.

El Salvador — Direccion General de Estadisticas y Censos, Tercer Censo Nacional de Poblacion 1961, San Salvador, El Salvador.

Guatemala — Direccion General de Estadisticas, Guatemala en Cifras 1959, Ciudad Guatemala, p. 22.

India — See Chapter 6, p. 141.

Nicaragua — Direccion General de Estadisticas y Censos, Resumen Estadistico 1950-1960, Managua, Nicaragua, p. 11.

Peru — See Chapter 6, p. 162.

Thailand	Tasana Patanapanich. Economic Effects of the East-West Highway, a thesis for the SEATO Graduate School of Engineering, Bangkok, Thailand, 1964, Tables 26 and 28.
Uganda	Computed from data in Chapter 6, p. 176.
Venezuela	Ministerio de Fomento, Direccion General de Estadisticas, Boletin Mensual de Estadistica. Republica de Venezuela, Marzo y Abril 1961, p. 7.

Conclusion

The general explanation of the divergent results is to be found in the extent of economic opportunity created, although it is not possible to rule out completely the role of attitudes and the nature of responses. Many questions, however, remain unanswered in the foregoing appraisal, and in the final analysis these may prove to be significant. It is worthwhile to summarize some of the implications with respect to the economic analysis of development.

(1) Investment options might usefully be analyzed in terms not only of their direct economic payoff but also according to their influence on attitudes. This is relevant to the manner in which rates of return, even using the social marginal productivity concept, are typically computed. Furthermore, in every case, the actual results are correctly ascribed to a cluster of investments (even ignoring policies, natural resources, and attitudes) which means that attributing any portion of the increased production solely to the highway is not only spurious but regularly overstates net benefits relative to costs. *All* of the investments must enter the

denominator and any attribution of the total productive result to one of them is as economically unsound as finding the cost of each of two or more joint products.

(2) The learning or spillover effect of road transportation appears to be greater than that of other modes of transport. It is especially significant at low levels of development.

(3) All transportation capacity is not "social overhead" in any meaningful interpretation of that elusive phrase. Nor does this depend on the particular mode. Rather the social nature of transportation depends upon the extent to which it is specific to a particular industry or generally available to a wide variety of industries.

(4) The issue of ethnic distinctions, although not apparently decisive in the present cases, should not be timidly sidestepped by economists out of a desire not to offend or for any other motive however well-intentioned. The Chinese in Malaysia, for example, are important in imparting the peculiar dynamism to that country. To ignore this as a fact of economic as well as political and social consequence, is to obtain a distorted image of reality already blurred by the usual economic approach to growth.

(5) The number of elements in the growth process that are designated as "necessary but not sufficient" is substantial. They include the following: capital in general and transport investment in particular; the "proper" psychological attitudes toward economic activity and change;

entrepreneurial abilities; technical abilities and education; the legal, social and political environment; the kind and amount of natural resources; and so on. In short, the phrase "necessary but not sufficient" has become a kind of grand developmental cliché applied to so many separate notions that it might well be expunged from the literature. If it applies to everything that can be thought of as an important ingredient in economic growth, then it is either tautological, redundant, or false.

The lessons for policy that emerge from the cases are examined in the following section.

Some Lessons for Policy

In this section we are concerned with what can be learned from the cases in a practical sense so that past failures can be avoided in the future and successes improved upon. The lessons of greatest relevance are therefore those pertaining to pre-investment surveys. The following is a brief catalog of these that emerge directly from the cases themselves.

The Significance of Prior Dynamism. The probability of success of a transportation investment is obviously dependent upon the existence of prior dynamism in the region or nation as a whole. If a particular region is growing rapidly in terms of population, output and so on, the probability is very great that existing transport facilities will soon constitute a true bottleneck even if there is some excess capacity at the moment. The discovery of such dynamic areas not only suggests where additional capacity should be located but also is a good indicator that heavy utilization may be expected.

If the nation as a whole is growing rapidly, the probability of making a successful transport investment is high even in a non-growing region so long as it possesses some reasonably good economic potential. As indicated in Chapter 8, the existence of overall dynamism implies among other things an environment in which economic opportunity tends to be sought and rapidly exploited when found. Thus, in any circumstance of local or general dynamism both the need for new transport capacity and probability of success is very great.

But where there is no initial growth or development, a single transportation project cannot be expected to accomplish much. It is in this type of situation that a coordinated set of investments, inducements and policies is most essential and where the prospects of success from a single project of any kind are very low. The initiation of growth is a fundamentally different and more difficult task than its facilitation and normally requires a more careful appraisal of non-economic factors as well.

These considerations have obvious implications for the nature of pre-investment transportation surveys. In a dynamic context, there is less need for a comprehensive, all-inclusive and general economic report than would be the case in a static situation. Transport economists alone would probably suffice for the economic appraisal of transport in the former case while more broadly trained economists and others would be needed in the latter. The degree of prior dynamism obviously conditions the length and nature of the economic feasibility report.

Government Policy toward New Highway Capacity. As noted in the analysis of the cases, one of the important ingredients in inducing increased production was a sharp reduction in rates usually associated with an expansion of vehicle capacity. In other words, the coming into existence of a highly competitive motor transport industry was the mechanism whereby the cost savings in transport were passed on to producers. But there are several ways in which this stimulus can be blunted or eliminated: (a) by the imposition of high user taxes or tolls, (b) entry restrictions into motor transport, (c) rate regulation or rate agreements among the firms, (d) the prohibition of imports of new vehicles or high duties, (e) weight and size limitations beyond those necessary to protect the highway with adequate maintenance. The first is likely to occur because of the revenue needs of the government, associated or not with the expenditures that arise due to the existence of the highway, and the ease of collection. Since such taxes or tolls reduce the extent of sustainable rate reductions, it is important that they be limited to those amounts strictly associated with the revenues needed to maintain the highway and to pay interest and principle on whatever loans were incurred in its construction. Alternatively, since the developmental impact of rate reductions is generally high, a tax on land values along the right-of-way which generally rise with improved transportation, might be preferable on economic grounds and could be set at such a level that at least interest and principle of the highway loans involved could be covered. User taxes could then be limited to amounts necessary to finance those costs directly associated with use, namely, maintenance and repair not caused by weather or other natural phenomena.

Entry restrictions should not be imposed to any greater extent than is essential for safety purposes. But even the need to meet minimal safety standards is subject to abuse and can effectively preclude entry. The general rule in most underdeveloped countries should be no restriction on entry at all unless a definite safety need emerges. We have noted the substantial learning effect of widespread participation in motor transport which suggests that the natural ease of entry should not be reduced without compelling reason. Furthermore, the more firms in existence in the absence of rate agreements, the more likely that competition will exert downward pressure on rates. Similarly, weight and size limitations for vehicles should be limited strictly to the capacity of an adequately maintained highway. The latter is important since failure to maintain highways adequately increases the apparent damage done by heavier vehicles that is more properly related to inadequate maintenance, which encourages stringent restrictions.

As far as rate regulation of motor transport goes, it has generally been a failure in most developed countries and effective enforcement requires a degree of administrative overhead that is out of the question in most underdeveloped economies. Thus, there should be no public rate regulation, since this chiefly serves to prevent rate reductions, and thus blunts the incentive to expand production in the area. Where private rate agreements emerge among the various firms supplying transport, these should be eliminated.

The general policy with respect to road transport should therefore be one of substantial laissez-faire. This is not recommended on doctrinaire grounds but rather because restrictions for other than minimal safety needs prevent the kind of spillover effects that we have previously argued are so pervasive in motor transport.

As far as developmental loans for transport are concerned, this general policy might usefully become part of the contract conditions when highway construction is under consideration.

The problem of import restrictions or excessive duties on vehicles is closely associated with existing vehicle supply and the foreign exchange position. If a highway is to be built and if the present vehicle supply is to meet the expected increase in output, then the whole question revolves around the availability of foreign exchange. If there are difficulties here, vehicle imports may have to be curbed. But there is still room for maneuver in the sense that private passenger cars can be prohibited while trucks may be imported with few restrictions up to the numbers considered necessary.

The Issue of Road vs. Rail. Where a road to parallel an existing railway is under consideration, certain facts must be examined. First there is the question of rail capacity, an elusive notion that can refer to rolling stock, right-of-way or switching yards. Congestion in any one of these does not itself suggest expansion in each. Furthermore, what may appear to be congestion, manifest in delays of various kinds, is frequently a function of the rate structure or poor administration. Attempts to remedy these should clearly be made before large investments in road or rail are considered. But if the congestion of the railroad cannot be relieved by other than additional investments, then the preferred option should be based on a comparison between road and rail costs and net regional value added _/ including an appraisal of the effects upon

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_/ See Appendix I for discussion of this approach as contrasted with the more traditional benefit-cost analysis.

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indigenous entrepreneurs. Assuming the road is built, the matter of rate policy remains. Rail rates are normally regulated and based on value considerations. But when competition with road transport emerges, and if the latter is (properly) free from detailed rate controls, it follows that the railway should similarly be freed to equalize competitive opportunity and add a further stimulus to exploitation of the resources of the region.

In summary, the case analysis suggests that (1) agencies engaged in developmental finance insist that pre-investment surveys obtain evidence, often by sample surveys, that fits the developmental approach as outlined in Appendix 1 rather than the traditional cost-benefit approach; (2) loans for highway construction should, where possible, include provisions that would limit the regulation of the motor transport industry to those features directly and solely pertinent to safety; and (3) the nature of the pre-investment transport survey should depend upon whether the area involved is or is not currently in the process of rapid development.

Taking a broader look at the case studies, the conclusion is inescapable that the relation of transportation to economic development is highly complex, especially in the least developed regions. Inadequate transport facilities can help perpetuate low level stagnation, but good facilities cannot ensure growth. Clearly much more detailed information is required. This suggests that lending agencies establish certain follow-up procedures to assess the results of any important investment they help to finance. AID missions, being on the spot, could easily make observations of results and try to interpret their meaning. At the same time, more case studies comparable to those summarized in the present volume would broaden the basis of our present knowledge of transport and its effects.

On the whole, the cases indicate the generally stimulating impact of road investments. This does not, of course, mean that roads should be preferred over other alternatives. But it does suggest the peculiar dynamism attributable to a facility that is open, accessible, and usable by large numbers of people. It is perhaps no accident that all but three of the cases can be viewed as making important contributions to economic development. Even the three "poor shows" cannot be construed as failures, especially Bolivia. Indeed, all of the cases may yet become at least qualified successes. The conclusion of the present volume is that increased participation in the world automotive revolution by the poorer nations may induce a degree of development beyond that implicit in the usual benefit-cost computations.

TABLE A 1. Cost of Atlantic Highway and Port of Matias de Galvez (In thousands of quetzals)[a]

Sector	Expenditure
Port of Matias de Galvez[b]	
Guatemalan government expenditures	5,000
Atlantic Highway	
Guatemalan government expenditure prior to July 1955[c]	18,122
ICA grant, early September 1955[d]	500
Subsequent ICA grants[e]	13,505
Subsequent expenditures from Guatemalan government appropriated funds[f]	6,015
Portion of $18.2 million IBRD loan allocated to Atlantic Highway[g]	9,625
Total:	52,767

[a] One quetzal = 1 U.S. dollar.

[b] IBRD estimate.

[c] Guatemalan government figure (Ministry of Communications and Public Works).

[d] AID Project File, original project agreement.

[e] AID Project File.

[f] Induced memo prepared by Direccion General de Caminos.

[g] From memo cited in (5), AID Project File indicates that $12,164, was in fact used from IBRD loan for Atlantic Highway. The U.S. BPR sets the IBRD allocation at $7,550,711, and the TAMS (the firm of consulting engineers on the project) final report of March 21, 1961, sets the IBRD figure at $10,869,700.

TABLE A 2. Reductions in Railroad Tariffs After Completion of the Atlantic Highway
(In quetzals)[a]

	1957	1958	1959	1960	1961	1962	1963
Local Freight Per Hundred Weight							
"Basic Commodities"							
Beans	.595	-	-	-	-	-	.40
Corn	.595	-	-	-	-	-	.40
Rice	.710	-	-	-	-	-	.40
Fruits and Vegetables	.990	-	-	-	-	-	.40
Lumber	.515	-	-	-	-	-	.40
General Merchandise	1.980	-	-	-	-	-	.40
Guatemala-Barrios Exports Per Hundred Weight							
Sugar	-	.43	-	-	-	.30	.40
Logs	-	.36	-	-	-	.30	-
Coffee	-	.98	-	-	-	.35	.50
Barrios-Guatemala Imports							
Commodity and Unit							
Bulk Petroleum Products-per gallon	-	.02 1/4	.02	.01 3/4	.01 3/4	.01 3/4	-
Wheat-per 100 lbs.	-	.40	.40	.25	.25	.25	-
Fertilizer-per 100 lbs.	-	.40	.32	.32	.32	.32	-
Iron & Steel-per 100 lbs., bars sheets, tubes, wire	-	.43	[illegible]	.30	.30	.30	-
Tallow-per 100 lbs.	-	.47	[illegible]	[illegible]	.30	[illegible]	-
Automobiles & trucks-per unit up to 450 ft.	-	60.00	40.00	40.00	40.00	40.00	-
-per unit over 4500 ft.	-	71.80	71.80	71.80	71.80	71.80	-
Bottles, glass-per 100 lbs.	-	.60	.32	.32	.32	[illegible]	-
Insecticide, agr. per 100 lbs.	-	.60	.32	.32	.32	.32	-
Groceries-per 100 lbs.	-	.60	.45	.32	.32	.32	-
Machinery (not over 14,000 lbs. piece) -per 100 lbs.	-	.60	.60	.60	.35	.35	-
Machinery (over 14,000 lbs. piece)-per 100 lbs.	-	.93	.93	.93	.60	.60	-
Paraffine & stearine-per 100 lbs	-	.50	.32	.32	.32	.26 1/4	-
Chemicals, Industrial NOS-per 100 lbs.	-	.60	.60	.35	.35	.35	-
Wines & Liquors-per 100 lbs.	-	.75	.75	.35	.35	.35	-
Paper, Newsprint & Wrapping-per 100 lbs.	-	.60	.45	.35	.30	.30	-

Source: Guatemala Division, International Railways of Central America.

[a]One quetzal = one U.S. dollar.

TABLE A.3. Passenger Travel by Private Vehicles, Pacific Littoral Highway, Nicaragua - 1963
(In thousands of passenger-kms.)

Section	Private Pass. Veh.[a]		Load[b]		Days		Distance		Passenger-km.
Managua-Leon	719	x	2.5	x	365	x	82	=	53,784
Leon-Chinandega	1,235	x	2.5	x	365	x	40	=	45,077
Chinandega-Corinto	562	x	2.5	x	365	x	19	=	9,743
Yearly private vehicle traffic									108,605

[a] Traffic count less heavy vehicles and commercial passenger vehicles.

[b] Load estimated by observation.

TABLE A. 4. Passenger Travel by Pacific Littoral Highway in Nicaragua, 1954, 55, and 62
(In thousands of passenger-Kms.)

Year	Total Passenger-Km.[a]	Managua-Corinto Section
1954	129,724	85,000
1955	136,076	90,000
1962	58,802	50,000

[a] Ferrocarril del Pacifico de Nicaragua records.

TABLE A. 5. Passenger Travel by Bus in the North Pacific Region of Nicarag[illegible], [illegible]
(In thousands of passenger-kms.)

Distance	Capacity per Day	Passenger-kms.
	From Managua[a]	
30	562	16.9
82	306	25.1
122	164	20.0
141	823	115.0
		177.0
		x2
	Capacity-km. per day	354.0
	Departments of Leon and Chinandega[b]	
200[c]	2,089	417.8
	Total capacity-km. per day	771.8
	Yearly passenger travel by bus[d]	
	771.8x70x365=199.4	

[a]Calculated from the actual schedule obtained from the Chief of Transito, Managua. The schedule is only for buses leaving Managua; therefore, the total is multiplied by two for the return trip.

[b]The registration of buses was obtained from the Department of Highways.

[c]The distance per day is hypothetical.

[d]Seventy percent of capacity used is probably lower than the actual, but is applied to obtain a conservative estimate.

TABLE A. 6. Value of Agricultural Production in Chinandega and Leon, 1951/52 and 1962/63
(Value in thousands of U.S. dollars)

Product	1951/52 Area	1951/52 Yield $/manz[a]	1951/52 Total Value	1962/63 Area	1962/63 Yield $/manz[b]	1962/63 Total Value	Percent Change
			Department of Chinandega				
Cotton	10,196	197	2,008	62,291	346	21,553	973
Rice	5,216	164	855	851	101	86	(-90)
Sugar C.	10,418	359	3,740	14,314	375	5,368	44
Beans	3,174	140	444	288	96	28	(-94)
Corn	18,040	83	1,497	15,968	60	958	(-36)
Sorghum	3,312	70	232	4,400	25	110	(-53)
Sesame	8,016	117	938	170	57	10	(-99)
Total:			9,714			28,113	189
			Department of Leon				
Cotton	16,308	201	3,278	48,340	327	15,807	382
Rice	6,128	121	742	237	130	31	(-96)
Sugar C.	597	320	191	482	323	156	(-18)
Beans	4,182	84	351	1,284	59	76	(-78)
Corn	14,958	81	1,212	11,148	36	401	(-67)
Sorghum	9,376	52	488	8,158	30	245	(-50)
Seasame	16,224	106	1,720	2,522	88	222	(-87)
Total:			7,982			16,938	+112
Grand Total:			17,696			45,051	155

[a] Based on recorded yields and the following prices per pound: Cotton-32.55¢; rice-8.165¢; sugar C.-0.404¢ (U.S. price); beans-6.804¢; corn-3.250¢ (1953 price); sorghum-2.722¢ (1954 price); sesame-10.890¢.

[b] Based on the following prices per pound: Cotton-28.67¢; rice-6.804¢; (1959 price); sugar C.-0.414¢ (U.S. 1959 price); beans-7.258¢ (1959 price); corn-2.68¢ (1959 price); sorghum-2.268¢ (1959 price); sesame-12.01¢ (1959 price).

TABLE A. 7 Area and Yield in Cotton in Chinandega and Leon, 1950/51 - 1962/63.
(Area in manzanas, production and yield in quintales)

	[illegible]	[illegible]	[illegible]
	Department of Chinandega		
1950-51	6,030	18,602	[illegible]
1951-52[a]	~~8~~,770	49,809	[illegible]
1952-53	9,276	56,098	6.0
1953-54	13,113	116,[illegible]	8.9
1954-55	36,891	324 551	8.7
1955-56	35,057	180.663	5 2
1956-57	24,014	244,91[illegible]	10.[illegible]
1957-58	30,069	336.250	11.2
1958-59	32,106	361,238	11.[illegible]
1959-60	38,080	337.939	8.6
1960-61	45,858	373,584	8.1
1961-62	51.382	600,250	11.[illegible]
1962-63	62,291	752,[illegible]	12.[illegible]
	Department of Leon		
1950-51	11,034	48,396	4 4
1951-52[a]	15,221	93,321	6.2
1952-53	7,468	54,099	7.[illegible]
1953-54	12.416	91.467	7.[illegible]
1954-55	34,848	322,619	9.2
1955-56	30,783	283,458	9.4
1956-57	25,002	226,641	9.0
1957-58	41,057	376 [illegible]	[illegible]
1958-59	38,590	371,324	9.7
1959-60	40,500	176,008	4.4
1960-61	27,286	218.540	8.[illegible]
1961-62	37,695	405,161	10.[illegible]
1962-63	48,340	552.184	11.5

Source: Ministerio de Economica Direccion de Estadistica y Censos.

[a]Note that the figures for 1951-52 on this page do not coincide with those on Tables 12 and A.6. . The figures in Tables 17 and A.11 were taken directly from the census results, while the figures in this table were obtained separately from the Direccion de Estadistica y Censos.

TABLE A. 8. Production Indices in Venezuela, 1960
(1955 = 100)

Item	Nation	Aragua	Carabobo	Caracas	Miranda	Zulia	Lara
Total	217	271	317	218	147	143	223
Durables	204	547	514	155	92	182	384
Wood products	133	118	83	168	76	89	197
Furniture	66	-	-	-	-	-	-
Rubber	325	-	1,649	423	105	-	-
Non-metallic minerals	144	178	126	107	87	159	545
Metal products	659	2,402	-	195	51	2,297	137
Machines	179	-	-	-	-	-	-
Vehicles	174	-	-	159	85	-	-
Jewelry	310	-	-	-	-	-	-
Non-durables	218	245	288	233	165	96	221
Food	201	254	187	365	104	86	332
Beverages	207	214	280	180	164	170	204
Tobacco	239	-	-	208	-	68	-
Textiles	269	257	112	206	508	535	1,826
Clothing	180	239	-	-	233	-	-
Paper	619	-	1,705	267	1,018	9,850	-
Printing	220	-	-	-	-	-	-
Hides and skins	215	1,597	151	132	1,462	65	306
Chemicals	218	163	827	158	267	128	1,623
Petroleum products	204	-	-	-	-	-	-
Miscellaneous	483	593	-	1,480	-	134	737

Source: Memoria, Banco Central de Venezuela, 1961.

TABLE A. 9.. Comparison of Production Trends, 1957-62
(Area in thousand rai; production in thousand metric tons)[a]

Year	Upland Crops and Vegetables: Area Harvested FA[b]	Upland Crops and Vegetables: Area Harvested RA[c]	Upland Crops and Vegetables: Production FA	Upland Crops and Vegetables: Production RA	Poultry FA	Poultry RA	Swine FA	Swine RA
1957	349	343	252	491	1,465	3,400	125	301
1958	348	355	246	493	1,593	2,623	144	234
1959	448	300	416	519	1,782	3,645	142	258
1960	722	565	607	605	2,544	2,668	144	270
1961	1,165	519	665	636	2,744	4,141	136	239
1962	882	688	391	716	-	-	111	95

Source: Department of Agriculture, Bangkok, as compiled by John Hugh Jones, Economic Benefits from Development Roads in Thailand, Technical Note No. 15, SEATO Graduate School of Engineering, Bangkok, Thailand, April, 1964.

[a] Poultry and swine in thousands of heads
1 Rai = 0.395 acres
1 MT = 2,200 pounds

[b] FA refers to Friendship Highway Area and includes the provinces of Saraburi and Korat.

[c] RA refers to the reference area composed of the provinces of Khonkaen, Udorn and Nongkai.

TABLE A. 10. Paddy Production in Korat and Saraburi Changwads, 1955-59
(Area in thousand rai; production in thousand metric tons)

Year	Korat		Saraburi	
	Cultivated Area	Production	Cultivated Area	Production
1955	1,438	255	638	182
1956	1,592	361	639	149
1957	715	78	629	119
1958	1,120	175	608	93
1959	1,012	111	635	109

Source: Department of Rice, Bangkok

TABLE A. 11. Comparison of Production Trends, 1957-62

Year	Upland Crops and Harvested Area EW	Upland Crops and Harvested Area RA	Vegetables Production EW	Vegetables Production RA	Poultry (000's) EW	Poultry (000's) RA	Rice Production (000) Metric Tons EW	Rice Production (000) Metric Tons RA
1957	158	31	54	39	133	420	N/A	[illegible]
1958	198	33	112	39	125	618	290	136
1959	268	49	152	44	119	581	269	139
1960	302	60	171	38	901	580	307	152
1961	245	67	142	51	911	636	261	11[illegible]
1962	361	50	186	47	1,033	782	344	1[illegible]3

Source: Tasana Patanapanich, Economic Effects of the East-West Highway, Unpublished Master's thesis prepared for the SEATO Graduate School of Engineering, Bangkok, 1963.

EW refers to East-West Highway area and includes the provinces of Pitsanulok and Petchaboon.

RA refers to the reference area composed of the provinces of Tak and Kampangpetch for upland crops and vegetables. For poultry and rice the reference area includes the provinces of Tak and Sukhothai.

TABLE A. 12. Lumber Production

Year	Non-teak				Teak	
	Pitsanulok	Petchaboon	Sukhothai	Tak	Pitsanulok	Petchaboon
	Volume of cubic meters				Volume of cubic meters	
1956	14,585	21,635	27,229	14,384	16,695	2,597
1957	19,625	26,494	47,919	16,686	5,800	1,858
1958	23,588	41,229	23,717	17,511	12,806	-
1959	12,269	16,762	16,773	10,742	9,250	1,633
1960	30,626	26,239	15,003	13,014	4,160	2,305
1961	92,952	45,292	5,195	13,746	5,627	199
1962	96,965	41,909	11,485	14,586	N/A	N/A

Source: Tasana Patanapanich, Economic Effects of the East-West Highway, Unpublished Master's thesis prepared for the SEATO Graduate School of Engineering, Bangkok, 1963.

TABLE A. 13. Fuel Wood and Charcoal Production
(In cubic meters)

Year	Fuel Wood				Charcoal			
	Pitsanulok	Petchaboon	Sukhothai	Tak	Pitsanulok	Petchaboon	Sukhothai	Tak
1956	1,775	2,900	4,044	397	-	-	-	-
1957	1,592	6,799	3,239	357	-	-	-	-
1958	1,593	1,412	8,906	697	909	70	2,322	1,215
1959	5,808	1,263	2,062	412	935	331	2,810	1,970
1960	13,261	832	2,492	392	1,170	310	3,019	1,841
1961	14,479	861	15,111	898	14,782	660	3,393	2,893
1962	68,573	5,432	13,663	948	-	-	-	-

Source: Tasana Patanapanich, Economic Effects of the East-West Highway, Unpublished Master's thesis prepared for the SEATO Graduate School of Engineering, Bangkok, 1963.

TABLE A. 14. Number of Business and Commercial Establishments in Pitsanulok Town.

Type of Business	1957	1958	1959	1960	1961	1962	
Hotels	20	24	29	34	36	38	38
Restaurants	94	98	113	156	168	183	186
Grocery shops	116	139	161	194	213	248	261
Retail shops	130	153	175	210	224	238	294
Construction equipment and material dealers	50	58	63	68	76	82	82
Dispensaries	22	24	27	34	34	39	41
Bicycle sales and service shops	11	13	17	22	24	30	36
Goldsmith's shops	19	19	23	28	30	32	32
Radio sales & service shops	5	7	8	8	8	11	13
Automotive parts shops	8	11	12	13	14	16	18
Garment sales & tailoring shops	108	120	139	176	209	223	227
Miscellaneous small manufacturing & processing establishments	65	112	157	191	209	220	228
Banks	1	1	1	1	1	1	1
Total	649	778	925	1,135	1,246	1,361	1,457
Index (1957 = 100 %)	100	120	142	175	192	210	223

Source: Tasana Patanapanich, Economic Effects of the East-West Highway, Unpublished Master's thesis prepared for the SEATO Graduate School of Engineering, Bangkok, 1963.

TABLE A. 15. Number of Business and Commercial Establishments in Lomsak Town.

Type of Business	1957	1958	1959	1960	1961	1962	196[illegible]
Hotels	3	3	3	3	3	3	[illegible]
Restaurants	24	27	30	34	36	39	4[illegible]
Grocery shops	17	18	18	21	21	21	[illegible]
Retail shops	61	64	65	65	67	67	7[illegible]
Construction equipment and material dealers	8	10	10	10	10	10	1[illegible]
Dispensaries	6	6	6	6	7	8	[illegible]
Bicycle sales & service shops	4	4	4	4	4	4	[illegible]
Goldsmith's shops	4	4	4	4	5	5	[illegible]
Radio sales & service shops	1	2	3	3	3	4	[illegible]
Automotive parts shops	4	4	4	4	5	5	[illegible]
Garment sales & tailoring shops	11	12	13	13	15	19	1[illegible]
Miscellaneous small manufacturing and processing establishments	40	70	92	107	119	130	13[illegible]
Total	183	224	252	274	295	315	3[illegible]
Index (1957 = 100%)	100	122	137	150	161	172	18[illegible]

Source: Tasana Patanapanich, Economic Effects of the East-West Highway, Unpublished Master's thesis prepared for the SEATO Graduate School of Engineering, Bangkok, 1963.

TABLE A. 1[illegible] Number of Miscellaneous Small Manufacturing or Processing Establishments

Year	Pitsanulok Town		Lomsak Town		Sukh[illegible]	
	Number	Index	Number	Index	Number	[illegible]
1957	65	100	40	100	63	[illegible]
1958	112	172	70	175	74	[illegible]
1959	157	242	92	230	80	[illegible]
1960	191	294	107	267	86	[illegible]
1961	209	322	119	297	90	[illegible]
1962	220	338	130	325	95	[illegible]
1963	228	350	136	340	97	[illegible]

Source: Ta[illegible]ana Patanapanich, Economic Effects of the East-West Highway, Unpublished Master's thesis prepared for the SEATO Graduate School of Engineering, Bangkok, 1963.

TABLE A.17. Appraised Value of Land (Baht per Rai) in the East-West Highway Area

Location	1954	1956	1959	1962	[illegible]
Arunyig district					0 to 3.5
Within 40 met from ROW	750	40,000	40,000	40,000	
Residential area	750	1,500	1,500	3,000	
Agricultural area	750	1,000	1,000	1,000	
Sinokae district					3.5 to 14.5
Within 200 met from ROW	750	2,000	2,000	2,000	
Residential area	750	1,000	1,000	1,000	
Agricultural area	750	1,000	1,000	1,000	
Wangthong amphur					14.5 to 19.1
Municipal area	1,500	2,000	5,000	10,000	
Residential area	875	2,000	2,000	2,500	
Agricultural area	-	600	650	800	
[illegible] district **	1,000	1,500	2,000	2,000	19.1 to 25.5
[illegible] district					25.5 to 31.9
Within 200 met from ROW	100	400	600	1,000	
Residential area	100	400	600	[illegible]	
Agricultural area	45	45	100	200	
[illegible]ngsopa district					70
Within 200 met from ROW	45	60	200	1,000	
[illegible]	45	60	60	200	
[illegible] district	1,000	-	1,500*	2,000	123.5 to 127.0
[illegible]wai district	1,500	-	2,000	2,[illegible]	127.5 to [illegible]

Source: Tasana Patanapanich, Economic Effects of the East-West Highway, Unpublished Master's thesis prepared for the SEATO Graduate School of Engineering, Bangkok, 1963.

**Values apply both to residental and agricultural areas.
*For 1958.

TABLE A.18. Average Daily Freight Traffic on the Ramnad-Mandapam Road and Parallel Railway, 1959

Commodity	Tons[a] Road Carts	Tons[a] Road Trucks	Tons[a] Road Total	Tons[a] Rail Total	Ton-miles[b] Road	Ton-miles[b] Rail
Fire wood	9.0	13.5	22.5	--	360	--
Palmyra products like mats and baskets, coconut and coir industry products	8.6	12.1	20.7	2.6	220	40
Building and road materials	1.2	11.4	12.6	5.1	180	120
Rice	7.8	1.1	8.9	1.3	120	30
Salt, sugar, jagree and eatables	1.6	0.7	2.3	0.7	30	20
Fish	1.4	0.9	2.3	2.0	20	35
Agricultural and other implements	1.5	4.9	6.4	--	80	--
Others (like kerosene, oil, gram, manure, etc.)	3.1	1.7	4.8	1.7	30	25
Total	34.2	46.3	80.5	13.4	1,040	270

Source: Government of India, Ministry of Transport and Communications, Economic Benefits of Ramnad-Mandapam Road 1959-60, pp. 14 and 18.

[a] Tons moved by the railway and road include:
- (i) traffic moving within the stretch,
- (ii) traffic originating beyond the stretch and terminating within the stretch, and
- (iii) traffic originating within the stretch and terminating outside the stretch.

[b] While calculating ton-miles, the distance traveled on the portion of the route from Ramnad to Mandapam (22 miles) only was taken.

TABLE A.19. Estimated Savings (+) and Increases (-) in Annual Costs and Resulting From Construction of the National Highway and Rate of Return on Capital Costs

Item		Amount saved per year in (1959)
Consequences to highway users (direct benefit)		
1. Passenger Traffic		
(a) By Buses	(i) Consequences due to reduction or increase in fares	-40[a]
	(ii) Consequences due to saving in time	+91
(b) By Cycles	(i) Consequences due to reduction or increase in fares	+2
	(ii) Consequences due to savings in time	+21
2. Goods Traffic		
(a) Saving due to reduction in freight charges for commodities carried by motor goods vehicles		+108
(b) Saving due to reduction in freight charges for commodities carried by bullock carts		+4
	Sub-total for (1) and (2)	+186
Consequences to other than highway users (indirect benefit)		
3. Increase in value of agricultural production		+326
4. Increase in value of industrial production		+360
	Sub-total for (3) and (4)	+686
A Total Benefit		+872
B Annual maintenance		+ 70
C Net benefit (i.e. A-B)		+802
D Capital Cost of Construction		+1,400
E Rate of return on capital cost (i.e. $\frac{C}{D}$ x 100)		57%

Source. *Economic Benefit of Ramnad-Mandapam Road, 1959-60*, p 41

TABLE A.20. Comparative Transport Cost Per Ton-Mile by Mode of Carrier (In soles)[a]

Area	Mode of Transport			
	Mule	Truck	Air	Water
POZUZO				
Poauzo to Huancabamba	18.96	--	--	--
CHANCHAMAYO-OXAPAMPA				
San Ramón to Lima	--	0.70	11.21	--
TINGO MARIA-PUCALLPA				
Pucallpa to Lima	--	1.13	11.36	--
Tingo Maria to Lima	--	1..23	11.36	--
Tingo Maria to Tarapoto	--	--	9.44	--
Tingo Maria to Yurimaguas	--	--	9.44	1.66[c]
Tingo Maria to Uchisa	--	--	9.44	3.33[c]
Pucallpa to Iquitos	--	--	11.36	0.28
Pucallpa to Aguas Calientes	--	--	11.36	0.32
SATIPO				
Satipo to San Ramón	--	--	10.00	--
Satipo to Lima (1947)	--	0.85	--	--
Satipo to Masamari	28 23	--	--	-
AVERAGE RATES	23.60	1.05	10	

Source: Wolfram U. Drewes, The Economic Development of the Western Montaña of Central Peru as Related to Transportation, published by the Peruvian Times, Lima, Peru, May 1958, p. 34.

[a]S. 19.20 = $1.00 (1955).

[b]Transportation by balsa not included in average because tonnage transported by this mode is negligible in comparison to that transported by commercial river boats on the Ucayali.

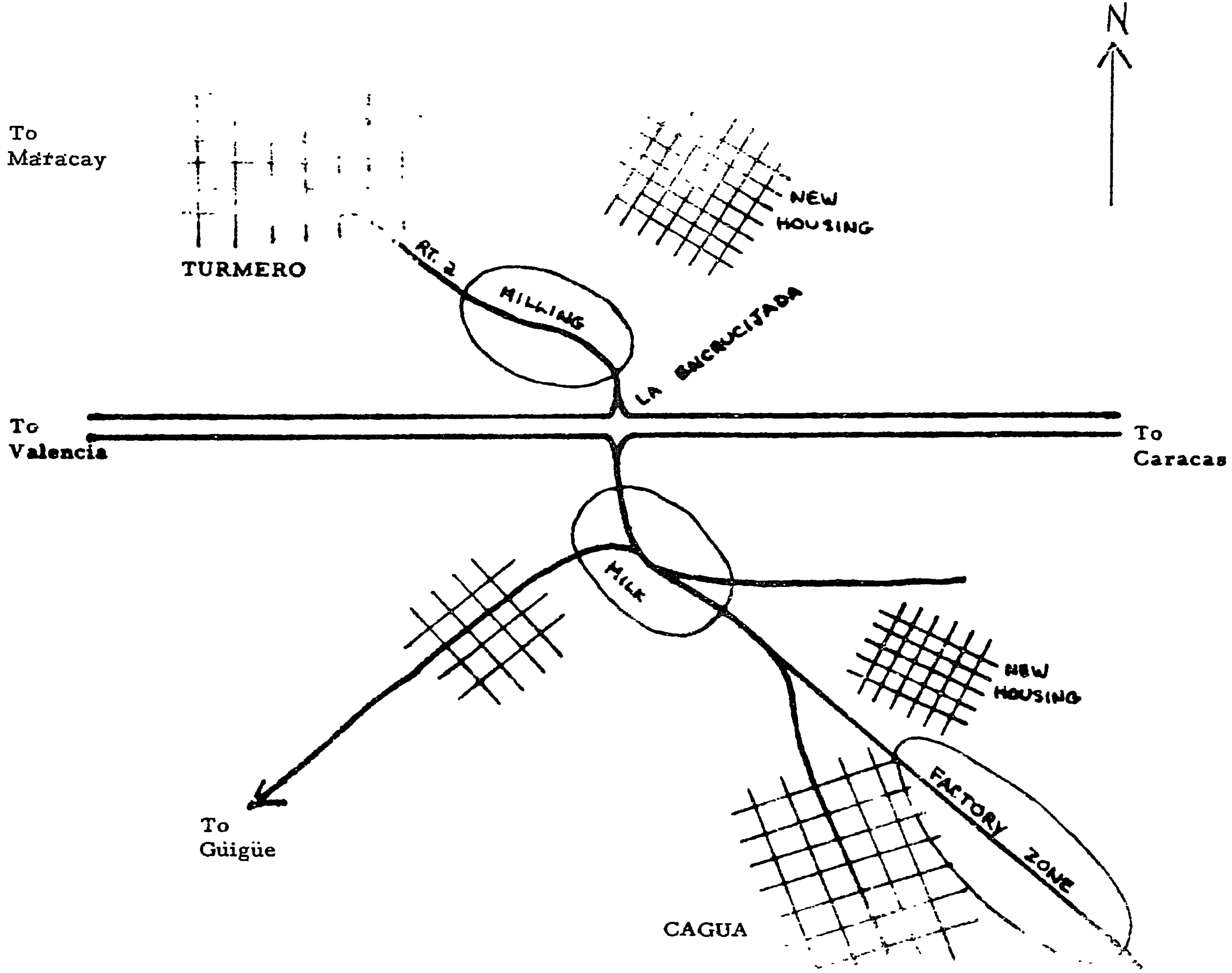
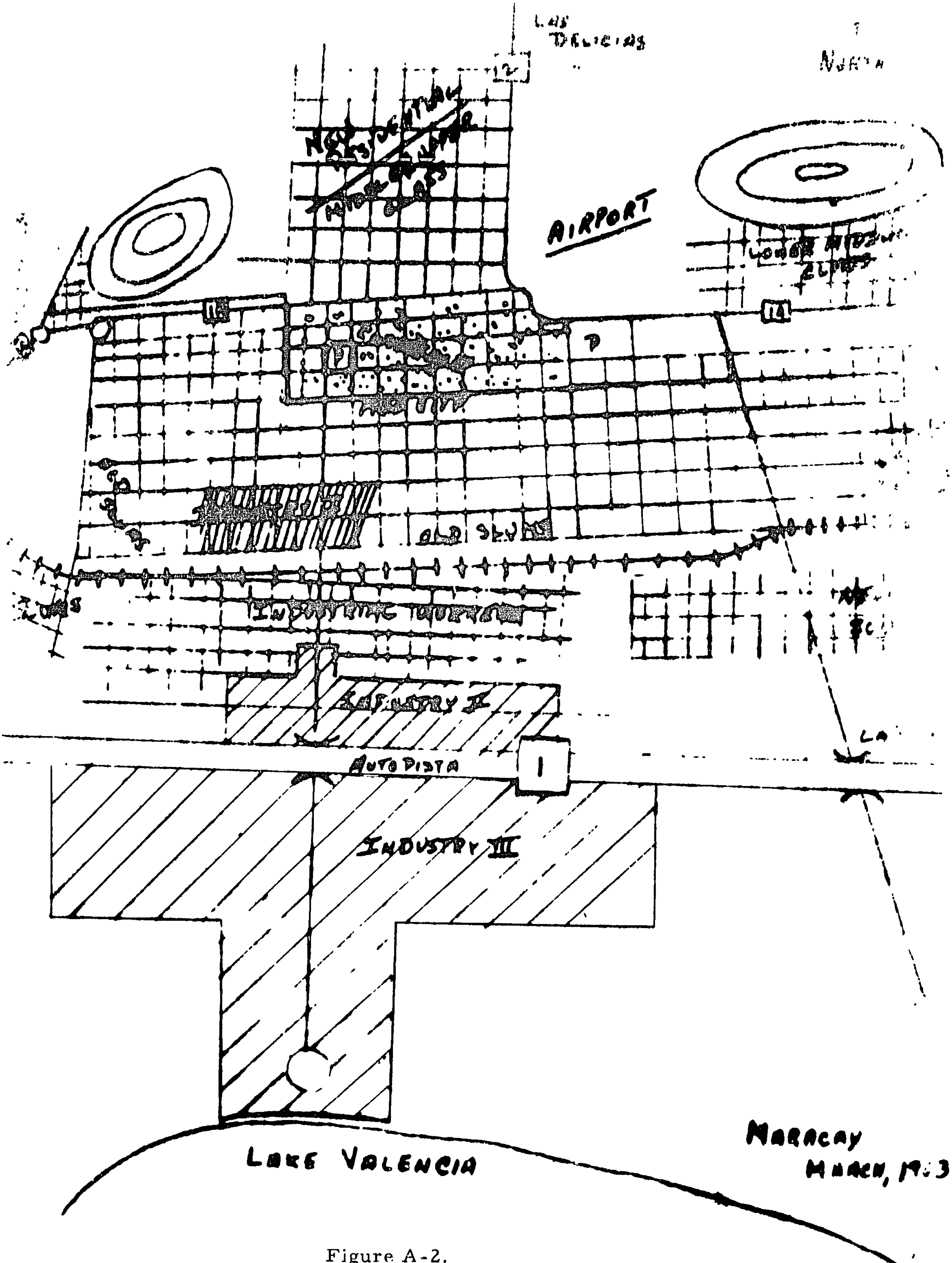

N
To Maracay
TURMERO
NEW HOUSING
RT. 2
MILLING
LA ENCRUCIJADA
To Valencia
To Caracas
MILK
NEW HOUSING
FACTORY ZONE
To Güigüe
CAGUA

Figure A-1



AIRPORT
OLD SLUMS
INDUSTRY III
AUTOPISTA
LAKE VALENCIA
MARACAY

Figure A-2.

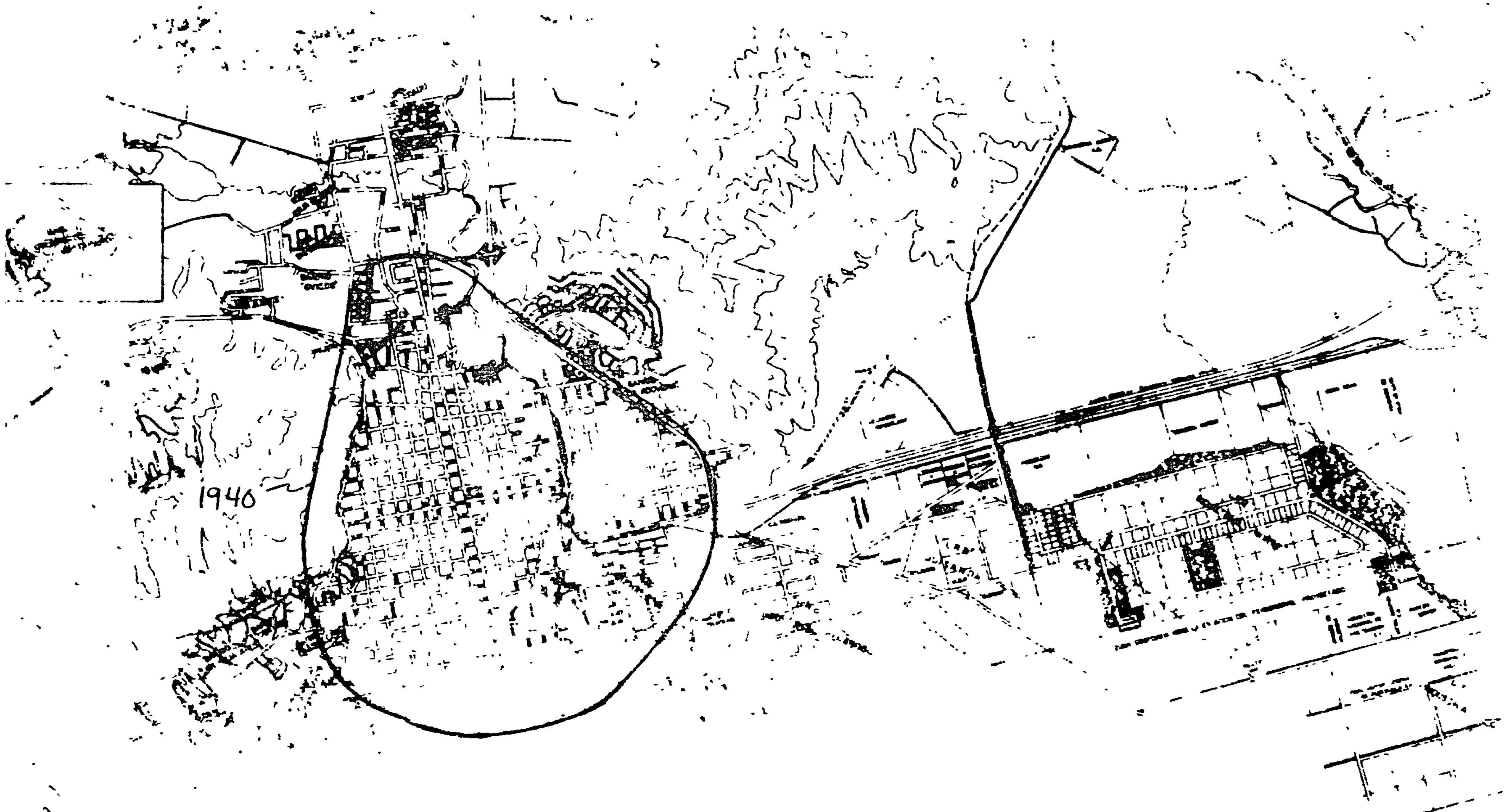


Figure A-3. VALENCIA, 1961

(Ingeneria Municipal)

APPENDIX I

Cost Benefit Analysis
A Critique

A proper evaluation of the relative economic success achieved by each of the above cases has not been possible. Although attempts were made by the researchers in the Latin American case studies, as well as the Indian case, to compute benefit-cost ratios or rates of return, there were not only serious data gaps and often heroic assumptions made, but also significant conceptual problems that rendered the estimates non-comparable. It is the latter issue that we wish to discuss here.

The conceptual difficulties arise from two main sources: (1) the attribution problem, and (2) valuation of the non-marketed benefits.

(1) The Attribution Problem. This has two aspects, one relating to direct user benefits and the other relating to the indirect effects. The former problem emerges because, while one can reasonably credit the user cost savings per ton-mile or vehicle-mile to the total traffic previously moving between any two points, the issue is less clear when traffic increases. The usual custom of attributing half of the value of the traffic increment multiplied by the unit cost reductions has a shaky logical basis, and seems especially irrelevant where no previous traffic existed. _/

_/ The attribution of the total reduction in transport costs to only half the so-called "generated" traffic is presumably based upon the assumption of a static linear demand curve and a notion of consumers' surplus. There are however no good reasons for believing that the demand schedule for highway use is either linear or static and both the empirical and logical aspects of consumers' surplus leave much to be desired. Other rationalizations of partial attribution have been summarized as follows:

"As far as reductions in transport costs are concerned, it would not be appropriate to apply the total reduction in unit operating costs to this traffic since it would not have materialized without the reduction. If there is reason to believe that in a particular situation the traffic would have been generated with a transport cost reduction of only a quarter the actual reduction, it would be appropriate to apply three-quarters of the unit cost reduction to the generated traffic. In the many situations where the available data do not permit a judgment on the relationship between the degree of transport cost reduction and the volume of generated traffic, perhaps the most reasonable assumption is that this traffic would have developed in proportion to the reduction in transport costs; if so, it would be appropriate to apply approximately one-half of the unit cost reductions to this traffic." (Hans A. Adler unpublished manuscript prepared for the Brookings Institution.)

But the attribution problem is especially vexing in the case of increased production associated with the new facility. To raise the output of any product

.n the area served by a highway requires additional investments of a widely varying sort such as the cost of clearing the land, construction of new buildings, acquisition of new equipment, and so on. These are as essential in generating increased output as the highway In fact all of these investments as well as the highway are jointly responsible for whatever changes in production in the region occur. To attribute the increase in net value added solely to the transport investment will seriously overstate the rate of return or benefit-cost ratio. The best that can logically be done is to relate the total change in net regional product to all the investments jointly contributing to it, of which the highway is only one.

Indeed the so-called direct and indirect effects are closely related since traffic would not increase unless output or production increased. To credit half the traffic increment to the highway and in addition all the increase in value of production notonly smacks of double counting if not carefully done but also yields a curious mixture of partial and total attribution of interrelated phenomena whose meaning is at best ambiguous even if it were not an illogical procedure.

(2) Valuation of Non-Marketed Benefits . Leaving aside those alleged benefits that defy quantification (e.g. national cohesion, effects on attitudes and so on) and concentrating only on certain benefits that can be measured even if not sold, still leaves important conceptual ambiguities. Two of these are especially important: (1) time savings and (2) accident reduction.

The amount of time saved due to a new or improved highway applies to both freight and passenger traffic Time saved in moving goods is valuable to shippers and may lead to non-transport economies in the form of reduced inventories, improved scheduling, increased ability to obtain particular inputs which may become urgently needed and so on. Likewise, a reduction in elapsed time leads to savings of varying kinds to the provider of transport. The valuation of these time savings, however, is especially complex as far as the buyer of goods in concerned. The value placed upon any quantity improvement in transport (e.g., "time" in the present instance) will vary substantially among shippers depending upon location, type of product, inventory policy, state of the market and so on. It is not possible to make any single reasonable assumption regarding the value of say, one hour faster service, that has relevance to all shippers or that can be expected to remain stable when conditions change.

The same is roughly true with regard to time savings in passenger travel. Thus to calculate the amount of time saved per vehicle by virtue of the improved highway and multiply this by some arbitrary pecuniary amount which in turn is multiplied by the previous traffic plus half the so-called induced traffic, is no more than an arithmetic excercise performed in the attempt to give a precision that can only be spurious.

As far accident reduction is concerned there are clearly enormous valuation problems in describing what it is worth to have the accident rate decline. The economic cost likewise depends upon what group of people are involved. Indeed it has been suggested that "the skilled and educated part of population . . . . travel more than the average [in underdeveloped countries and] if they are killed or disabled, the loss to the community is a heavy one". _/

_/ E.K. Hawkins, "Investment in Roads in Underdeveloped Countries", Oxford University, Institute of Statistics Bulletin, Vol. 22, Nov. 1960, pp. 361-362.

As we have not yet developed an "economics of death" this remains a problem from the point of view of measuring pecuniary costs and gains.

In all of the foregoing the familiar problems of using an "appropriate" rate of discount and time horizon further compound the difficulties of evaluating the net benefits from highway investment. For these reasons, as well as the statistical gaps, it was not possible to develop a set of ratios for each of the cases in the present volume that would permit a ranking in terms of degree of success.

A Revised Methodology. But much of the conceptual difficulties arise because of use of the benefit-cost methodology. In the present context this is seriously misleading even assuming good data can be obtained. What one is mainly interested in is the developmental impact of the road investment. Granting that other objectives may be just as relevant, let us assert that the paramount aim in underdeveloped regions is to raise the output per head on a sustainable basis. The measure of output is, of course, value added. It thus seems appropriate to assess the developmental impact of improved transport in these terms. If so, the model is conceptually easy: on the investment or cost side, compute the present value of the highway construction costs plus all other investments needed to raise or sustain the level of regional net product: thus we have a series of investment expenditures for both transport and non-transport activities spread out over time whose present value is readily calculated. On the net value added side, perform the same calculations. If the latter exceeds the former, this is prima facie evidence that the road will make a net positive contribution to economic growth. Whether this is the best set of investment options depends upon the relative gap between the two using alternative investment packages and their associated impact on net value added. But ignoring alternatives, when a decision whether or not to construct a highway has to be made, the above type of computation is required for any meaningful interpretation of its economic feasibility. It is not enough to consider only the highway investment, for other investments are equally essential if regional net product is to be increased. In other words, there is a high degree of investment or project interdependence. To attribute all the effects to the highway or even any portion of them is an arbitrary exercise as already noted.

Even granting this developmental approach there are serious difficulties regarding the rate of discount, the time horizon and how to measure net value added. The first two difficulties are discussed in detail in another volume of this series and can be ignored here. The problem of how to compute net value added, however, remains. The concept is clear enough and is simply that which forms the basis of the national income and product accounts. The real difficulty is once more than of statistics. But in any of the regions likely to be of concern for the purposes of a new highway, the number and variety of producing units is liable to be small. Where some private manufacturing large scale plantation activity is involved,it should be possible to get information on production and net income by direct inquiry although there will often be a reluctance or refusal to disclose this kind of evidence. How one gets firms or people to respond is a question of tactics and will vary from place to place. We do not discount the difficulties of eliciting reliable responses but generalization regarding tactics is hazardous and probably misleading. In the small scale agricultural and services (including transport) sphere, data will normally be lacking and with the greater numbers of small producers involved, there seems little alternative but to conduct a sample survey to ascertain costs and revenues. Again, one should not understate the difficulties of such surveys and the problem of the reliability of the responses, representativeness of the sample and so on. But if there is no solid evidence presently available, such a technique with all its difficulties seems preferable to guesswork or evidence based on other countries or regions. What is required is a set of concepts and data based thereon that is directly relevant to and descriptive of conditions in the area under consideration.

When or if, information analogous to a series of income statements for each sector is obtained, it will be a simple matter to recast this into value added form by elimination of purchases from other producing units. For purposes of projecting these into the future, assumptions regarding prices and production costs will of course have to be made. But this is true of all projections. In the present instance, if the potential in terms of physical quantitites is estimated the probable trends of values may be deduced on the basis of other information or, perhaps simply assumed constant at present levels.

This brief sketch of the computation of developmental effects of highways needs considerable amplification and is presented here as a suggested alternative to the usual practices of cost-benefit analysis. Since either technique requires new data, in most circumstances, it is preferable to attempt to obtain statistics relevant to a better technique rather an an inferior one. Furthermoe, the value added approach to transport and other sectors fits into any regional or national integrated development scheme and explicitly refrains from treating transport separately from the other sectors. Nor does it involve multiplying the reduction in transportation costs by present traffic volumes plus half the so-called induced traffic as is frequently done and then call these direct benefits. At the same time this method refrains from putting an arbitrary value on time savings for passengers and freight and including these in direct benefits. Most importantly the value added approach avoids the arbitrariness of imputing the value of increased production solely to the highway and acknowledges that whatever the net increase of value added in the region or nation it is a joint product of all capital expenditures and other policies.