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PLANNING PROBLEMS IN IMPROVING COLOMBIAN ROADS AND HIGHWAYS

BY

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Recent transportation advances illustrate the paradoxes in 20th century development planning. A Colombian traveler can have lunch

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in Bogota and dinner in New York -- the same amount of time it takes his rural neighbor to bring two bundles of fireplace wood by pack burro 10 kilometers to Bogota's northside residential district and return home again. This paradox is not just a matter of contrasts in time and distance -- if the farmer could have loaded his wood on the national airline instead of renting or maintaining the burro, his transportation costs per kilometer would have been less.[1]

This paper describes and analyzes planning concepts relevant to the improvement and expansion of national and local road transportation in Colombia. Recent transport investment policies have emphasized national highway improvements while virtually ignoring rural transportation. Disproportionate progress in the two areas is described and related to fiscal and planning mechanisms. Finally the paper provides an illustration of how existing resources could be reallocated between national and local projects in order to provide greater balance to highway expansion. Agricultural development and rural road planning, finance and construction are given special attention in the last section.[2]

The problem and the need for planning

Planning plays an important role in transportation development for three important reasons. First, transportation systems are usually among the most costly parts of infrastructure -- they demand large public investments which take capital away from other needs. Second, an investment program is of more concern than individual expenditures. Railroads depend on rolling stock, airplanes need airports, ships must have harbors, cars and trucks call for roads. Third, transportation investments are usually long term and relatively permanent. Since they are also costly, it means large amounts of capital will be fixed reducing the flexibility of subsequent national investment choices. For the same reasons, mistakes and inefficiencies are also difficult to remove.

Transportation planning can help to minimize costly errors as well as to anticipate needs and direct improvements toward increasing transport capacity and speed so that productive activities and market exchanges can also expand. But the points where planning is done and the mechanisms used to finance highway construction and maintenance govern directly the availability and capacity of road systems in different areas. This analysis illustrates the discrepancy in progress between national and local highway units.

Six concepts have been identified as being of primary importance to road and highway planning in Colombia. They are: 1) specification of a limited road and highway system which will make an investment plan

practical, 2) planning based on network designs rather than segment projects, 3) design, engineering and construction fitted to the unique geographical and spatial characteristics of the country, 4) a tax and revenue policy formulated with regard to highway finance and maintenance, 5) an incentive program for rural communities which will stimulate construction of farm roads, and 6) reorganization of administrative and decision structures at the local level to provide transport planning and management capacity in rural communities.

Colombia has made rapid advances in national transportation during the past 25 years. Highway and street paving have been greatly expanded. The national rail system, started by private companies during the last century, is now nationally operated and has been extended to both sea coasts. Public and private agencies have built more than 200 airports. Pipelines for both crude and refined petroleum connect the main producing fields and cities. Wilfred Owen, a world expert on transportation planning, says Colombia may actually have invested too heavily in transportation to the neglect of other equally important public programs -- improved education, technology, marketing, and other services.[3]

Owen points to Colombia and Turkey as countries where attention to transportation during the 1950's was out of proportion to other vital programs. In 1959 all levels of Colombian government were allocating 41 percent of total public investment to transportation and communication and only three percent to education. The percentage of national

government investments in transportation rose even higher but has since been reduced to about 22 percent of the total.[4] Colombia now needs a more balanced and integrated highway investment package that will take into account national characteristics and road deficiencies in rural areas.

In 1968 the Ministry of Public Works reported that Colombia had 18,000 kilometers of national highways of which about 4,000 were paved, 16,000 kilometers of departmental (state) roads, and 4,000 kilometers of rural access roads. The nationally owned railway has 3,436 kilometers of track connecting the main cities and sea ports. River transport is also available in many regions, but its relative importance is declining. Airlines and motor buses are the main carriers of passengers.

About 60 percent of all freight in Colombia, including minerals and bulk petroleum, is moved on highways. Excluding petroleum, highways still accounted for more than half of all ton-kilometers of transport movement.[5] Total road and highway use is gradually increasing because of additional vehicles on the roads, as well as more intensive use of some principal highways. Road congestion, however, is not a serious problem. Colombia still has relatively few motor vehicles. About 30 percent of the vehicles in Colombia are trucks and buses, but these compose up to 80 percent of the total traffic on many routes.[6]

Motor vehicles in Colombia are manufactured abroad or assembled locally from foreign components. Imports are regulated by government

controls. Most classes of vehicles are heavily taxed -- the tax on automobiles ranging from 230 percent to 450 percent of factory price.

The number of vehicles is currently increasing at the rate of seven to nine percent annually. Nearly 50 percent of all vehicles are concentrated in the three main urban centers of Bogotá, Medellin and Cali. Consequently most vehicles use a few heavily traveled primary routes during almost every trip out of town. Table I shows that the number of vehicles has continued to increase faster than the kilometers of roads.

TABLE I. NUMBER OF MOTOR VEHICLES AND KILOMETERS OF ROADS IN COLOMBIA BY TEN YEAR PERIODS.[7]

Year	Number vehicles	Kilometers of roads	Vehicles per kilometer of road
1904	1	-	(1st. auto in Colombia)
1920	1,900	2,800	0.68
1930	11,500	5,800	1.98
1940	24,600	7,300	3.37
1950	63,300	21,750	2.91
1960	182,000	32,000	5.69
1967	266,000	38,000	7.00
1970	320,000	41,600	7.69 (estimate)

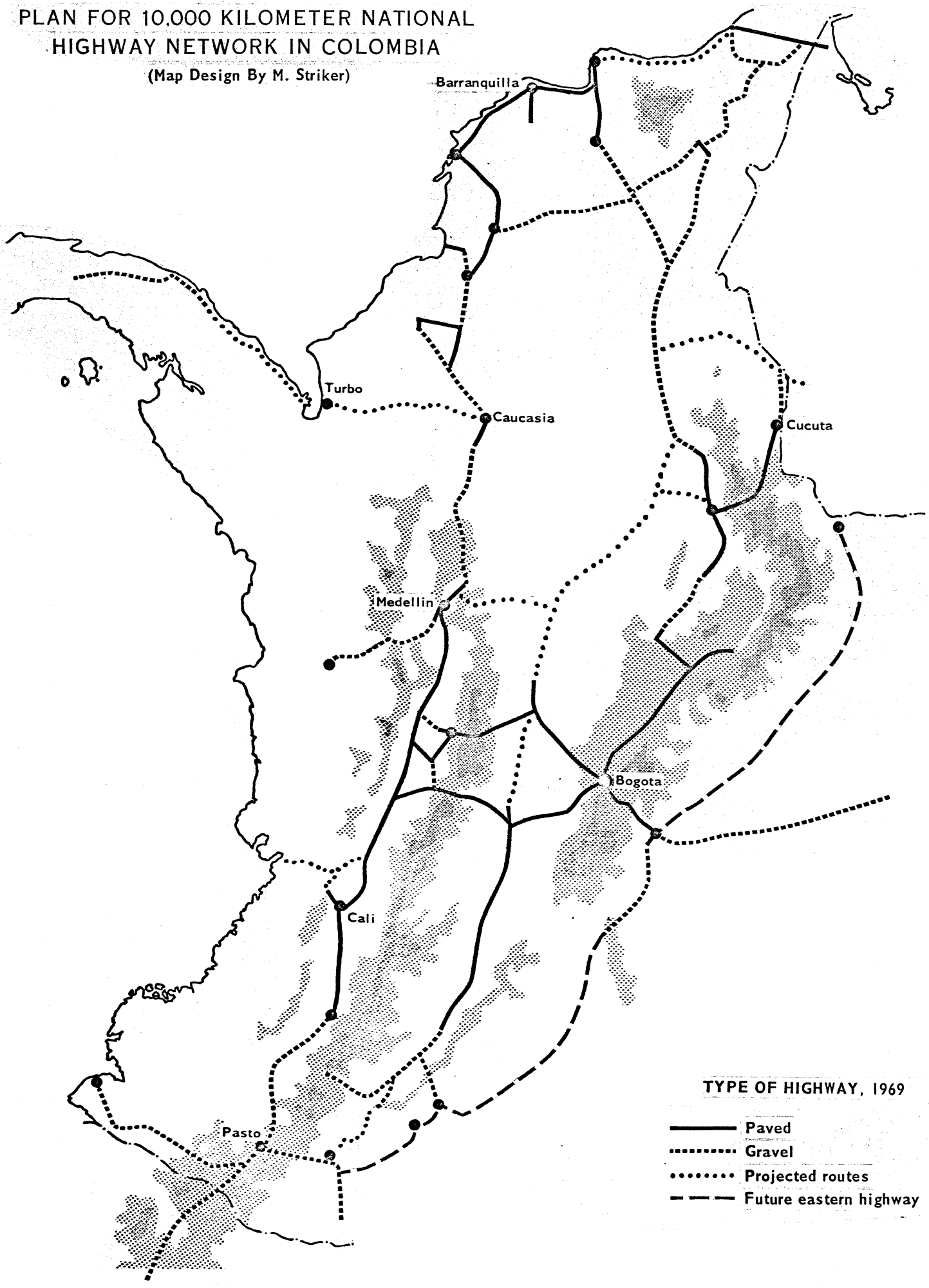
Given the pattern of vehicle use, Colombia's rugged terrain, and necessary limits on transportation investments, national highway planning should logically be directed toward establishment of a primary highway network which will give nation-wide service without an excessive or rapidly expanding number of kilometers of main roads.

Such a plan would allow increased investments in paving and road bed improvements on heavily traveled routes. The major extensions in the road system could then be made on secondary and rural access roads.

The main population and economic centers in Colombia could all be connected with 10,000 kilometers of highways -- even when allowing for expansion into the eastern plains. It is assumed that these primary connections justify moderately good quality highways, eventually all paved. A general scheme showing how the network could be placed is presented in the following map. If high-cost investments were limited to 10,000 kilometers of primary highways, many of the roads already in the national system could be shifted to the category of secondary roads. Some growth could then be allowed in secondary roads with major stimulation given to access roads. This new classification would result in 24,000 kilometers of secondary roads increasing to about 30,000 kilometers by 1990. Giving proper emphases to access roads, the rural system should expand by about 3,000 kilometers per year. Added to existing rural roads, this would bring the total in this class to 35,000 kilometers in 10 years.

This outline follows the general road and highway classification now being used by the Ministry of Public Works. The classification places all roads into three groups according to their design characteristics.

1. Primary roads. These are wide two lane or four lane highways paved with either asphalt or concrete, constructed for heavy loads,


PLAN FOR 10,000 KILOMETER NATIONAL HIGHWAY NETWORK IN COLOMBIA
(Map Design By M. Striker)
Barranquilla
Turbo
Caucasia
Cucuta
Medellin
Bogota
Cali
Pasto
TYPE OF HIGHWAY, 1969
Paved
Gravel
Projected routes
Future eastern highway

and built according to speed and safety standards. Road grade rise and fall is seven percent or less, curves have a 70 meter or greater radius, and the road bed is protected with parking shoulders along most of the length. The majority of the 18,000 kilometers in the existing national highway system do not meet these specifications.

2. Secondary roads. They are two-lane roads with 6.5 meters of improved surface width, generally gravel, 10 percent maximum grade, and maintenanced to handle up to 300 vehicles per day under year-round conditions. This classification is generally for departmental highways, but is also used for older paved roads that do not meet the design specifications of primary highways.

3. Rural access roads. These roads are the lowest cost and may have any type of surface. They include all non-primary or secondary routes useable by motor vehicles. About 75,000 kilometers of these roads will eventually be needed to provide access to populated agricultural regions Since so many kilometers must be built, low cost and minimum design specifications can be justified.[8]

Planning the primary and secondary system

There are a number of concepts of key importance in planning the national highway network. One of the main ones is highway location in relation to Colombia's mountainous features and related concentrations of population. Most of the nation's 20 million inhabitants live in three long Andean Mountain chains which stretch from north to south and cover

the western half of the country. The most economical way to establish a highway network in this terrain, while at the same time connecting the major population centers, is to build the main highways in the pattern of an elongated grid.[9]

The grid consists basically of two long vertical trunks and six cross links requiring less than 10,000 kilometers of highways. At the same time the network connects all major population, industrial and trading centers. The system has the further advantage of minimizing mountain crossings and maximizing use of the Magdalena and Cauca river valleys and level terraces to reduce construction and maintenance costs and improve speed and safety. The proposed network provides a low-cost and relatively early through connection for the Pan American Highway to both Ecuador and Venezuela and includes important frontier connections for future rural development.

Early Colombian roads were built in the mountains following pack trails. These routes often used high elevations where there were fewer problems with jungle growth, fewer tropical diseases, and cooler temperatures, all of which increased the performance of pack animals. This pattern is so often repeated in building roads that there is a saying in Colombia that "roads are planned by mules and not by men."

Pack routes tend to have undesirable characteristics for motorized transport -- excessive curves (as many as 20 or 30 per kilometer), steep grades, blind corners and turns, narrow widths and unstable road bases. Seventy percent of the total primary highway system could be

located on moderately rolling land or valley terraces if some changes were made in the network.

Another consideration in planning the primary network, and a subject of years of discussion and debate, is how to provide the last link to close the Pan American Highway between North, Central and South America. This study offers a new alternative to the dozens of previous plans. Essential to the plan is an initial ferry boat link over the Gulf of Uraba bringing vehicles from the end of the Panamanian Highway across the gulf to Turbo. A ferry crossing of this kind is feasible, and is similar in time and distance to a crossing of the English Channel where ferry service has been used for many years. The Gulf of Uraba is an easier crossing than the Channel because it is well protected and subject to little wind and tide. Service could be maintained throughout the year.

After leaving Turbo, a new road built on the intermediate level terraces which fan out at the end of the western mountain range would provide a modern highway connection with the main trunk highways leading to both Venezuela and Ecuador. A cross link between Panama and Venezuela would also open rich new lands in the San Jorge and Sinu river valleys and should be partly justified by its effects on national frontier development.[10]

Several arguments support a ferry link for the initial stages of development of the Pan American Highway. A ferry can be installed without delay. It is possible to recover part of the investment through user charges and through resale if someday there is an extension of the overland highway. The road link between Panama and Colombia has been blocked for

years by the extremely wet and marshy conditions in the Atrato and Darien basins which present some of the most difficult road building conditions in the world. If sites upstream on the Atrato River are chosen, one enters areas receiving extreme rainfall--as much as 10.5 meters annually.

Planning highway investments

During the decade of the 1950's the public and private sectors together invested an average of one billion current pesos a year in transportation. (The peso equals six U.S. cents.) Most of these investments were for highways and railroads.[11] The investments were made at a time when only a small part of highway costs were being recovered through user charges and taxes.

An ad valorum gasline tax was initiated in December of 1966 at the rate of 114 percent on the refinery price of gasoline and 55.5 percent on the refinery price of diesel fuel. Prior to that time there was a fixed tax of 15 Colombian cents per gallon on gasoline which in 1961 was producing only 22 million pesos in revenue while the highway budget was 398 million--in effect a substantial subsidy to highway users.[12]

The new tax is now producing 700 million pesos annually in revenue. This income is channeled through a semi-autonomous National Highway Fund and is earmarked for primary and secondary road construction and maintenance. Revenue from the gasoline tax is expected to increase to about one billion pesos by 1974 and could rise even higher if indirect government subsidies to oil refineries were lifted, allowing gasoline prices,

and thus tax revenues, to rise.[13] Gasoline purchases are generally considered inelastic to price changes. This proved to be true in Colombia as consumption continued to increase after 1966 even though gasoline prices nearly doubled. Price at the pump, including tax, is now 2.36 pesos per gallon for regular grades.

Using one billion pesos of revenue by 1974 as the figure for budget planning, it is possible to make maintenance and construction estimates for the next 10 years. Funds short of one billion in current tax revenues during the first four years would be balanced by expected additional revenues after 1975. Operating in this way also allows highway agencies and contractors to tool up during the period. It is expected that the national government will pay the administrative costs for the National Highway Fund during these years.[14]

TABLE II. TEN YEAR ROAD AND HIGHWAY CONSTRUCTION AND MAINTENANCE INVESTMENT PLAN FOR COLOMBIA, 1970-1979 (IN KILOMETERS AND CURRENT PESOS).

	Primary Highways	Secondary Highways	Rural Access Roads	Total Kilometers or Pesos
1. Beginning inventory of roads, kilometers	10,000	24,000	5,000	39,000
2. Funds available annually, pesos	--	--	--	1 billion
3. Average cost per kilometer per year for maintenance, pesos	15,000	10,000	1,000	--
4. Amount of annual budget required for maintenance, pesos	150 million	240 million	-0- a/	390 million b/
5. Amount remaining for construction and reconstruction, pesos	310 million	150 million	150 million c/	610 million
6. Average cost per kilometer for new construction, pesos	1,750,000	450,000	50,000 c/	--
7. Kilometers to be built new per year	150	300	3,000	3,450
8. Kilometers to be paved or rebuilt per year	250 d/	100 d/	--	--
9. Road and highway goals for 1979, in kilometers	10,000	27,000	35,000	62,000

a/ Rural road maintenance will be paid locally as explained later.

b/ As roads improve, maintenance costs should decline slightly. A constant amount is used for purposes of this illustration.

c/ It is expected that an equal amount of costs will be borne by the local community through property taxes, Community Action Committees, and grants by semi-autonomous agencies. Supplements are needed to provide the 100,000 pesos per kilometer for rural road construction.

d/ Partly to be paid from maintenance funds.

Many readers will be disappointed to see from Table II that so few kilometers of new and improved highways can be built per year with existing budgets. The limited construction and improvement figures are brought about first of all by high maintenance costs -- demanding 40 percent of annual funds -- and secondly by high construction costs on primary highways. When highways cost nearly two million pesos per kilometer, a budget of 310 million pesos will not build many kilometers in relation to the total kilometers already in the system. International borrowing, which is now in use, will advance the construction dates but will not greatly affect the number of kilometers of new construction.

Road engineers report that adequate maintenance of existing national highways costs nearly 18,000 pesos per kilometer annually.[15] Maintenance costs are presently high because of a large proportion of mountainous roads, overloaded trucks, inadequate drainage, exposed cuts and fills which are continually subject to erosion and sliding, and poorly prepared road beds with excessive curves and narrow shoulders. A well designed road over improved sites, while more costly initially to construct, would reduce annual maintenance costs to one-half present rates as shown in Table III.[16]

TABLE III. CONSTRUCTION AND MAINTENANCE COSTS PER KILOMETER FOR THREE CLASSES OF ROADS ACCORDING TO TERRAIN AND CONSTRUCTION CONDITIONS (ONE PESO EQUALS SIX U.S. CENTS).

	Cost According to Terrain			Annual Maintenance Costs	
Road Class	Gently Rolling Well Drained	Mountains, Wet Areas	Average Cost	At Present	After New Construction
1. Primary	750,000	3,000,000	1,750,000	15,000	7,500
2. Secondary	200,000	800,000	450,000	10,000	5,000
3. Rural	25,000	200,000	100,000	-	1,000

Sources: Colombian Ministry of Public Works, National Planning Office, Private Engineering Firms, and Colombian Army Corps of Engineers.

Primary and secondary highway maintenance now cost 300 million pesos annually. If costs could eventually be reduced by improved construction, higher efficiency, and limits on the length of the primary highway system, additional capital would be released for further highway construction. A large proportion of current maintenance funds are wasted by employing excessive numbers of men with picks and shovels who are not able to correct structural weaknesses in the road base. Labor does not substitute for equipment for certain tasks like leveling a wash-board gravel surface.

Many studies have recommended that early priority be given to paving existing highways, delaying most of the new construction to later stages in the planning period.[17] This is especially important for the major central and coastal highways. At present there is not a single paved connection from the interior of the country to either coast.

Guidelines for Latin American highways indicate that paving is warranted on roads used by 200 to 300 vehicles per day. At this use level many more Colombian highways should be paved.[18] Existing gravel roads are in such poor condition that trucking firms report damage to vehicles and tires on nearly 100 percent of trips to the Atlantic Coast. Cattle from the coast sold at interior markets suffer 80 to 100 pounds of weight loss from trucking, cotton bales ignite spontaneously on trucks due to friction from excessive jostling.

Special problems in providing rural access roads

Rural access road planning and investment is the most neglected part of Colombian surface transportation. Rural road building is plagued by a

series of problems. Local governmental authority is highly fragmented. Rural users lack a voice in local infrastructural decisions, finance procedures are slow and complex and there is a shortage of equipment, technical personnel and maintenance systems.

Most countries which have extensive rural road systems have left the activity wholely or largely in the hands of local authorities. The English speaking and Northern European countries are the main examples.[19] But simply placing the responsibility with local governments is not enough--they must have corresponding fiscal, administrative, planning, and contracting powers.

In Colombia, local governments generally function badly. They are not strong in any of the essential areas. Local road building is the responsibility of the municipalities working in collaboration with departmental committees of Community Roads (Caminos Vecianales). Community Road legislation calls for the formation of municipal road commissions composed of a representative from the mayor's office, the parish priest, and a departmental highway representative. Recent studies indicate that the local commissions have not been formed in many communities, or if they have, they have built few rural roads and in many areas they have been wholely inactive.[20]

In response to inaction from municipal authorities, many informal community groups called Community Action (Acción Comunal) have planned and built access roads. Community Action associations may obtain an official charger for community improvement work. They decide on local needs, collect funds from residents and from semi-autonomous agencies like the Coffee

Federation, and request aid and equipment from state agencies, government officials and private citizens. They have no tax powers. They usually direct their attention to projects such as roads, schools, water and sewerage systems, and parks. Their procedures are filled with delays, frustrations, false starts, petty politics, endless hand shaking and letter writing, and many disappointing projects.[21] Fortunately, however, some groups have been successful in building a few kilometers of rural roads.

In order to obtain data on rural access roads and to study the problems involved in planning, financing and constructing them, the author visited more than 15 rural projects over a period of two years. Transport cost data for agricultural products were collected from more than 50 hauling points and included all of the usual transport forms--animals, trucks, buses, jeeps and farm wagons.

As a result of these surveys, plus a review of other data on farm to market transport, the following tentative conclusions are offered and will be discussed in greater detail:

1. Rural access road building should be planned on the basis of relatively simple criteria. Typical benefit-cost studies are often neither practical nor cognizant of the realities of fiscal and administrative procedures used in the countryside.
2. Rural access road planning and construction require financial incentives and locally oriented decision units which can consider project priorities in relatively small regions rather than on a state or national basis. Local groups need taxing powers as well as a rapid and simple way to obtain national grants.

3. Rural road building groups need considerable latitude in choosing road designs, making roads fit local budgets rather than making budgets fit designs.
4. Rural communities must have equipment to build roads. Sharing agreements with departmental highway units or standing contracts with private construction firms may be a way to improve this situation.
5. Community road committees need maintenance funds as well as construction funds. The land tax should be applied to all areas where roads are built with part of the subsequent revenues applied as needed to maintenance.

These points will be more meaningful if we have a better picture of the characteristics of present rural transportation in Colombia. Colombia currently produces more than 21 million metric tons of agricultural products annually. More than half of these products move off the farm toward markets on the backs of animals. There are more than 1.7 million horses, mules and donkeys in Colombia, almost all of them used for transport rather than draft purposes.[22]

A pack animal normally carries one carga which consists of two 50 kilogram sacks of product (altogether about 225 pounds). It costs an average of one peso per kilometer to transport a carga of product by pack animal. This price varies depending on distance hauled and region of the country. Short distances tend to have higher average costs while longer distances are slightly cheaper per kilometer. Since there are 10 cargas to a metric ton, the animal transport price measure is 10 pesos per ton-kilometer.

By way of comparison, transport costs for agricultural products moved by motor vehicles is approximately three pesos per ton-kilometer for rural, part-load, carriers and less than .75 peso per ton-kilometer for full-load express hauling. Hauling is frequently done in the countryside by buses with open sides which receive both produce and passengers.

An estimated 10 million tons of agricultural product could be shifted from the backs of animals to motor carriers if there were adequate rural roads. If we assume that all of this product would be hauled on local vehicles at three pesos per ton-kilometer instead of the current 10 pesos by pack animal, a potential 350 million pesos saving results. This saving is the economic potential upon which a rural road building program should be planned. The problem lies in capturing these potential savings through taxes or other charges so they can be invested in roads. There is little value in talking about the promising benefit-cost ratios which can be calculated for road projects if there is no practical fiscal or administrative structure available to allocate social capital in the countryside.

Our plan is based on the concept that both the rural property owners where roads are built (the direct beneficiaries) and the nation (the indirect beneficiary) must share in the cost of new access roads. For convenience and simplicity, a 50-50 share is used here.

Improvements are needed in the tax system before local governments can collect adequate revenue from agricultural land. Land taxes can be supplemented by special levy benefit taxes. A benefit tax law was first

passed in 1921 making it possible to levy a special assessment against properties adjoining or benefited by a public improvement.[23] The problem with this tax is that appraisals and collections are slow, too complicated for rural use, and unduly influenced by local political groups. So far the benefit tax has been successfully applied to road projects only in or near urban areas.

The second concept in this plan involves the way rural communities justify the choice of access roads for construction. A simple criterion can be used: any rural area with at least six farms per running kilometer along the proposed new route which is willing to raise half the cost of the road, should be allowed to proceed. Construction requirements can be flexible, allowing rural communities to choose among alternative cost and design features. At present all rural roads are built according to one set of standards set by the central government. The average rural access road costs 100,000 pesos per kilometer. A community where a new road is built would have the burden of raising one-half of this amount plus 1,000 pesos per kilometer per year thereafter to maintain the road. The national contribution would come from the gasoline tax fund.

An example will help illustrate how these funds could be raised.

This example assumes a 10 kilometer road segment to be built at a cost of 100,000 pesos per kilometer. The total cost will be one million pesos with the community paying one-half plus 10,000 pesos per year for maintenance. It is estimated that this road would benefit about 12 farms along each kilometer or 120 farms in total.

From a variety of field studies we have determined that an average small farmer with one pack animal makes one trip per week to the village market plus about 50 extra trips a year to sell products from two to three annual harvests.[24] On this road, the average round trip would be 10 kilometers. Without the road, the community of farmers would be making 12,000 pack trips per year at an average cost of 10 pesos per trip or 120,000 pesos per year.

These estimates appear to be on the conservative side. The product hauled to market with 100 pack trips per year could be produced by less than one hectare of potatoes or less than one-half hectare of tomatoes, or about four hectares of rice. With 12 farms per kilometer extending back one kilometer on each side of the road, each farm would average 17 hectares of land. At the same time, the example illustrates the real bottleneck caused by animal transport. The amount of product marketed reaches a limit at the point where each animal is making one trip per day to the market. There are rapidly diminishing returns to adding additional animals and mule drivers. Also, many other kinds of inefficiencies are related to animal transport. Inputs like fertilizer are often not used, or used in less than optimum amounts, when transported by low volume, high cost means. Large scale field cropping and commercial dairy operations are not carried on.[25]

If the same products above were transported by local trucks and buses, the cost would be 36,000 pesos with an annual savings to the farmers of 84,000 pesos. If these savings were then captured through

property taxes and invested in a local road, it would take the farmers only seven years to pay off their share of the capital costs. In addition, however, the farmers would have to pay interest charges to raise the initial capital plus 10,000 pesos a year to maintain the road.

The above community must raise about 63,000 pesos annually through combined property-benefit taxes in order to pay for the 10 kilometers of road in 10 years, including interest charges and maintenance costs. A typical value for the 120 farms along this road would be 12 million pesos or 100,000 pesos per farm. Thus the beneficiaries must set the tax levy at 5.5 mills for 10 years to raise the necessary funds. This rate is still considered low for agricultural land and only one-third of the 15 mill limit set by recent constitutional reforms.

The plan described here calls for a 50 percent contribution from the national gasoline tax fund as a grant to those communities which organize a road project and raise the other half of the funds. The national government would justify its contribution on the basis of the increased traffic and gasoline consumption resulting from the new road.[26]

Besides financial problems, rural communities have equipment problems. Experience indicates that labor alone cannot build and maintain access roads. Some equipment is needed to do heavy earth work and to make rock cuts, although large amounts of local labor can often be used if there is some provision to feed the workers and provide them with suitable tools. Maintenance in Colombia is very heavily dependent on the quality

of drainage for the roadbed, plus the use of some kind of mechanical road blade to level and restore gravel surfaces. Drainage work and ditch cleaning can be done almost entirely by hand. Road blading requires a machine, although certainly not a heavy duty imported road maintainer. Locally constructed tractor drawn blades are not used in Colombia, but would be adequate for most rural access roads. Farmers along the road could provide labor with their contribution subtracted from their tax bills.

Having provided a largely economic example of rural road planning, we must confess, as others have already done,[27] that the barriers to access road building in Colombia are not primarily economic or technical. The problems are also structural and political. As already reported, local governments and local fund raising instruments function badly. The Colombian government is highly centralized with most of the decisions regarding tax powers and public investments controlled by rules established and administered from Bogota. Under these conditions it is doubtful whether rural community groups could obtain the degree of flexibility and management control over public capital needed to undertake rural projects. At the same time, the national government is not disposed to pay the full cost of rural roads except in a few areas where national security is at stake, where there have been extreme political pressures, or where the road forms part of a larger colonization or regional development project.

In brief, the first task is to establish community-level machinery with administrative and fiscal flexibility in order to plan public investments and manage local capital. After there is progress along these lines, the financial requirements can also be met.

The road building plan described here probably cannot function unless there are moderately independent community groups with sufficient authority to sponsor road projects. There are currently no state or national groups with the degree of reconnaissance and administrative capabilities to allocate access roads to the several thousand communities where farmers live. And it is doubtful that a centralized procedure for such a diffuse activity is feasible. The problem is: which of several possible local groups should be assigned the local management task?

The best local performance has come from Community Action associations.[28] The Community Action device might be used to form local road boards consisting of the farmers to be benefited by the road. These groups must be broadly chartered to provide the board with the right to tax and contract. The charter itself probably could be granted at the state rather than the national level to prevent delays in Bogota.

The non-economic obstacles associated with rural access road planning and construction have been given little attention in transport discussions. Yet rural road construction will proceed unless more effective decision and management units are provided at the project level. At the same time, there are basic apprehensions about the long run effects produced by new

administrative and organizational arrangements.[29] The formation of new community groups with wide latitudes to control capital and local investments is often viewed as new competition and a threat to established political and community authority. In view of these numerous and complex problems, only token progress can be made on rural access roads during the next 10 years. Most national highways can be built with existing planning and administrative methods, rural access roads cannot.

FOOTNOTES

1/ Hauling costs by pack animals are about 10 pesos per ton-kilometer. (The peso equals 6 U.S. cents.) Avianca charges 4.20 pesos per kilogram to fly cargo from Bogota to Barranquilla, or an average of 6 pesos per ton-kilometer. Pack animal hauling is thus 1-1/2 times more than air transport, but it offers a completely different degree of flexibility and capital intensity.

2/ Data gathered by the author during field studies in 1968 and 1969.

3/ Wilfred Owen, Strategy for Mobility. (Washington D.C.: The Brookings Institution, 1964), p. 39.

4/ Figures from the Colombian Ministry of Public Works and the National Planning Office.

5/ Norman Gillmore, "La futura demanda de transporte de carga en Colombia," (Bogota: Departamento Administrativo de Planeación, August, 1963).

6/ Traffic counts by the Colombian Ministry of Public Works, Bogota, and "Memoria de obras públicas 1965-1966," (Bogota: Ministerio de Obras Públicas, 1965).

7/ Bulletins of the Departamento Administrativo Nacional de Estadística, Bogota. Donald S. Barnhart reports on the first automobile brought into Colombia in "The Development of the Surface Transportation System of Colombia, 1820-1940," (Unpublished Master's thesis, Department of History, University of Chicago, 1950), p. 66.

8/ Leon Monroe Cole, "Transport Investment Strategies and Economic Development," Land Economics, August 1968, pp. 307-317.

9/ A similar plan proposing three main trunks and 27 transverse roads was written into law nearly 40 years ago. See Law 88, Leyes expedidas por el Congreso Nacional en 1931, (Bogota: Congreso Nacional, Sesiones Extraordinarias, 1931), pp. 603-609.

10/ Some studies give priority to a cross-country highway along the margins of the eastern mountains: Charles J. Stokes, Transportation and Economic Development in Latin America. (New York: Frederick A. Praeger, Publishers, 1968), Chapter 4.

11/ Owen, op. cit.

12/ Parsons, Brinckerhorff, Quade and Douglas, "Plan de mejoramiento para los transportes nacionales," (Bogota: Ministerio de Obras Publicas, Diciembre 1961).

13/ Estimates by the Transport Group, Departamento Administrativo de Planeación Nacional, Bogota, 1968.

14/ These figures are similar to those reported by the National Highway Fund in El Tiempo, January 3, 1969.

15/ Data provided by engineers and contractors, especially SAMEL Ingenieros, Bogota.

16/ Estimates by the Colombian Ministry of Public Works and Bogota contracting firms.

17/ Transport Research Program, "An Analysis of Investment Alternatives in the Colombian Transport System," (Cambridge: Harvard University, September 1968).

18/ Union Panamericana, "Investigaciones de los factores que afectan los costos de transporte," (Washington, D.C.: Pan American Union, 1964).

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21/ Eric A. Abbott, "Communications Processes of Community Action Groups in Colombia," (Unpublished Master's thesis, Department of Agricultural Journalism, University of Wisconsin, Madison, in process).

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23/ William Rhoads and Richard M. Bird, "Financing Urbanization in Developing Countries by Benefit Taxation: Case Study of Colombia," Land Economics, (November 1967).

24/ Field Studies by Land Tenure Center personnel in Colombia, especially: Felstehausen, op. cit. and James E. Grunig, "Communication and the Economic Decision Making Processes of Colombian Peasants," forthcoming in Economic Development and Cultural Change.

25/ Ibid.

26/ Experience indicates new roads create a variety of related economic activities, Edmund Eduard Hegen, Highways into the Upper Amazon Basin, (Gainesville: University of Florida Press, 1966).

27/ Diego Jaramillo S. and Francisco Jairo Yepes, "Justificación económica de la construcción de tres carreteras veredales en Antioquia," (Unpublished undergraduate thesis, Facultad de Ciencias Agropecuarias, Universidad Nacional, Medellin, 1968).

28/ Matthew D. Edel, "The Colombian Community Action Program: An Economic Evaluation," (Unpublished doctoral thesis, Yale University, New Haven, 1967).

29/ This is clearly reflected in the strong public reactions against tax reform, including property tax reform, El Espectador, Separata March 22, 1969.