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TRANSPORTATION: AN INFRASTRUCTURAL VARIABLE IN  
CARIBBEAN ECONOMIC DEVELOPMENT

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There can be no illusion about the role of marketing as a tool in furthering the economic development of the Caribbean countries. The existence of markets and efficient marketing can represent the difference between a stagnant, depressed economy and a viable, thriving economy in which the marketing system plays a dynamic and important function in the development process. This process has its genesis in the understanding of why countries engage in trading in the first place. A Guyana or a Jamaica is not self-sufficient. They do not exist in a vacuum. Any attempt to isolate themselves economically would be akin to entombing themselves. The theory of comparative advantage is concerned with this question. It suggests that each country should concentrate on producing those products in which its productivity advantage is greatest -- where it has a comparative advantage -- and then import those products in which its productive advantage is least.

While the realities of production and trade reduce the practical application of such a procedure it nevertheless sets the stage for countries such as ours, to seek markets as a means of securing the needed medium of exchange to acquire those goods and services which they are not in a position to produce. For example, in the field of forestry, in supplying timber and timber products, Guyana has a marked advantage since she is naturally endowed with large tropical hardwood forests. J.C. Abbott,<sup>1</sup> in considering what factors are important in agricultural development, lists three conditions which he says are important in assisting market demand to provide production incentives. They are:

1. Reasonably stable prices for agricultural products at a remunerative level. Unless they (producers) have confidence that prices will bear some minimum relationships to costs, farmers will hesitate before incurring additional work or expense to increase their output or raise its quality.
2. Adequate marketing facilities. The marketing system should ensure that growing urban demand, stabilised prices, and differentials for quality at the processing or consuming level, are actually reflected in cash incentives to the producers and are contributors to the Region's development.
3. A satisfactory system of land tenure. The effect of market incentives for increased and improved production will be greatly reduced if the system of land tenure results in a large share of any increased pro-

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Abbott, J.C., 'The Role of Marketing in the Development of Backward Agricultural Economies', Marketing and Economic Development: Readings in Agribusiness Research, University of Nebraska Press, Lincoln, 1967, pp.4-5.

duction accruing to landlords. Moreover, farmers will hesitate to incur the expense and effort needed to improve their holdings unless they have reasonable security of tenure.

In viewing those practices and policies which affect the movement of goods in foreign trade the emphasis is usually on such things as tariffs, quantitative restrictions, and exchange controls. Yet, anything which impedes the flow of goods -- lack of transportation, lack of aggressiveness on the part of producers in finding markets -- adds to the ultimate cost and is germane to the problems of increasing and improving trade between countries. Thus freight rates, no less than tariffs, add to the cost and hence is a deterrent to effective marketing.

The purpose of this paper then is to discuss what is considered the potentially most damaging link in the chain of cooperation being forged in the Area. While some research and concern has been given to the problem of transportation in the Region the point should be clear that the statistical data needed to document the fears that the author has on the problems are not readily at hand. It is strongly urged, therefore, that the acquisition and documentation of this data be pursued.

In pursuing a strategy of economic development, one of the building blocks I would submit for a viable and efficient economy (whether in developed or underdeveloped countries) is the development of a system of marketing and of markets which is responsive to the problem of efficiently moving the products to satisfy time and place utilities. As Collins and Holton pointed out: "Rarely, however, is it recognised that industrial and agricultural sectors in turn are dependent on the development of a distributive sector to bridge the gap between producer and ultimate consumer. In a sense the goods are not fully 'produced' until they reach the hands of the final buyer; new production goals cannot be considered successfully achieved in any viable long-run sense unless firm and continuous contact is made with markets."<sup>1</sup>

The important functions in this process transcend a variety of specialised fields. Goods produced must be processed, stored, transported, financed and delivered in the desired form at the optimum time and place to meet the needs of users. How well these market functions are carried out will determine the contribution of this system to the suppliers, firm or region.

Developing countries must trade (develop markets) or die. Referring to the countries of the Caribbean, W. Arthur Lewis makes the point that in low income predominantly agricultural countries, the rate of growth of the economy is a function of the rate of growth of the agricultural sector. Since no country can

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Collins, N.R. and Holton, R.H., 'Programming Changes in Marketing in Planned Economic Development', Agriculture in Economic Development, McGraw-Hill Book Co., New York, 1964, p.359.

finance all its imports by loans or gifts its survival will in a large part depend upon its capacity to trade effectively.<sup>1</sup>

Today, we associate the growth of trade both in the agricultural and non-agricultural sectors of the Caribbean region as being functionally related to the level of demand in the member countries.<sup>2</sup> This market area (encompassing the eleven governmental units and a diversified group of manufactured and agricultural products) of over four million people is projected to have more than five million people by 1975.

A look at the products which are destined to move through the market channel makes the point quite clear that for the most part, they are high volume and/or low valued products. These commodities are rice, timber, petroleum, sugar, rum, cement and bananas. For such goods there seems to be no real alternative to water transportation. On the other hand, industrial products<sup>3</sup> which are being produced in larger volume in the Region can well be transported by air.

#### Theories Associated with Transportation Choice

It is pertinent to examine the theoretical concern given over the years to the importance of transportation and transportation costs as a basis for trade and thereby a boost to economic growth. In appraising why it is vital that governments should define the development of adequate transportation needs as a priority in the scheme of development I wish to present the following.

The major contribution to this field of Johann Heinrich von Thunen, the earliest of location theorists, is his discussion of the effect of transportation costs on location. He identified weight and distance as the functional elements in determining transportation charges. He saw the original price of a product as the market price minus the transportation charges.<sup>4</sup>

Alfred Weber took a tact slightly different from that of von Thunen. Three general factors affecting location were propounded. These are: (a) transportation cost, (b) labour cost, and (c) agglomerating forces. His less restrictive assumption of more than one consumption center gave broader scope to the analysis of the effect of transportation on location as he maintains that where all costs other than transportation costs are constant, then trade would gravitate to the points of minimum transfer costs for both the raw material and finished product.<sup>5</sup>

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Lewis, W.A., The Theory of Economic Growth, London, 1963, p.278.

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For the benefit of this paper I am using the eleven countries which are members of CARIFTA as my point of reference. These are: Barbados, Guyana, Jamaica, Trinidad & Tobago, and the Leeward and Windward Islands.

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For example, rubber, plastics, clothing and textiles, pharmaceutical and toilet preparations, and electrical products in Jamaica.

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Von Thunen, Johann Heinrich, The Isolated State, trans. Carlan Wartenberg and ed. by Peter Hall, Paragon Press, England, 1966.

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McDonald, V.R., 'Spatial and Structural Analysis of the Marketing of Livestock in Maryland, 1962-67,' Unpublished Ph.D. thesis, Univ. of Maryland, College Park, Md., 1968.

August Losch also in discussing the question of location theory centers his consideration on the minimum total cost -- including transportation of both inputs and outputs as factors in development.<sup>1</sup>

In addition, the effect of transportation costs on the location of plants (markets) is described by Edgar M. Hoover who states that: "For each combination of material sources and markets there must be a point or points at which the total transportation costs involved in assembling the materials and delivering the product to the market are less than they would be anywhere else."<sup>2</sup>

In arriving at the rates to be changed he de-emphasises the importance or the existence of linear freight costs and suggests the use of zone pricing. Again, he says: "Rate schedules are commonly simplified by grouping the points of origin or destination in blocks or zones so that a uniform rate applies over a considerable range of distance. Thus the progression of rates from any one point to successive points along a route resembles a flight of stairs rather than a smooth ramp but is somewhat irregular and becomes less and less steep as it ascends."<sup>3</sup>

The economic integration effort by the eleven member countries of CARIFTA will not be successful unless there is substantial improvement in the means of transportation between them.<sup>4</sup> In reality, a programme to develop both the domestic and intra-CARIFTA members transportation system is necessary. (Certainly, the intra-region trade cannot be improved if adequate internal transportation is not available.) Actually, the problem of the former might demand different kinds of solutions than that of the latter (in one case national and in the other international or regional). Regardless, the inadequacy of transportation facilities is an undisputable general condition of the Area.

#### The Role of Transportation

The transport network must act as a spearhead for the development of new resources towards which the increasing demands of a large population increase can be channelled. In this case the function of the transport lines will be either to make economic the utilisation of resources already known or help in the discovery of new resources.

When two markets, hitherto inadequately linked, are connected with a transport line, they immediately expand their opportunities for larger production, specialisation and economies of scale.

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<sup>1</sup> Losch, A., The Economics of Location, Yale University Press, New Haven, 1954.

<sup>2</sup> Hoover, E.M., Location Theory and the Shoe and Leather Industry, Harvard Univ. Press, Cambridge, 1937.

<sup>3</sup> Ibid, p.22.

<sup>4</sup> Ocean transportation between the members of CARIFTA is carried out mainly by small sloops and by two ships inherited from the defunct Federation. Cargo ships and tramp steamers provide service to these countries but it is questionable whether such service is consistent and dependable.

Transportation to the layman is often seen simply as a method involved in getting people from town to town, city to city or country to country. But in practice transportation is more than that. Transportation supplies the means of bringing together the resources used in the production and marketing processes and to provide access to the markets for the resulting products. In effect, it is the function of transportation to bridge the time and space gaps separating buyers and sellers.<sup>1</sup>

Transportation today is an industry which demands highly skilled technical personnel, and its methods of operation must be subject to constant appraisal and re-appraisal in an effort to provide the kinds of services needed by firms and countries.<sup>2</sup>

The members of the Caribbean countries need to engage in new and improved programmes of marketing and diversification of their economies -- not only in order to strengthen and build up their capacity for exporting to the outside markets but also in an effort to increase all production efforts and promote intra-Caribbean trade.

As indicated, transportation is of basic importance for carrying out programmes of development. Among CARIFTA members there has been some expansion and improvement of means of transportation and communication, but indications are that the present conditions of transportation among CARIFTA countries -- in its new stage of economic development -- leave much to be desired. The emergence of this economic bloc -- given the geographical distribution of these countries -- suggests that interest in the extent to which present air and ocean shipping is adequate for economic integration and especially for increased trade in industrial products must be evaluated.

The concern and interest in transportation needs within the trading bloc cannot be isolated, however, from the concern of these countries regarding their transport connections with the rest of the world. A policy geared towards the satisfying of this dual requirement should be the focus of Caribbean governments. A transportation policy should be established to ensure that all the people of the Region have an opportunity to participate in increases in regional development.

The role of those responsible for transportation planning -- the transportation planner -- is described by Robert T. Brown. He points out: "The importance of space and time to the transport planner is far greater than to planners of other sectors. This is because little is gained from talking of transport in the abstract. Slight use can be made of a transport plan composed solely of national targets of gross ton-miles, for example. A transport plan must deal with specific transport media -- highways, railroads, pipelines ... the transport programme must identify which railroad should be built or abandoned, where a highway should be constructed, and how much capacity is required in a specific port."<sup>3</sup>

Many factors must be taken into consideration in arriving at a decision for

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Pegrum, D.E., Transportation: Economics and Public Policy, Richard Irwin, Inc., Illinois, 1963, p.4.

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Jones, R.E., 'Physical Distribution Management: Functions and Practices', Readings in Physical Distribution, The Interstate Publishers, Inc., 1966, p.31.

3

Brown, R.T., Transport and the Economic Integration of South America, The Brookings Institution, Washington, D.C., 1966, p.3.

the form of transportation to use. Value, volume, distance to be shipped, fragility, location of origin and destination are all important. Given alternatives air and water in the case of intra-regional trade a rational decision of choice must be made. Such a decision should not be based on freight cost only for while the answer is yes, a transportation mode use is a function of the cost of the service, other variables, e.g., warehousing and inventory carrying costs must also be considered.

For example, if a decision is to be made relative to cost of air and water with the intent of transporting a fixed number of units, the most obvious expense would be the freight charge. This at face value would be substantially more for air than water. However, if the speed of the air transportation were such as to permit inventory turnover to be tripled, then the interest on inventory investment would be cut to a third and the warehousing or holding costs would also be substantially reduced. Consequently, while water freight costs would be less than half that of air freight, these other cost centers can pad the total freight bill to the point that air might turn out to be less expensive than water.<sup>1</sup>

Reliable estimate of the cost and efficiency involved in satisfying the transportation needs among countries of the Caribbean is important if marketing plans are to be efficiently carried out.

Several methods of allocation and simulation are possible. The advent of high speed computers have contributed to the ability of regions and individual firms and countries to achieve an equitable system and forecast of shipping and production alternatives which are open to them.

In this example of a linear programming model<sup>2</sup> the Caribbean is divided into eleven (representing members of the Caribbean Free Trade Area) countries with clearly defined boundaries. Each country is assumed to be interested in maximising total exports while minimising the costs associated with such endeavours.

The model is schematised to determine the least cost movement of exports for each country to the remaining ten countries.

A knowledge of (1) the volume of exportable products from each country and (2) the ability of the partners to accept such exports is necessary.

The model assumes then, that the following conditions have been satisfied:

- (a) there is a known level of production in each country and the demand for these products is homogeneous;
- (b) the volume of each importing country's needs is known;
- (c) the cost associated with transporting each unit of product to the respective countries is known.

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<sup>1</sup> Stern, M.E., Marketing Planning: A Systems Approach, McGraw-Hill, New York, 1966.

<sup>2</sup> For an example of the use of linear programming for such a purpose see Brown, Robert T., Transport and the Economic Integration of South America, The Brookings Institution, Washington, D.C., 1966.

The model is further based on the following assumptions: there are  $m$  origins (countries) with  $a_i$  units for export,  $i = 1, 2, \dots, m$ . There are also  $n$  importers; each importer requires a shipment of  $b_j$  units of (exports) input,  $j = 1, 2, \dots, n$ .

The  $a_i$  are called the row requirements and the  $b_j$  are called the column requirements. All row requirements must be positive since zero or negative row or column requirements would be economically meaningless. The sum of the row requirements equals the sum of the column requirements, or we optimise the objective function:

$$Z = \sum_{i=1}^m \sum_{j=1}^n C_{ij} X_{ij} \quad (i = 1, 2, \dots, m; \quad j = 1, 2, \dots, n)$$

subject to restraints of the form

$$X_{ij} \geq 0 \quad (i = 1, 2, \dots, m; \quad j = 1, 2, \dots, n)$$

$$\text{and } \sum_{i=1}^m X_{ij} = a_j \quad (j = 1, 2, \dots, n)$$

$$\sum_{j=1}^n X_{ij} = b_i \quad (i = 1, 2, \dots, m)$$

$$\sum_{j=1}^n a_j = \sum_{i=1}^m b_i$$

where:

$X_{ij}$  = the volume of products shipped from the  $i$ th (export) country to the  $j$ th (import) country

$C_{ij}$  = the cost of shipping each unit from the export to import country

$m$  = 11 (the number of exporters)

$n$  = 11 (the number of importers)

$a_j$  = the volume of the  $j$ th goods imported

$b_i$  = the volume of the  $i$ th goods exported.

The objective of each country is to minimise total transportation costs for all possible export-import patterns. In other words each country wants to minimise its costs where:

$$Z = \sum_{i=1}^{11} \sum_{j=1}^{11} C_{ij} X_{ij} \quad (i = 1, 2, \dots, 11; \quad j = 1, 2, 3, \dots, 11)$$



An advantage of this technique is that we can stimulate alternative patterns by varying our constraints. For example, if transportation cost should increase by say ten per cent from any one of the existing origins then such an impact on present shipping patterns can be determined.

### Proposals

Marketing can serve as a catalytic variable in Caribbean economic development. For these countries to have a take off and achieve sustained economic growth it is necessary that a coordinated regional transportation system be established with the specific objectives to:

- (a) establish the Regions over all transportation needs;
- (b) ascertain the impact of comparative modes (air, water) for inter-country needs;
- (c) ascertain the impact of comparative modes (water, air, motor, rail, pipelines) for intra-country coordinated transportation needs;
- (d) provide a basis for comparison of existing transportation facilities *vis-a-vis* the respective countries;
- (e) establish a distributive sector which permits distribution of the output of primary and secondary industries at the lowest possible cost per unit of product.

The establishment of such a regional body, authorized to improve the Region's transportation needs will be faced with a herculean task but one that is within the realism of achievement.<sup>1</sup> Of necessity the representatives of such a body should be comprised of both private and governmental representatives who have the authority and knowledge of the respective government's programmes and plans such as those of the regional body must dove-tail with those of the respective member governments.

The Region's transportation needs must be viewed in relation to the total economic development and growth of the Area. There should be a detailed transportation survey of the Region; one that establishes the priorities for each method of transport -- such as the giving of priorities to transportation needs of agricultural, manufactured or human needs.

The transport system must be conceived as an indispensable infrastructural investment. One of the essential characteristics of a better transport system is that it should revolutionise the costs of getting commodities to the markets.

Such a transport system must be part of the necessary social overhead outlay, the "infrastructure" necessary to the markets.

Such a transport system must be part of the necessary social overhead outlay, the "infrastructure" necessary for Caribbean development.

Some of the problems associated with such planning requires the resolving of such questions as:

- (a) the choice of modes,
- (b) the portion of public funds that can be devoted to transportation without sacrificing other essential government services;

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<sup>1</sup> See for example the discussion by Bonavia, M.R., The Economics of Transport, who points out: "It is clear from the foregoing that the object of state investment is to secure output of a kind whose private net returns are lower than its social net returns, and which accordingly tends to be less than it would be under ideal conditions." p.49.

- (c) alternative sources of funds, and
- (d) the availability of skilled personnel to carry out planned new programmes.

### Difficulties of Evaluation

Regional economic analysis of transportation needs requires the weighing of economic costs and benefits in order to understand the relationship between the benefits and the alternatives available from other possible investment opportunities.

While the value of a decision is evaluated by its contribution to the aggregate development of the Region it is not a ready measurable phenomenon. It requires an accumulation of data which is vital in considering costs and benefits from the point of view of the regional entity as a whole and not on the basis of the individual territories being studied.

How do we measure the costs and benefits of such an effort? The answer to this is more easily raised than accomplished. The measurement is done in monetary terms although it is difficult if not impossible to quantify some of the variables which are identifiable since they have no explicit market price.

The benefits derived from reduced transport costs are spread over the entire Region -- people and product -- hence, making long-run forecasts hazardous. In addition, many of the benefits are indirect such as the stimulation of the economy from improved transport; and to achieve these benefits other investments are frequently also needed.

A listing of some of these benefits might include:

1. Savings in time for both freight and passenger through:
  - a) frequency of service
  - b) consistency in service
  - c) dependability of service
  - d) greater flexibility
2. Reduced freight and passenger rates
3. Increased comfort and convenience
4. Reduced turn-around time for planes, ships, etc.
5. Better port and railroad facilities
6. Improved warehouse and storage facilities
7. Increased wages
8. Increased per capita food consumption
9. Easier market availability.

### Conclusion

How well such a regional programme will improve the transportation system of the Region is not clear. What is clear, is that inaction on the part of the Region

will only result in its products being marketed under conditions characterised by high costs and less than efficient movement patterns.

Ignoring technological improvements and failing to introduce new techniques of transportation will in the long run penalize producers and shippers, destroy public confidence and adversely affect the economic development of the country and Region as a whole -- hence retarding marketing in the Region.

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