THE INTEGRATION OF LAKE TRANSPORTATION
WITH ROAD AND RAILWAY SYSTEMS:
THE CASE OF THE VOLTA BASIN IN GHANA

by

VIRGINIA EMELIA AKWELE ENGMANN

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF
THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS

in the Department
of
Community and Regional Planning

We accept this thesis as conforming to the
required standard

THE UNIVERSITY OF BRITISH COLUMBIA
April, 1965
In presenting this thesis in partial fulfilment of the requirements for an advanced degree at the University of British Columbia, I agree that the Library shall make it freely available for reference and study. I further agree that permission for extensive copying of this thesis for scholarly purposes may be granted by the Head of my Department or by his representatives. It is understood that copying or publication of this thesis for financial gain shall not be allowed without my written permission.

Department of Community and Regional Planning

The University of British Columbia,
Vancouver 8, Canada

Date April, 1965.
ABSTRACT

The slow rate of development in some of the regions of Ghana, and in fact of the developing countries, is partly due to the lack of adequate and efficient transportation services. The provision of such services is greatly hindered by the excessive competition between transportation modes and the inexpedient allocation of capital resources for transport development. The utilization of the Volta Lake for the purposes of transportation will probably constitute a source of competition to existing modes of transportation, particularly roads. In order to make possible the use of this economical means of transport, ways must be found to integrate lake transport with existing systems, since water transport cannot function efficiently as a separate system. It is hypothesized that an integrated system of road, rail and lake transport can be used as a means of achieving the economic, physical and social objectives for the balanced regional development of the Volta Basin.

In order to evaluate the potential development of transport integration and the possibilities of utilizing integrated transport facilities as a tool for achieving regional development, the concepts of transport integration and transport coordination are defined and reviewed. It is demonstrated that transport integration is concerned with the
employment of each mode of transportation in the economic circumstances best suited to its characteristics. The concept of the region and the process of regional planning and development are also reviewed. The regional unit appropriate to planning in the developing countries is the 'uniform region', which is described in terms of its similar problem characteristics. Regional planning and development have evolved as a means of solving these problems and of ordering the natural and human resources in order to ensure balanced growth. The Volta Basin regional planning unit is determined to be viable for the purposes of development; however, for this study, the region is extended to include the Tamale Area in the north and the Accra-Tema Area in the southeast, because of the tremendous flow of traffic between the two areas.

In order to investigate how Volta Lake transport could be integrated with road and railway systems, the case study approach is used. The principles of integrated transport development utilized in the U.S.S.R., and in the Tennessee Valley Region and the New York-New Jersey Metropolitan Area of the U.S.A. are reviewed. It is observed that an efficient transportation system is considered to be a means of achieving economic, physical and social development in these countries. The principles of transport integration in the U.S.S.R. include joint traffic scheduling, distribution of traffic among the various modes of transportation, rate
structuring and a centralized system of control. A major limitation is the high-cost of transshipment. In the Tennessee Valley Region and in the New York-New Jersey Metropolitan Area of the U.S.A., transport integration is based on the principles of joint rate structuring and containership operations respectively. The use of containers eliminates the problem of transshipment; however, the absence of a coordinating body is a major drawback to transport integration in the Tennessee Valley Region.

On the basis of these principles, a method for integrating Volta Lake transport with road and railway systems is proposed. The sources of potential traffic for Volta Lake transport are examined and it is concluded that there is a demand for a Volta Lake transportation system. The principles of integrated transport development employed in the U.S.S.R., the Tennessee Valley Region and the New York-New Jersey Metropolitan Area of the U.S.A. are considered to be relevant for application in the Volta Basin. The establishment of a Lake Transport Authority to implement integrated transport policies is recommended.

It is concluded that an integrated transportation system will contribute both directly and indirectly to the regional objectives of economic development, the provision of better employment opportunities, a higher level of living, provision of community facilities and services and the rational distribution of settlements.
ACKNOWLEDGEMENTS

Many people have provided their assistance in the development of this study. With particular gratitude, I wish to acknowledge the contributions made by Dr. H. P. Oberlander, Head of the Community and Regional Planning Programme, for his guidance in the initial stages of this study. Many thanks go to Dr. K. J. Cross, of the Programme, for his patience and diligence in going over the first draft and for his constructive suggestions. I also wish to thank Mr. E. Gibson, part-time lecturer in the Programme, for his seminars on Regional Planning which provided an insight into the process of regional planning and development, and its importance to developing countries, including Ghana.

The assistance given by Mr. P. L. Evans, Director of Information, Tennessee Valley Authority, in providing publications on Tennessee River navigation is greatly appreciated. My sincere thanks go to the Town and Country Planning Department of Ghana for their help in contributing written material and maps on the Volta Basin.

Finally, I wish to thank the United Nations for sponsoring my two-year planning programme at the University of British Columbia.
TABLE OF CONTENTS

ABSTRACT ii

TABLE OF CONTENTS v

LIST OF TABLES ix

LIST OF FIGURES x

ACKNOWLEDGEMENTS xi

CHAPTER:

I. THE PROBLEM OF TRANSPORT INTEGRATION IN GHANA 1
   A Statement of the Problem and its Importance in Ghana 2
   Statement of the problem 2
   The significance of the problem to Ghana 7
   The Concept of Transport Integration 14
   Defining the principle of transport integration 15
   The need for transport integration 17
   The Need for Planning for Balanced Regional Development in Ghana 21
   Dual economy and differential rates of growth 21
   Balanced regional development 24
   The Hypothesis 27
   Summary 27

II. THE VOLTA BASIN AS A REGION FOR PLANNING AND DEVELOPMENT 30
   The Regional Concept 31
<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>The region as viewed by social scientists</td>
<td>31</td>
</tr>
<tr>
<td>Planning regions</td>
<td>33</td>
</tr>
<tr>
<td>The regions of Ghana</td>
<td>37</td>
</tr>
<tr>
<td>The Process of Regional Planning and Development</td>
<td>43</td>
</tr>
<tr>
<td>The concept of regional planning and development</td>
<td>43</td>
</tr>
<tr>
<td>Regional planning in Ghana</td>
<td>46</td>
</tr>
<tr>
<td>The Background of the Volta Basin</td>
<td>51</td>
</tr>
<tr>
<td>The geography of the Volta Basin</td>
<td>52</td>
</tr>
<tr>
<td>The economic base</td>
<td>54</td>
</tr>
<tr>
<td>The resources</td>
<td>57</td>
</tr>
<tr>
<td>Transportation facilities</td>
<td>58</td>
</tr>
<tr>
<td>Population and settlement</td>
<td>61</td>
</tr>
<tr>
<td>Evaluation of the Region of the Volta Basin as a unit for Planning and Development</td>
<td>64</td>
</tr>
<tr>
<td>Summary</td>
<td>68</td>
</tr>
<tr>
<td>III THE PRINCIPLES OF INTEGRATED TRANSPORT DEVELOPMENT IN SELECTED COUNTRIES</td>
<td>71</td>
</tr>
<tr>
<td>The U.S.S.R.</td>
<td>72</td>
</tr>
<tr>
<td>Soviet transportation policy</td>
<td>72</td>
</tr>
<tr>
<td>Basic types of transport in the Soviet Union</td>
<td>76</td>
</tr>
<tr>
<td>Principles of integrated transport development</td>
<td>82</td>
</tr>
<tr>
<td>Administrative framework for integrated transport operation</td>
<td>89</td>
</tr>
<tr>
<td>CHAPTER</td>
<td>PAGE</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>The implications of integration for application in Ghana</td>
<td>91</td>
</tr>
<tr>
<td>Summary</td>
<td>94</td>
</tr>
<tr>
<td>THE U.S.A.</td>
<td>96</td>
</tr>
<tr>
<td>The transportation policy of the U.S.A.</td>
<td>96</td>
</tr>
<tr>
<td>Elements of transportation in the U.S.A.</td>
<td>100</td>
</tr>
<tr>
<td>Principles of integrated transport development in the Tennessee Valley Region</td>
<td>108</td>
</tr>
<tr>
<td>Principles of integrated transport development in the New York-New Jersey Metropolitan Region</td>
<td>115</td>
</tr>
<tr>
<td>Administrative framework for integrated transport operation</td>
<td>120</td>
</tr>
<tr>
<td>Implications of integration for application in Ghana</td>
<td>121</td>
</tr>
<tr>
<td>Summary</td>
<td>123</td>
</tr>
</tbody>
</table>

IV APPLICABILITY OF THE PRINCIPLES OF INTEGRATION TO THE VOLTA BASIN 126

Regional Planning Objectives for the Integrated Development of the Volta Basin 127

The Demand for Integrated Transport Facilities 130

Potential traffic for the Volta Lake transportation system 131

Transport integration in the Volta Basin 142

Administrative Machinery for Integrated Transport Operation 149
<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated Transport and Volta Basin Development</td>
<td>151</td>
</tr>
<tr>
<td>Summary</td>
<td>158</td>
</tr>
<tr>
<td>V. SUMMARY AND CONCLUSIONS</td>
<td>162</td>
</tr>
<tr>
<td>Summary</td>
<td>162</td>
</tr>
<tr>
<td>Evaluation of the Concept of Transport Integration and its Use as a Means of Achieving Balanced Regional Development in the Volta Basin</td>
<td>172</td>
</tr>
<tr>
<td>Conclusion</td>
<td>175</td>
</tr>
<tr>
<td>BIBLIOGRAPHY</td>
<td>177</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>TABLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Percentage of Population by Size of Settlement, Volta Basin</td>
</tr>
<tr>
<td>II</td>
<td>Percentage Distribution of Traffic in the Soviet Union</td>
</tr>
<tr>
<td>III</td>
<td>Composition of River Traffic (1956) in the Soviet Union</td>
</tr>
<tr>
<td>IV</td>
<td>Estimated Annual Tonnage of Freight Through Lake Volta Ports, 1970</td>
</tr>
<tr>
<td>V</td>
<td>Estimated Total Freight at Major Crossings (1962), Volta Basin</td>
</tr>
<tr>
<td>VI</td>
<td>Location of Planned Agricultural Development, 1963 - 1970, Ghana</td>
</tr>
<tr>
<td>VII</td>
<td>Lake and Road Distribution of North-South Freight Transport Requirements Resulting from Increased Agricultural Production in 1970, Volta Basin</td>
</tr>
<tr>
<td>VIII</td>
<td>New Local Traffic Generated by Lake Volta Community Development, 1970</td>
</tr>
<tr>
<td>IX</td>
<td>Summary of Total Capital and Annual Costs for Alternative Systems, Volta Basin</td>
</tr>
<tr>
<td>FIGURE</td>
<td>Title</td>
</tr>
<tr>
<td>--------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>1.</td>
<td>Railway and Road Network in Ghana</td>
</tr>
<tr>
<td>2.</td>
<td>Extent of Volta Lake and Planning Region</td>
</tr>
<tr>
<td>3.</td>
<td>Administrative Regions of Ghana</td>
</tr>
<tr>
<td>4.</td>
<td>Geographical Regions of Ghana</td>
</tr>
<tr>
<td>5.</td>
<td>Transportation Facilities and Ports in the Volta Basin</td>
</tr>
<tr>
<td>6.</td>
<td>Principal Phases of the Unified Transportation System</td>
</tr>
<tr>
<td>7.</td>
<td>The General Method of Distribution of Traffic and of Equipment among Various Forms of Transportation</td>
</tr>
<tr>
<td>8.</td>
<td>The Scheme of Joint Traffic Schedules</td>
</tr>
<tr>
<td>10.</td>
<td>Physical Integration of Volta Lake Transportation with Road and Railway Systems</td>
</tr>
<tr>
<td>11.</td>
<td>Schematic Presentation of Types of Regions that can Exhibit Different Growth Potentials</td>
</tr>
</tbody>
</table>
CHAPTER I

THE PROBLEM OF TRANSPORT INTEGRATION IN GHANA

Transportation is the movement of persons, property, and goods, from one place to the other. It is the link between people and their social and economic organization and its main function is to relate population to land use. Throughout history, man has often settled along arteries of transportation and there the growth of communities has occurred. Although advances in technology have made available a wider choice of transportation media, the function of transportation has been equally vital to both primitive and civilized man.

Transportation has been and is today considered an essential factor of life. Much of the history of civilization has been shaped by transportation since it has permitted the potential values of natural resources to be realized. Transportation facilities have unified many nations socially, economically, and politically and have contributed to broaden the cultural and other aspects of these nations. So vital is the role of transportation in the development process that no scheme of national or regional development is complete unless due regard is given to the significance of transportation.
It is doubtful if the anticipated growth of the economy of a nation can be satisfactorily achieved without due attention being given to the effective development and better utilization of the nation's transportation resources. Efficient production and distribution, effective use of resources and other measures contributing to economic and social development depend significantly on how well the transportation system performs its supporting function. Transportation's role in contributing to vigorous economic growth or more desirable living arrangements is a positive one.

1. A STATEMENT OF THE PROBLEM AND ITS IMPORTANCE TO GHANA

Statement of the problem. The need for transportation has arisen from the uneven distribution of physical, economic and social resources on the earth's surface. The unequal distribution of physical and economic resources is expressed in differences in the physical characteristics of the soil and sub-soil and its mineral content, differences in topography and differences in the kind, quality and quantity of commodities produced in the different regions of a country. This has greatly influenced the distribution of population. With people settling in areas where they can best satisfy their material needs, both developing and
industrialized countries are faced with the problems of areas of population congestion, areas of declining population and also problems of areas of economic and social backwardness.

The natural resources of a nation have little value unless developed for human use. Goods must be transported from areas of production to places where they are needed; and people must be carried from one activity to the other. Transportation has therefore been used as a means of overcoming physical space. In economic terms, each space for production and living has one or more other locations to which it is related. Such locations have become focal points for diverging and converging movements. Although each location has distinguishable functions, it is generally joined with the others to provide for a larger spatial range of economic activities. In most countries, there is also the objective of using transportation as a means of evening out and raising the standards of economic and social prosperity. Transportation has therefore come into existence not only as a means of overcoming the distance between two localities but also as an instrument for achieving other objectives.

In the developing countries, transportation is rarely desired for simple convenience. It is often developed with other objectives in view. These objectives may include the exploitation of natural resources, the increase of agri-
cultural production, the increase of industrial activities, the improvement of urban amenities and raising of living standards. The degree to which these developmental aims can be achieved is generally determined by the efficiency of the transportation system. This, in turn, depends on how well transportation facilities are integrated to provide a fast and improved service, lower transportation costs, and maximum utilization of transportation resources.

The regional planner is inescapably concerned with transportation planning. Transportation facilities are always related to the land and have a setting in spatial relationships. About 30 per cent of the developed land of an area is devoted to transportation. It therefore competes with other activities for land. In addition, transportation to a large extent, determines the use of land and the density of development. Transportation facilities have a direct impact on adjacent land uses and on the ways in which settlements develop in regional patterns. At the same time, the kind and amount of traffic generated and the types of transportation facilities required are dictated by the land uses.

The role of the regional planner in transportation planning is dictated by the above considerations. The provision of efficient, safe and economical transportation facilities and services must be one of his primary aims. The planner must be able to visualize the transportation
industry as a whole and in a comprehensive manner. Due regard must be given to both passenger and freight transport, to inter-regional and intra-regional transport, to rail, road, water, and air transport. Above all, transportation planning needs to be coordinated with land use planning because of their inter-relationships.

Each mode of transportation plays an important role in the transportation industry. The services offered vary from one system to another. Competition among the different modes of transportation hinders the realization of these services and the efficient functioning of the transportation system. In order to achieve an optimum utilization and a maximum efficiency of the transportation facilities of a country, it is necessary to integrate these facilities.

Integration assumes the usage of two or more modes of transport in the movement of a shipment or a person from point of origin to point of destination. It may be argued that developing countries do not have the pressing need for transport integration since there is no over-supply of transport services. This does not, however, mean the absence of competition between different means of transportation for traffic. On the contrary, competition has been and it still is acute in the developing countries despite the overall deficiency of facilities.

Developing countries are not only faced with the problem of how to make the best use of existing transportation
services; they are also faced with the problem of planning for expanded transportation services. The rate of physical, economic, and social development of these countries can be summed up in the following phrase: "availability of an efficient transportation system."

In industrialized countries, like the United States of America and Russia, integration of transportation has been given much attention. It has been the national policy of these countries to integrate transportation services, that is to fit them together in a systematic way in order to make use of the respective function of each in the transportation system. The need for transport integration is not a new proposition. It has, however, attained greater primitiveness in recent years because of the development of a variety and competing modes of transport. The means of implementing this policy vary from country to country, depending on such factors as the political system, transportation objectives and policies, and transportation administration.

The importance of the principle of transport integration has been accepted by many countries, such as Britain, Hungary, Russia, the United States of America, and Burma. It has been realized that in a complex society, "no single system of transportation can provide for all the movements involved."\(^1\) Integration of transport systems is therefore

---

required.

The significance of the problem for Ghana. In order to put into perspective the problem of transport integration in Ghana, a brief analysis of the development of transportation, as it relates to this problem is necessary. Many factors have influenced transportation development in Ghana. Some of these factors have proved more significant than others. The result has been a concentration of transportation facilities in the southwestern and southeastern sections of the country, around Kumasi in the Ashanti Region and a relative lack of transportation facilities in the Northern Region and parts of the Volta Region, as shown in Figure 1, on page 8.

"Head porterage" was the earliest means of transport in Ghana. Before the advent of railways and later, motor transport, there was no alternative means of conveyance except for the limited use of the Ankobra and Volta Rivers.

The beginning of the twentieth century, saw the construction of a railway line to Kumasi. "This and the subsequent rail development came from the need to link internal areas of potential agricultural and mineral production to world markets, and potential Ghanaian markets to external areas of production."\(^2\) Internal trade grew in

FIGURE 1
RAIL AND ROAD NETWORK IN GHANA
foodstuffs to supply the mines and the growing urban centres.

The importance of railways in the development of the country was not apparent, until the introduction of the motor car, which extended the hinterland of the railways to include the remote areas. Road access to towns and little villages meant more rail shipments. Rail and road relationship changed after the second world war, when roads assumed the capacity of a primary transportation facility. Competition between rail and road was initiated at this period. The continuation of this conflict is a reflection of the persistence of the functions of railways and roads as independent distribution systems.

Roads were built in certain areas paralleling railways, which consequently lost traffic to road transport. Railways were forced to become the carriers of bulk ores and timber only. The absence of control and regulations which might curb this "wasteful" competition, or which might ensure a healthier competition between the different modes of transportation, made it impossible for the early realization of the importance of rail transport. Today, only a small section of Ghana is served by railways, as illustrated in Figure 1 on page 8.

The whole of the Volta Region as well as parts of Ashanti and the Western Region are still entirely dependent on road transport. Although road transport has contributed
greatly to the opening up of the country, it cannot alone satisfy transportation requirements of the areas mentioned. More transportation facilities need to be provided, however this may aggravate the "transportation problem". Planning must envisage the problems mentioned above and attempts should be made to eliminate them.

Water transport has suffered a worse fate than rail transport. In contrast with the growing significance of rail and road transport today, water transport has greatly declined. Early water transportation followed the historical north-south alignment and traffic along the Volta River consisted mainly of salt carried by canoe to the vicinity of Salaga, in the Northern Region.

At the beginning of the century the high costs of road transportation increased the need to develop water transport. Attempts were made to develop the Volta as a trade artery. The transportation of foodstuffs from Ada to Longoro, was one of the major attempts made; but the prolongation of the journey due to the presence of rapids led to the abandonment of this policy. The rapid development of road transport as a result of the cocoa industry, perpetuated the decline of water transport. At present, there is little movement of passengers and commodities on the Volta above Akosombo.

Many factors account for the decline of commerce along the Volta.
"The first is the existence of natural impediments in the water; for example sand bars and rapids and also stage fluctuations in the level of water in the Volta. Secondly, no real effort has been made so far to provide navigable channels along the courses of the river. Lastly, the population, industrial and commercial activities have been scattered and their needs for outside goods have been served by trucks at a few points."  

The revival of water transport is, however, anticipated with the completion of the Volta River Project. The project is a multi-faceted scheme involving the mining of bauxite; its reduction to alluminum using power from the H. E. P. development on the Volta River; the irrigation of a part of the Accra Plains; the improvement of transportation; and the provision of power for urban and industrial uses. The Volta Lake which will be formed as a result of the Volta River Project will cover an area of 3275 square miles; it will have a length of 250 miles and a width of 25 miles. Figure 2 on page 12 shows the extent of the Volta Lake.

The creation of the Volta Lake will open up large areas of the Northern and Eastern Sections of Ghana, which were formerly inaccessible. These areas will be developed in the near future for the purposes of human settlement and for the purposes of agricultural and industrial activities. The utilization of the Volta Lake for the purposes of transportation "will be necessary to handle passengers, the export

---

FIGURE 2
EXTENT OF THE VOLTA LAKE AND PLANNING REGION
of products from the region, the import of raw materials to serve the local industries in the region and to serve as a link in cross-country shipping.\(^4\)

The use of the Volta Lake for transportation purposes is likely to pose problems of competition with existing highways and railway systems, which have been the dominant means of inland transportation. The greatest impact and effect of this problem will be felt in the Volta Basin - the logical sphere of influence of the Volta River Project. The need to improve the economic, social, and physical aspects of the region, calls for ways and means of ensuring an optimum utilization of the overall transportation resources of the region. The lack of good transportation facilities has been a major factor in hindering the development of the Basin.

The scope of the thesis embraces an investigation into the possibility of employing an integrated transportation system as a means of promoting the regional development of the Volta Basin. The investigation includes a review of the principle of integration, a description of the concept of a region, the concept of regional planning and development and an evaluation of the viability of the 'region' of the Volta Basin as a unit for planning and development and for transport integration. Because integration has been

\(^4\)Ibid., p. 3.
achieved in different ways by different countries, case studies have been chosen from Russia and the United States of America, to illustrate the principles of integration; these principles are then applied to the Volta Basin; and finally the type of growth that might occur in the Volta Basin with the introduction of integrated transportation facilities is described.

The study is based on the assumptions that:

1. Inter- and intra-regional traffic will increase to the extent of warranting the use of the Volta Lake as well as the provision of rail and more road facilities in the Basin.

2. Volta Lake transportation, when it is provided, will be utilized for the transportation of both goods and persons.

II. THE CONCEPT OF TRANSPORT INTEGRATION

It is difficult to define in concrete terms the principle of transport integration. Transport integration and transport coordination have been used interchangeably by some authors while others try to distinguish the differences between them. While these differences are not clear-cut, they are important in comprehending the process of integration. An attempt is made in this section to identify
and define the several meanings of the terms "transport co­
ordination" and "transport integration" and what they imply.

Defining the principles of transport coordination
and transport integration. The International Labour Con­
gress at its fourth session in 1951, defined transport co­
ordination as the "harmonious combination of agents of
functions towards the production of a result,"\textsuperscript{5} in other
words, "to organize transport --- in such a way as to
provide the required services, as economically, efficiently
and uniformly as possible, to facilitate trade and reduce
the cost of goods carried."\textsuperscript{6} It further defined coordina­
tion as:

The regulation and ordering of transportation
safeguarding and encouraging the development of
the same in conformity with technical and econo­
mic potentialities without allowing the free
expansion of one at the expense of the other.\textsuperscript{7}

M. W. Fair and E. W. Williams in their book en­
titled "Economics of Transportation", defined coordination
as "the placing of separate units in such a position as to
permit the establishment of a harmonious relationship among
them."\textsuperscript{8}

\textsuperscript{5}International Labour Organization. \textit{Coordination
of Transport Labour Problems} (Genoa: International Labour

\textsuperscript{6}Ibid., p. 14.

\textsuperscript{7}Ibid., p. 13.

\textsuperscript{8}Fair, M. L., and Williams, E. W. (Jr.). \textit{Economics
of Transportation} (New York: Harper and Brothers Publishers,
The above definitions presuppose a multiplicity of units. Emphasis is on the organizational rather than on the functional aspects of this relationship. Coordination may be achieved within the same system of transportation. Railroads in the United States of America were the first to realize the need to coordinate; because as their numbers increased and as they attempted collectively to provide service to an extended market, they were compelled to find means of coordinating their operations.

Integration, as distinguished from coordination,

"refers to the systematic arrangement of the modes of transportation in a given area in accord with the economic fitness of each mode - - - - - integration may be a goal of a public agency or a private carrier system in a program of developing each mode in its logical place. Integration is thus employing the principle of efficiency in transportation planning and adjustment."9

Integration, as defined, involves the differentiation of the functions of each mode of transportation and its employment where it can best serve the public interest. This means that each mode of transportation is used in the economic circumstances best suited to its characteristics. Integration therefore embraces more than one system of transportation. It cannot take place within a single system of transportation; the existence of more than one system of

9Ibid., p. 659.
transportation is a prerequisite to the successful implementation of a policy of integration.

Although the objectives and purposes of integration and coordination may be identical, there is a difference in emphasis and the scope involved.

The need for transportation integration. The fact that various means of transportation possess certain advantages and limitations for the movement of particular types of traffic, provide the basis for integration. Today complementary facilities find themselves in competition with each other. The growth of competition within the transportation industry has destroyed the functional relationships that could have existed between carriers.

Competition has been the core of the "transportation problem" facing many countries today; it means the duplication of administration, and operation at high cost, the duplication of facilities and the utilization of costly services. Transport integration has been posed as the solution to this problem.

The characteristics of a carrier affect the type of commodity which can most suitably be moved by it. Water transport has been characterized by its low cost and its ability for long distance bulk transportation. Inherent in water transport are numerous handicaps; these are often overshadowed by its great advantage of economy. Among these
handicaps is its slowness and general dependence on rail and road transport to complete a haul. Steamships can only load and unload at ports. Transport to and from inland points can be served only by other modes of transportation. Water transport is thus mutually linked with land transportation; the encouragement of competition between these destroys this interdependence.

Railways, like water carriers, require a large capital outlay for terminal facilities; most of this capital outlay is fixed and invariable, whatever the amount of traffic carried. Consequently, costs per unit of traffic decrease with increasing traffic volume. The economic and efficient functioning of rail transport necessitates the optimum utilization of its capacity.

The advantages of rail transport as opposed to road transport, for instance, lie in its ability to consolidate a number of carrying units into one train; and in its ability to handle raw materials of industry and bulky or heavy articles which pass in quantity. On the other hand, rail transport is handicapped by the fact that it can provide services only at particular points and has to depend on motor transport for the distribution of goods and persons from terminal to destination.

Road transport presents a different picture to that of rail and water transport. The adaptability and
flexibility of motor transport sets it apart from other modes of transportation. Road transport is not fixed to one route, and accessibility can be obtained where there is a road of some sort, improved or unimproved, over which to operate. The operations of motor carriers are flexible and adjustable because they use the public highways in which they have no investment. Operations can thus be shifted from one route to another without any loss of funds invested in fixed facilities. As a result, road transportation services can be started with relatively little capital and can be successfully operated, where traffic volume would not be sufficient to support a railway.

This broad adaptability applies in still another way. The motor vehicle, both in freight and passenger service, lends itself to the satisfaction of an unlimited variety of needs. It provides door-to-door service and fast transportation is obtained to the exact destination required. The shipper, who uses commercial motor freight, enjoys frequency of scheduling because of the flexibility of its timetables. Terminal handling and operations are avoided. Owing to this reduced handling, fragile articles are less likely to be damaged when sent by road, and packing costs are greatly reduced.

The characteristics of different types of carrier reveal the fact that the services they provide are complementary. The provision of rail or water transport facilities
is not complete without a connecting highway system. The provision of joint services by complementary carriers is the beginning of transport integration. It is exemplified in all transport arrangements for the through movement of traffic by road and rail, by rail and water, and by water and road. The minimum requirement for integration, in this respect, is the location of facilities for the transfer of people and commodities. The better provided it is with cost reducing and expediting facilities, the higher the degree of integration.

Technological advancement has placed before man a variety of transportation media. This has created the need for fitting them together into a systematic arrangement, and of forming a coherent whole from the constituent parts. Under this arrangement, it will be possible to assign each facility to those transport tasks for which it is best suited. A compromise will then be attained between monopoly and competition; such as will provide an optimum service at low cost. Since transport integration involves a variety of interests and policies, certain compromises may be required. However, the public interest should guide integrated transportation policies and not the maximization of profit.
III. THE NEED FOR PLANNING FOR BALANCED REGIONAL DEVELOPMENT IN GHANA

The origins of the problems that developing countries have to contend with are far from recent. These problems have, however, gained a wider recognition, importance and urgency and are by no means restricted to the "transportation problem". The trend of growth in these countries has been considerably influenced by former colonial policies. The outcome has been an emphasis on the development of the agricultural sector to the exclusion of the secondary sector of the economy. As a result of this type of development policy, the income and standard of living of the people is low. In order to solve this problem, most developing countries have embarked on a policy of industrialization and a policy of diversifying their economic base as a means of achieving social objectives.

**Dual economy and differential rates of growth.** A system of "dual economy", which is the co-existence of two types of economic systems - an exchange economy and a subsistence economy has developed in Ghana. The exchange sector forms an integral part of the world economy, and has been relatively well developed. In sharp contrast, is the subsistence sector, which produces for family and local consumption and sometimes it remains completely isolated from the market
economy. The two sectors are marked by unequal levels of living. The gap between these two sectors will increase gradually if the imbalance is not redressed.

Dualism implies a divergent pattern of economic growth among the various sections of the country, with the less developed areas depending on the developed areas. This means an overconcentration of economic and other activities in a few large cities, and the neglect of other areas. These large cities receive most of the investment for development. Ultimately, a situation of substantial diseconomies will develop as the cities become too congested and rents and the costs of urban services greatly increase. Dualism has resulted in the limitation of the available market because of the absence of a high purchasing power in a larger section of the country and the flight of capital to the already developed areas.

Physically, there is an apparent disparity in the distribution of cities, towns and villages and in the distribution of transportation and other facilities. Urbanization has progressed more in the south than in other areas in Ghana. Cities and towns of 500,000 and 50,000 population and over, respectively are all located in the southern section of the country. The Northern and Volta Regions contain settlements of 5,000 population or less. This pattern is closely related to the pattern of transportation development,
to the provision of urban and social amenities, and to the availability of employment opportunities. The concentration of urban development has led to the domination of the social, economic and political life of Ghana by Accra and to a lesser extent by Kumasi. These "primate" cities, which are larger in size than any other settlement in the country have functioned to restrain the development of the country as a whole, as well as to hinder the development of other areas. These cities have thus contributed to the existence of poverty in areas such as the Volta and Northern Regions.

Owing to poor economic conditions as well as poor social conditions in the Northern and Volta Regions, there has been a gravitation of population to the south. Here they are able to obtain employment mostly as labourers on cocoa farms, in mines or on road works. Consequent upon all this, have been the congestion of population in the southern section, the further development of this section at the expense of other sections, and the widening of the gap between the developed and the less developed sections.

One of the means of bridging this gap and of counteracting this unequal rate of growth is through a program of balanced development of the economic, physical, and social aspects of all the regions of Ghana. Although planning can be done on the national level, the national spatial unit is usually too large, too differentiated internally, and too far
removed from the local scene to provide for an effective framework for local planning and development. On the other hand, the urban area is too small a unit for the effective planning of development. The region has therefore evolved as an intermediate level employed in planning for development.

**Balanced regional development.** The purpose of regional development may be defined as the achievement of "progress toward the goal of higher economic standards of living by putting the resources of an area to work to provide a better life for the inhabitants."\(^{10}\)

The concept of regional development is all-inclusive in that it embraces all the aspects of the economy of an area. Essentially, it implies the making of decisions in the light of an understanding of the future of the area concerned. This means an understanding of the direction of economic trends and a knowledge of the impact and ramifications of these decisions on the progress of the area as a whole. Thus regional development can ensure that communities develop along certain sound lines; and can prevent mistakes in location or development, which because of their uneconomic nature, may prove costly both to industry and to the community.

The development of the physical, social, and economic aspects of a community cannot be done on an ad hoc basis. It must proceed simultaneously and in relation to each other, since development of one aspect of a community has its repercussions on other aspects. The concept of balanced development, as used in this paper, means an appropriate relation between economic, social and physical factors. In this relation, each factor is given due attention in the total complex.

In the process of balanced regional growth, economic development often receives a greater emphasis than other factors, because it determines to a considerable extent the social well-being and the physical growth of an area. The location of industries within a region has contributed to the improvement of the standard of living of the local inhabitants, to the provision of more employment opportunities, and to the location of urban settlements.

The balanced regional development of the Volta Basin is a desirable step toward an integrated economic, social and physical system for Ghana. Not only will it be a means of easing the population pressure in the south and of disseminating economic and urban activities, but it would also be a means of implementing the policy of providing a better life for the people of Ghana. The development of the various regions of Ghana cannot be divorced from the notion
of specialization and the division of labour. Each region should be developed with reference to its natural and potential resources and as part of an overall national system. The degree of interdependence between the regions and the degree of development within regions will depend largely on the efficiency of the transportation system. Transportation thus makes regional specialization possible; and the planning of facilities for movement within and between regions has become important to regional planning.

The provision of adequate transportation facilities has often provided the framework for detailed regional planning and development.

One of the steps toward the achievement of balanced regional growth and toward the spatial integration of activities is therefore the creation of inter- and intra-regional systems of transportation. The overall development of the Volta Basin will be greatly retarded if adequate and economical transportation facilities are not provided. Location theory points out that for the optimal choice of a site for economic development, total transportation costs must be minimized. The reduction of transportation costs would provide a means of creating a favourable climate for investment and development in the Volta Basin. Since the use of the Volta Lake would offer a cheaper means of transportation than existing means of transport, and since water transport
cannot function as a separate system, it is necessary to integrate the Volta Lake transportation system with other systems, particularly railways and highways. The achievement of this objective would ensure the mobilization of the resources of the Volta Basin - including the remote areas not served by transportation facilities, better employment opportunities, a higher standard of living and a better distribution of settlements.

IV. THE HYPOTHESIS

The hypothesis of this paper is that an Integrated System of Railway, Road and Lake Transportation would contribute towards the achievement of the Balanced Physical, Economic and Social Objectives for Development of the Volta Basin; Ghana.

Summary. Transportation has been defined as the movement of persons, property, and goods, from one place to another. Its main function is to relate population to land use. The need for transportation has arisen because of the uneven distribution of resources on the earth's surface. These resources have little value unless they are developed for human use. Goods must therefore be moved from the areas of production to the areas of consumption; people must also be carried from one activity to the other. Transportation
has thus developed as a means of overcoming physical space, although developing countries have used it as a means of achieving other objectives. The degree to which these objectives are achieved depends on how well the transportation facilities have been integrated.

Transport integration, as distinguished from transport coordination, is concerned with the differentiation of the functions of each mode of transport and its employment where it can best serve the public interest. It is considered a solution to such problems as excessive competition and duplication of facilities, which face the transportation industry today. In Ghana, competition between the different modes of transport led to the early decline of water transport and the utilization of rail transport in the southern section of the country only. The revival of water transport as a result of the utilization of the Volta Lake for transportation purposes, is likely to pose further problems of competition with existing rail and road systems, which have been the major means of inland transportation. The need for economical means of transport in the development of the Volta Basin and the mutual interdependence between these modes call for ways and means of integrating the Volta Lake Transportation System with road and railway systems.

The development of a "dual economy" in Ghana has resulted in a divergent pattern of economic growth among the various sections of the country, with the less developed
areas depending on the more developed areas. Consequently, economic and other activities have been concentrated in a few large cities to the neglect of other areas. The provision of integrated transport facilities would help to bridge this gap and to counteract this unequal rate of growth. The process of development in such backward regions as the Volta Basin and the Northern Region should be a balanced one, in that the physical, social, and economic aspects of the regions should be given due consideration; since development in one aspect has its repercussions on other aspects.
CHAPTER II

THE VOLTA BASIN AS A REGION FOR
PLANNING AND DEVELOPMENT

In the previous chapter the problem of transport integration and the need for integrated transport facilities as a means of achieving regional development in Ghana have been examined. A policy of regional planning and development must be implemented within a spatial framework and within the limitations of economic resources and political expediency. Both regional planning and regional development have been connected with the regional concept, which has been defined variously by the different disciplines, such as geography and sociology. However, the region has been accepted as a tool for analysis and for research purposes; in planning, it is considered as a logical and practical unit for facilitating certain desired national programs. On this premise, it is necessary to examine and define carefully the regional concept and its application to Ghana; to analyse the process of regional planning and development in Ghana and to evaluate the viability of the Volta Basin as a 'region' for planning and development.
I. THE REGIONAL CONCEPT

The word 'region' has often been used synonymously with the word 'area'. Thus employed, its meaning becomes indefinite and can be applied to a community, city, district or any other spatial unit of a country. A vagueness of meaning has developed which regional scientists have tried to remedy. Despite their efforts, a number of definitions have been derived, depending on the functions for which the region is defined. To some, the region has been considered as an area having certain cultural and physical attributes which set it apart from other regions. To some, the concept of the region has been developed as a means to an end.

The region as viewed by social scientists. The available definitions of the region can be grouped under two main categories. The first category identifies a region as a grouping of a number of unique elements. These elements may be physical or human elements or both. It is essential, however, that they exhibit considerable homogeneity and unity. Under this category a 'region' may be defined as:

Any one part of a national domain sufficiently unified physiographically and socially, to have a true consciousness of its own customs and ideals and to possess a sense of distinction from other parts of the country.11

---

In practical terms, such a region facilitates the classification of data for analytical and descriptive purposes. Out of this concept have emerged a number of regions, such as the agricultural, climatic, cultural, industrial and other types of regions. A multitude of regions may be defined depending on the factors used to measure them. It may be added that such 'single-factor' or proto-regions cease to exist once other factors come into play. They are only valuable where specialized data are being considered.

The second category deals with regions as dynamic units. Geographers and social scientists often see the region as an area of interaction and constant change, resulting from attempts to solve environmental and human problems. Thus the region is "an area within which the combination of environmental and demographic factors have created a homogeneity of economic and social structure."12 Viewed in this light, the region is a 'multi-factor' area measured in terms of several phenomena. It always exhibits a correlation between physical and human factors and expresses both natural and cultural differentiation from other regions.

Other regions include administrative regions which have been developed for administrative purposes. They have come into being because of administrative convenience rather than because of any innate qualities they might possess.

12Ibid., p. 142.
Their boundaries are usually arbitrary and artificial since they are drawn irrespective of existing human and sometimes physical factors. They often cut across trade routes and divide ethnic groups in such a way that one ethnic group finds itself under the jurisdiction of two different countries.

**Planning regions.** There have been differences in opinion as to methods for identification, description and measurement of functions of regions for planning purposes. It has, however, been realized that although the types of region identified above should not be ignored, they may not be the most appropriate areal divisions for the planning purposes at hand. The difficulty of defining a specific region which may suit all planning purposes has long been realized. Ginsburg, in his article on "The Regional Planning Concept and Planning Regions," points out that the determination of planning regions must be based on a consideration of the purpose, scale and process of planning.

The purpose for which planning is being undertaken may dictate the use of different regions or a system of regions at the various stages of the planning and implementation process. The importance of the scale of planning lies in the fact that planning can be done in areas varying in size from a small village to a nation state and beyond.

---

Since economic development has been the goal of many developing countries, the need has arisen of implementing these national goals throughout the country. Since the national unit is generally too large for practical reasons and for the purposes of fulfilling the above need, and since the urban area is too small a unit for effective planning, the planning region has been used as a means of implementing national and local planning objectives. The process of planning also has considerable influence on the size and type of region employed for planning purposes. Regions are not static units, they are subject to internal and external forces such as political decisions and market forces which may cause changes within the regions themselves. The improvement of transportation and communication linkages between two areas will provide opportunity for such close interaction that they cannot be considered separately for planning purposes. A broader region must therefore be defined. There are no hard and fast rules about the determination of planning regions. The concept of the planning region demands a flexible attitude towards its definition. It is necessary, however, to establish:

regions of maximum distinctiveness — to set up the largest valid regions for specific purposes which do not average out significant differences.14

The regional planner is often left with a choice between nodal and uniform regions. The nodal region has been defined as the area influenced by a center or focal point; it is the focal point and its hinterland that constitute the nodal region. The growth of cities, particularly, in western countries, has led to the development of urban hierarchies, which range in size from the metropolis to the small urban settlement. The metropolitan region is thus usually comprised of a large urban agglomeration serving a vast nodal region, which includes a hierarchy of settlements and smaller nodal regions. To this region the metropolitan area provides services and acts as a market for the products grown in the region. The linkage between the metropolis and its surrounding area is provided through a regional transportation system.

The extent to which the metropolitan region has been adapted for planning and development has been negligible. Metropolitan planning often tends to focus attention on the metropolitan or urbanized area of the metropolitan region, in the attempt to solve such problems as traffic congestion which are associated with the concentration of people. Although it is the urbanized area which gives the metropolitan region its vitality, it is necessary, for comprehensive planning and development, that metropolitan planning takes account of the total metropolitan region. In the United States of America:
it has been proposed that planning regions should be based upon metropolitan regions and that within each metropolitan region, sub-regional plans should be formulated in keeping with the nature of the regional hierarchies.15

The utilization of metropolitan regions for planning and development in the developing countries does not have a favourable potential. Planning within such a narrowly conceived framework results in the lack of attention to peripheral areas, where resource development is most needed. Since developing countries are trying to develop their natural resources, which have so far been lying idle, there is the need for utilization of a regional planning unit which would make possible the development of these resources.

Planning regions for resource development have been delimited in terms of their uniform problem characteristics. This is what has been referred to as the uniform region. Such regions vary in their characteristics from the dominance of a single factor to the presence of a multiplicity of factors. In the second type of uniform region,

regional development within a national framework is the objective, and increased efficiency in the utilization of the resource forms part, though not necessarily the most important part, of the developmental problem.16

The drainage basins of rivers have come to be accepted as units for regional resource development. This idea originated in the United States of America, where the first

15Ginsburg, N. S. op. cit., p. 35.
16Ibid., p. 38.
attempt at developing natural resources was in the field of water resource development. It was hoped that through the development of water resources for a variety of uses, social and economic advance in the watershed would be furthered. The watershed therefore became rapidly identified as the 'proper' region for planning.

The Tennessee Valley Authority program has become a prototype for river basin development, especially for the developing countries. The Damodar Basin (in India), the Lower Mekong Basin (in Burma) and the Volta Basin development programs, to mention a few, have all been prepared along the lines of the Tennessee Valley development program; in fact the respective countries sought technical assistance from the Tennessee Valley Authority (T.V.A.). The progress achieved so far by T.V.A. in developing the Tennessee Valley Region, has provided a living monument for the effective use of river basins for regional planning and development. The concept of integrated river basin development has therefore come to be considered as a technique for achieving social, economic and physical changes.

II. THE REGIONS OF GHANA

With the basic notions and concepts described above in mind, Ghana can be divided into a number of different systems of regions. Political and geographical factors have been the important criteria often used in dividing the
country into regions. For the purposes of administration, the country has been divided into six regions, as illustrated in Figure 3 on page 39, each of which is further subdivided into administrative districts. The boundaries of these regions, like other political boundaries, have been drawn arbitrarily with no reference to the physical features of the country. Most of these regions embody a major settlement unit, which give them their character and vitality. The settlement units are the seats of regional government and also the cultural and social centers of the regions in which they are located. The use of such administrative divisions for regional planning and development purposes poses a number of questions. The problems facing these regions are not confined within the political boundaries in which they occur; they transcend these boundaries and affect other political units as well. For the purposes of effective and comprehensive regional development, new regions will have to be defined, but at the same time they must be big enough to make possible the solution of problems through regional planning and development.

Since Ghana is a predominantly agricultural country, climate, soils and vegetation, which are the major influences on agricultural production, have provided a satisfactory framework for dividing the country into three broad geographical regions. On the basis of a variety of factors ranging
FIGURE 3
ADMINISTRATIVE REGIONS OF GHANA

NORTHERN REGION
BRONG - AHAFO REGION
ASHANTI REGION
EASTERN REGION
WESTERN REGION

Source: Boateng, E. A. A

miles
from physical to economic and social factors, these broad regions have been subdivided to give the geographical regions, shown in Figure 4 on page 41. Geographical units cannot be regarded as 'proper' regions for planning purposes, for the same reasons that were advanced to explain the unsuitability of administrative regions for planning. The Krachi and Northern Ashanti Region and the Afram Plains, for example, are characterized by such problems as low population density, low agricultural productivity, and poor transportation facilities. An approach to the solution of these problems on the basis of geographical regions would result in a piece-meal approach to planning.

It is important in the creation of regional units for planning and development to take into account the mutual relationships between the scattered population and the concentrated population; the mutual exchange of products; and of the interrelationship between people and land use activities. Often within the region, the rural population provides food and raw materials, while services and industrial articles are provided by the concentrated urban population, which also serves as the place of exchange for agricultural and industrial products and the focus of cultural activity and influence. This idea of a region does not imply isolationism.

A region is not conceived by planners as an isolated and completely self-sufficient unit, but as a cell in a larger organism. To a varying degree
FIGURE 4
GEOGRAPHICAL REGIONS OF GHANA

HIGH PLAINS OF WA
AND MAMPRUSI

GONJA AND DAGOMBA
SAVANNAHS

KRACHI AND NORTHERN
ASHANTI

SOUTHERN ASHANTI
PLATEAU

AFRAM PLAINS

AKAN LOWLANDS

Source: Boateng, E. A. A
it depends on exchange with neighbouring regions and with the bigger super-region, which might be a country, state or continent. The region is a basic unit, facilitating by its quality the existence of well functioning larger units.\textsuperscript{17}

Few attempts have been made in Ghana, in the field of regional planning and development and thus in the establishment of planning regions for comprehensive development. The first regional plan of its kind was the Doxiadis plan for the Accra-Tema-Akosombo Region in 1961 which was based on the assumption that the population growth which would result from the anticipated economic development at Accra and Tema, and the construction of the Volta River Project at Akosombo would influence to a great extent the future of the region. The Volta Basin regional development plan is another example of coordinated regional development. The Volta Basin planning unit has been defined as the area of direct impact of the Volta River Project. Vague though this definition may be, it has been delimited as an area in which problems of resource development as well as problems resulting from the Volta River Project may be solved. It is important to note that each of the above two regions includes a number of physical, social, economic and political factors, which need to be ordered in a systematic way to ensure their proper and balanced development.

\begin{footnote}
\end{footnote}
III. THE PROCESS OF REGIONAL PLANNING AND DEVELOPMENT

The complexity of regions, both in their human and physical factors, demands some form of planning that will make possible the optimum utilization of their human and natural resources as well as facilitating their proper functioning. Regional planning and development have been associated with this type of planning. In recent years there has been a revival of interest in regional planning. In developed countries, it has been realized that the existence of localized poverty within a country calls for regional solutions. In developing countries, the resulting locational shifts stemming from the process of industrialization has created the need for selecting "growth poles and for developing new resource bases for further economic expansion."18

The growing need for regional planning has also been influenced by the phenomenal growth of cities. It has been realized that in order to solve the problems of urbanization, such as unemployment and overcrowding, a regional approach is necessary since most of these problems are generated outside the city limits.

The concept of regional planning and development. The term 'regional planning' has been used by geographers, regional scientists, sociologists, et cetera, to describe a

---

systematic and functional ordering of the natural and human resources of an area. There have, however, been tremendous changes in the concept and process of regional planning and development. It was formerly accepted as a means of combatting the threat of the breakdown of communities. The main focus then was a strategy for growth and for working out the direction, sequence and extent of development within and around the major urban centre of the region. The metropolitan area was therefore considered as the logical unit for regional planning since the problems that regional planning tried to solve emanated from the metropolitan area. As the concept of regional planning developed, more emphasis was placed on the regulation and distribution of land uses within the region. Because of the growing need for land for development, it became the task of regional planning to impart a total view of the relationship between resources and population.

Today, regional planning has received a different emphasis, and has become more positive in its approach:

Thus the regional planning process has moved from overcoming the waste and misuse of resources to providing a guide for the optimum use and development of the region's resources and locational advantages; and from a preoccupation with halting the deterioration of environment to the creation of the best possible physical setting for the community's life.19

Regional planning has been defined as:

- - - - - - a comprehensive ordering of the natural resources of a community, its material equipment and its population for the purpose of laying a sound physical basis for the "good life" - - - - - - . Regional planning of industries and natural resources, as part of a regional whole. 20

Regional planning, wrote the National Resources Committee in 1935, "should in the main, confine itself to dealing with the physical resources and equipment." 21 At the United Nations seminar on Regional Planning held in Tokyo in 1958, the basic policy of regional planning was established, "to help to develop, assemble and allocate national resources to provide maximum social and economic returns." 22

On the basis of the above definitions, it can be said that regional planning is a continuing process mainly concerned with a systematic consideration of the functional organization of the resources of an area; and the relation between social purposes and spatial arrangements in a regional context. Planning on a regional basis does not, however, isolate the region from its national context. Regional planning often provides a framework within which the resources of an area can be utilized for development

20 Mumford, L. and McKay, B. "Regional Planning", in Encyclopaedia Britannica, p. 72A.
21 U.S. National Resources Committee. op. cit., p. 150.
22 Ibid., p. 150.
projects of national significance. It is the task of the regional planner to take into account this larger unit and to establish his goals for development to fit into the national goals.

Regional planning as pointed out by Friedman, has three main features in common, no matter where it is practised. Its main purpose is economic development and the physical and social implications resulting from this. Secondly, regional planning seeks to integrate functionally the various regions of a country into the national economy. Finally, since many regional economic problems affect national planning and policy, it is important to bring regional economic growth within the scope of national as well as local policy determination. The economic goal of regional planning is usually approached by developing the possibilities inherent in the resources, location and the labour force of a region. In an underdeveloped area, like the Volta Basin, it is important for regional planning to visualize the regional economic complexes that could materialize and to stimulate a healthy, well-balanced economic as well as social and physical growth.

Regional planning in Ghana. In developing countries, like Ghana, planning for development has often been approached from the national level; it tends to concentrate on the economic aspects of development and to ignore the
social and physical aspects, which are only considered in so far as they have a direct bearing on the economic aspects of the plan. The supposition, upon which this approach has been based, has been that economic growth by itself can bring benefits to the local people. As a result, development has been viewed in terms of economic and technological output. Usually, national planning policies are applied to the whole country, regardless of the differences that exist between regions. In order to achieve balanced national development, it is important that national policies be tested against regional requirements.

In the last few decades, developing countries have realized the significance of regional planning as a tool for development. Although regional planning was formerly concerned with community development projects, today it provides the setting within which multi-purpose river basin development schemes have been undertaken. Attempts have been made in these schemes to integrate the physical, economic and social aspects of development. However, despite the effects these schemes have on the development of the respective regions within which they are executed, not all of them are planned as regional development projects. Otto Koenigsberger states that

many (of the river basin schemes) are limited to irrigation, flood control, and power production. Other consequential developments are left to
chance, in fact, the planning which has preceded
the majority of the projects has been for public
works and engineering and not regional planning
--- but their potentialities as a means of economic and social reform remain unexploited.23

The engineering aspects of these river-basin deve­
lopment projects have often received too much emphasis with little or no attention being paid to other aspects. Since regional planning takes a bird's eye view of problems, as it tries to relate settlement structure to the natural environment, it gives due consideration to all factors involved in the development process although these may not be acted upon simultaneously. River basin development projects should em­
phasize the regional planning function in order to achieve the balanced development of the regions which come within their influence.

The only regional plans which have so far been prepared for Ghana, are the Accra-Tema-Akosombo Regional Program and Plan and the Volta Basin Regional Development Plan. The Accra-Tema-Akosombo Regional Plan was considered in a comprehensive manner in the survey and analysis stages, in that it considered the physical, economic, and social forces operating within the region. At the plan stage, how­ever, more emphasis was given to physical and economic

factors to the exclusion of social factors. To achieve an overall development of the region, due consideration should be given to all factors.

Although the Volta River Project was conceived as a means of producing power for the smelting of the bauxite in Ghana, consideration was given at the survey, analysis, and plan stages to physical, economic, and social factors. The resettlement of people, who will be displaced by the creation of the Volta Lake, labour, agriculture and industry, health and sanitation were some of the problem areas which were examined in great depth. In order to achieve the developmental objectives for the Volta Basin, all aspects of the development process should be carried through to the implementation stage.

In the other regions of Ghana, planning is being done on a local basis. Although development plans have been prepared for the individual towns within the regions, there has been no correlation between towns and the greater region of which they form part. The rural areas surrounding these towns have been left to develop by chance and the intimate relation which should exist between town and country has been ignored. A more comprehensive approach to planning is required, whereby both town and country will be developed simultaneously. Regional planning offers a great deal of scope to this type of development; the utilization of
regional planning as a means of achieving comprehensive regional development would contribute to the solution of the problems facing the regions of Ghana today.

The Physical Planning Act of Ghana, makes provision for the establishment of regional planning committees in each region, comprising the regional commissioner, the secretary to the regional commissioner, the regional heads of ministries responsible for communications and works, agriculture and social welfare, the regional head of the lands secretariat, and the regional physical planning officer for the region. The functions of the committee include the carrying out of surveys of the population and employment structure, existing and potential resources, location and capacity of utilities, services, amenities, et cetera. Secondly, the regional committee is responsible for preparing a regional physical planning scheme for the region concerned. Local schemes are required to conform with the regional planning scheme. The restriction of the powers of these committees to physical matters, makes it difficult for them to achieve a comprehensive and balanced development of the respective regions in which they operate. The establishment of regional planning agencies vested with such planning powers as would enable them to engage in all aspects of the planning and development process, would be desirable.

The establishment of the Volta River Authority (V.R.A.) was a move in this direction; the Volta River Act
of 1961, which created the V.R.A. gave it powers for the full development of the Volta Basin. These powers include the planning, execution and the management of the generation of electrical power, and provision for the development of the Volta Lake as a source of fishing, as a route for transportation, and the development of the lakeside area for the health and well-being of the inhabitants. It is impossible for the V.R.A. with such limited powers, to achieve a balanced regional development of the Volta Basin and most important of all to develop regional planning as the norm for development throughout the country. Regional planning agencies, like the V.R.A., should be given wide planning powers in order to be able to promote the overall development of the respective regions for which they have been established.

IV. THE BACKGROUND OF THE VOLTA BASIN

The foregoing sections have defined and analysed the concept of the region and the process of regional planning and development and how these apply to Ghana. The following sections examine the suitability of the Volta

Basin as a unit for regional planning and development. To provide a basis for evaluation, the geographic, population, economic and transportation background of the Volta Basin is analysed.

The Volta Basin regional planning unit occupies about 20 per cent of the total surface area of Ghana. It covers parts of the northern, central, eastern, and southeastern sections of the country. It forms a distinct geographic area, and has a character of its own. The extent of the planning region is shown on Figure 2 on page 12. Within the Volta Basin are found many elements of resource endowment, linked by natural and ecological processes. Its major resource is water, which is one of the main sources of electrical energy. Since power is essential to the manufacturing process, it has often provided a link between the resource complex of the "natural" region and the economic regional complex. Although the idea of the drainage basin as a desirable area for regional planning and development has been widely accepted, it is doubtful if the river basin is well suited to the planned development of natural resources other than water.

The geography of the Volta Basin. The drainage pattern of Ghana is dominated by the Volta system. The Volta River has its source in a low range of hills in the Republic of Upper Volta. As it flows through Ghana it is joined by
the Black Volta, White Volta, Afram and Otti Rivers. Although it exhibits some of the characteristics associated with West African rivers, such as the occurrence of rapids, the Volta River has a very gentle gradient varying between one and two feet per mile. The flow of the Volta depends on the rainfall cycle of the Basin. At the peak of the dry season, the Volta River dries up in most of its sections leaving most of the riparian communities without water. In the rainy season, on the other hand, the Volta River overflows its banks, thus flooding farms and rural settlements. During this season, the transportation of agricultural and animal products from the northern region to other parts of the country becomes a difficult undertaking, owing to the closing down of ferries operating at Yeji and other points along the river.

The geology of the Volta Basin is comprised of a series of sandstone with shale conglomerates and a few limestones. The voltaian rocks, as these are called, are more extensive than any other single system of rocks in the country and they cover some 40 per cent of the total surface area of Ghana. The voltaian series occur as horizontal folded strata and often give rise to flat-topped hills averaging 500 feet, in height; except at the northern and southern sections of the basin where they form high plateaux ranging to 1,750 feet above sea level.

The climate, and to some extent the geology, of the Volta Basin have given rise to a savanna type of vegetation.
This is comprised of scattered short trees with a continuous carpet of grass about twelve feet in height. Although the rainfall exceeds 40 inches per year, the dry season imposes a limitation on the vegetation. Because of the intensity of the dry season, the first rains run off the hard-baked soil before they are absorbed by the vegetation. Consequently, the trees show a marked adaptation to the dry season, by having hairy leaves which help them withstand the long drought and the dessicating winds. On the eastern and south-western sections of the Volta Basin are forest reserves, where cultivation and indiscriminate extraction of timber are forbidden by the government. The Volta Basin, therefore, possesses valuable reserves of timber which should form the basis of a timber industry in the Basin. Along the coast, around the delta of the Volta River, is found what is known as a strand and savanna type of vegetation. It is comprised of succulent plants and mangroves, which grow mainly near lagoons.

The economic base. The geography of the Volta Basin has determined, to a great extent, its economic activities. Since agriculture is the lifeblood of Ghana's economy, the regions of which it is composed have concentrated on the development of the agricultural sector of their economy. The Volta Basin is no exception to this rule. Except for a few manufacturing industries established in the southern section, the Northern and Volta Regions have emerged
as predominantly agricultural areas. It is hoped that Ghana's policy of economic development will help in the transformation of these regions to industrial areas or in the improvement of their agricultural output.

The agricultural problems which face the Volta Basin are enormous. The voltaian rocks found in the Basin generally produce thin and relatively infertile soils, which are difficult to cultivate. Large sections of the region, therefore lie idle and uncultivated for the greater part of the year. In the southern section of the Volta Basin, the prevalence of the tsetse fly makes both human and animal habitation practically impossible. The rearing of cattle and other livestock is therefore confined to the northern section, where the relative absence of the tsetse fly allows cattle farming on a fairly large scale. However, this area suffers an acute water shortage in the dry season when it becomes difficult to grow crops. The local people have to depend on food reserves from the previous harvest. Although famine used to be a common feature at this time, improved transportation facilities and the spread of trade have almost completely eliminated this threat.

Despite the problems enumerated above, farming has become the leading occupation throughout the Basin, apart from some fishing activities in the upstream areas of the Volta River and downstream between Akosombo and Ada and some
hunting in the Afram Plains. The Ada-Keta area exports large quantities of dried, salted fish to other parts of Ghana; it also exports salt which is obtained from the lagoons in the dry season. The food crops grown in the Basin include yams, maize, rice, onions, millet, and groundnuts. Except for cocoa cultivation in parts of the Afram Plains, the cultivation of cash crops for export has been insignificant.

The average cultivator in the Volta Basin is a small farmer who tills one or two acres of land with primitive instruments. He is exposed to the vicissitudes of the weather and annual yields are low. The Volta River Project promises a bright future for agriculture in the Basin. The availability of water for irrigation from the Volta Lake would bring under cultivation those areas which have not yet been farmed because of their aridity, especially during the dry season. The introduction of more efficient farming methods and the introduction of commercial crops would make the Volta Basin an important exporting region.

Large scale manufacturing industries are non-existent in the Volta Basin. This is due to the lack of some of the essential bases of industrialization, such as coal, power and skilled labour. The generation of hydro-electric power in the Basin would stimulate industrial development. There are a number of small scale manufacturing industries which cater to local and national needs. These
industrial activities include mining, quarrying, building and construction, processing of food stuffs, distillation of alcohol, and weaving of traditional cloths from local and imported yarn. For the most part, these industries take place in small establishments employing 30 or more people. Keta and Ho have developed as important centres for the manufacturing industry and they serve large areas of the Volta Basin. Other settlements usually contain one or two establishments serving local needs.

**Resources.** The major resource of the Volta Basin, as has been mentioned, is water. The conservation of the water resources of the Volta Basin prompted the Ghana government to launch the Volta River Project. In addition to water, the region possesses some potential resources which must be utilized to broaden the economic base of the Basin. At Sheini, to the north of the Volta Basin, about 100 million tons of iron ore have been discovered; these would form the basis of a steel or ferro-manganese industry in the region. The limestone reserves of Morno are believed to be more than 100 million tons and to be suitable for the manufacture of cement and fertilizers; while the bauxite deposits at Yenahin, totalling 400 million tons will be used in the manufacturing of alluminium products. The nearness of these mineral deposits to the Volta Lake increases the possibilities of developing a lake transportation system on Lake Volta.
In addition to these mineral resources, the Volta Basin has substantial reserves of forests in which development of any kind is prohibited; since they are valuable resources of timber and they also act as shelter belts against the wind and as protection against soil erosion. The future of the Volta Basin depends partly on the optimum utilization of these resources.

**Transportation facilities.** The low level of development in the Volta Basin has been attributed to the lack of efficient and adequate transportation facilities. The whole Volta Basin is served only by roads, most of which are in the second and third class categories. The only existing first class or trunk roads join Ada to Accra, Ada to Aflao, and Tema to Kadjebi, as shown in Figure 5 on page 59. Climatic conditions make road construction and maintenance difficult and expensive; most of the roads become muddy and sometimes impassable in the rainy season, while they become dusty in the dry season. The general condition of roads has deteriorated since the inception of the Volta River Project because of the possibility of their being flooded by the Volta Lake.

In the Afram Plains, as stated by E. A. Boateng,

there are practically no roads — — — — and the chief means of communications are a few waterways, rough tracks and foot paths. The lack of communication has seriously impeded economic development.25

---

FIGURE 5
TRANSPORTATION FACILITIES AND PORTS

Legend
- Trunk Roads
- Second Class Roads
- Projected Roads
- Terminal Ports
- Intermediate Ports
- Rail

Source: Volta Basin Regional Plan 1962
The only road that gives access to the area from other parts of Ghana, is the northward extension of the Nkawkaw-Mpraeso road. The Krachi area to the north, in spite of its vast-ness, is crossed by only three main roads running northwards through Wenchi, Atebubu and Kete-Krachi. Because of the scarcity of transportation facilities, population and farming have both been attracted to the few lines of transportation that exist.

The creation of the Volta Lake would interrupt the continuity of the national road system. To re-establish this continuity, trunk roads have been proposed to connect origin and destination points within the Volta Basin and to link the Volta Basin with the rest of the country. A railway line has also been proposed to link Tema and Akosombo. There have been investigations into the possibilities of establishing a Volta Lake transportation system, which would connect the northern and southern sections of the country. The fact that the Volta Lake lies in the main direction of commodity and passenger flow makes it an important artery of transportation and an important addition to the transportation resources of Ghana.

The use of water transport demands the construction of terminal facilities for the movement of goods and people. Two types of lake ports have been recommended: terminal ports, which would provide and facilitate economical cross-country transportation and would serve the communities and
the local industries in the area; and intermediate ports, which would make possible economical transportation and travel within the region and would provide the transportation requirements of people resettled in the nearby areas. The provision of an economical and efficient transportation system in the Basin would greatly enhance its development which has so far been hindered by inadequate transportation facilities.

Population and settlement. Transportation, economic activities, climate and vegetation have influenced the density of population and settlement patterns in the Basin. Although the Volta Basin covers 20 per cent of the total surface area of the country, it accounts for only 11 per cent (i.e. 725,000 people) of the total population of Ghana. The distribution of population in the Basin shows a distinct pattern. There is a concentration of population in the Lower Volta, East Volta and Krachi area in the north. In each of these areas, gross population densities range between 54 and 105 persons per square mile. In contrast to these areas is a relatively empty middle belt with population densities of ten persons per square mile and less. The low density of population has been ascribed to such factors as poor transportation facilities and the prevalence of the tsetse fly. Water and transportation have exerted a strong influence on population distribution in the Volta Basin. In the south
Volta area, a large number of the settlements are found along the Accra-Keta road. In the west Volta area, population densities increase from nine persons per square mile between Atebubu and Kete-Krachi to over 40 persons per square mile as the rainy sections to the west of the Basin are approached.

The sizes of settlements in the Volta Basin vary from 17,000 people in Keta to about 90 inhabitants at Alorgui. Of the total population of the Volta Basin, only 13.1 percent live in towns of 5,000 population and over. The rest of the population is concentrated in rural settlements with less than 5,000 inhabitants. Table 1, on page 63, illustrates the percentage distribution of persons by the size of the settlement. The Volta Basin therefore has a large rural population which earns its living from agricultural pursuits. Keta, the largest town in the Basin, is the administrative and commercial centre of the delta area. It grew up as a small "surf" port at the ocean terminus of the road network from the Accra region and the Volta Basin. With the building of Takoradi and Tema harbours, the importance of Keta as a port has declined. Other urban settlements with 10,000 people are Denu, Ho and Anloga, all of which are located in the southern section of the Volta Basin. Apart from these urban centres, the region contains a large number of smaller scattered settlements.

Most of these settlements will be flooded by the Volta Lake. About 78,000 people will be displaced and will
have to be resettled in areas already inhabited by some 100,000 people. The resettlement of these floodzone residents has been a major concern of the V.R.A. and the planners. Potential area densities and the growth of urban centres have been calculated and a resettlement program has been developed, involving a rational distribution of settlements which would take advantage of the potential resources of the Volta Basin.

**TABLE 126**

**PERCENTAGE OF POPULATION BY SIZE OF SETTLEMENT, VOLTA REGION**

<table>
<thead>
<tr>
<th>All sizes</th>
<th>100 Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 100 people</td>
<td>10.9</td>
</tr>
<tr>
<td>100 - 199</td>
<td>10.2</td>
</tr>
<tr>
<td>200 - 499</td>
<td>18.9</td>
</tr>
<tr>
<td>500 - 999</td>
<td>16.7</td>
</tr>
<tr>
<td>1,000-1,999</td>
<td>16.3</td>
</tr>
<tr>
<td>2,000-4,999</td>
<td>13.9</td>
</tr>
<tr>
<td>5,000-9,999</td>
<td>7.7</td>
</tr>
<tr>
<td>10,000-19,999</td>
<td>5.4</td>
</tr>
<tr>
<td>20,000-49,999</td>
<td>-</td>
</tr>
<tr>
<td>50,000 &amp; over</td>
<td>-</td>
</tr>
</tbody>
</table>

---

IV. EVALUATION OF THE REGION OF THE VOLTA BASIN AS A UNIT FOR PLANNING AND DEVELOPMENT

The analysis of the geography, economy, transportation and population and settlement patterns in the Volta Basin reveal the fact that the Volta Basin is by no means a homogeneous region. It exhibits differences as well as similarities in its individual characteristics. It embraces a number of geographical regions; at the same time it cuts across administrative boundaries. In strictly geographical terms, the Volta Basin covers an area bigger than the region defined in the previous section; it includes all areas drained by the Volta Basin. The Volta Basin regional planning unit has been carved out of the broader area for the purposes of regional planning and development. It is important at this point to evaluate the suitability of this region for the purposes for which it has been created.

The problems found in the Volta Basin are by no means confined within its boundaries. Problems, such as low population density, lack of transportation facilities and flooding are experienced in parts of northern Brong-Ahafo and Accra regions as well. One unique characteristic of the Volta Basin is the fact that it is drained by the largest river in Ghana, and has a distinctive geological structure.

The most evident need for comprehensive planning and balanced growth has arisen in the Volta Basin, where a
A 3,200 square mile lake will form within the next two years; and in which the impact of new water transportation and power would affect some 26,000 square miles of Ghana. In some cases this impact will be felt throughout the country. The lake, which would reach halfway across the country, would join together with cheap transportation forest and savanna lands, many crop regions and mineral deposits. Below the dam at Akosombo, lies a 70 mile stretch of irrigable grass lands, which have not yet been cultivated but which might be irrigated by pumping water from the lake. The pressing social problem associated with the multi-purpose development for the Volta Basin, is the resettlement of the displaced population in such areas as would facilitate the utilization of natural resources and would ensure a better life for the people.

As was pointed out in the first section of this chapter, the purpose, scale and process of planning should provide the bases for the determination of regions for planning and development. In terms of the purpose of the development program for the Volta Basin, the Volta Basin regional planning unit has been created as an area in which problems related to the Volta River Project could be solved effectively. These problems do not concern flooding and resettlement of people alone; they concern as well the development of natural resources, the utilization of the lake for transpor-
tation purposes, the development of modern agriculture and industry in the Basin so that the area would benefit from the project. These are the problems for which regional planning is attempting to find solutions.

Although areas to the north of the Volta Basin may be said to have problems basically similar to those of the Volta region, such as low standard of living and low agricultural productivity, these areas are oriented toward Tamale, the administrative and commercial centre of the Northern Region. To include these areas in the planning region of the Volta Basin would create administrative and social problems. To the west of the Volta Basin, the cocoa industry and the rapid growth of cities have given rise to problems, such as forest depletion and overcrowding, which are different from problems encountered in the Volta Basin.

In Ghana's drive for economic, social and physical development, it has been necessary to establish regions in which national goals can be implemented. For reasons, already mentioned, neither the national unit nor the local area has been considered suitable for these purposes. Planning regions, like the Volta Basin planning unit, have had to be created. The Volta Basin is undergoing a process of rapid change; since planning and development are centred around resettlement problems, and the utilization of previously unused or under-used natural resources, it is appropriate that the early stages of this developmental process
take place within the regional framework. The emphasis may shift toward the needs of cities and of industry, once the resource endowment has reached a high stage of development and industrialization has changed the character of the region. In terms of the purpose, scale and process of regional planning and development, the Volta Basin regional planning unit can be considered a suitable unit.

It is important to point out, however, that the definition of the Volta Basin regional planning unit as the area of direct impact of the Volta River Project is misleading. The main product of the project is electricity which will be distributed over the whole country both for industrial and domestic use. To regard the region for planning and development as the area of direct impact of the project, would mean taking into consideration all areas to be affected by the electricity produced from the project. Planning is problem-oriented, as such, it is more concerned with finding solutions to problems facing areas than with the areas per se. It is therefore necessary in the delimitation of regions for planning to emphasize the problems to be identified and solved and the purposes for which the area has been created.

Although the Volta Basin planning region has been accepted as a suitable region for planning and development, the problem of transport development needs to be examined in a broader region. Since considerable quantities of food stuff, cattle and poultry move from the Tamale area in the
north to the Accra-Tema areas in the south and since large quantities of petroleum, chemicals and consumer goods move from the southern to the northern areas, it has been found essential to include these areas in the planning region. The problem of transport integration will therefore be examined within this broader spatial unit, which extends from the Tamale area to the Accra-Tema area in the southeast. The following chapters describe the principles of transport integration in selected countries, how these principles could be applied to the Volta Basin and how transport integration could contribute to the planning and development objectives and policies of the Volta Basin.

Summary. The regional concept has been defined differently by the various disciplines, such as geography, sociology and planning. To some of these disciplines, the region is considered as an area having certain cultural and physical attributes which distinguish it from other regions; to some, the concept of the region has been developed as a means to an end. In spite of these differences, two major categories have been identified by social scientists, for analytical and descriptive purposes. These are "single-factor" regions which are defined on the basis of the homogeneity of their physical or human elements; and "multi-factor" regions, which are measured in terms of several phenomena, both physical and human. These regions do not provide the most appropriate units for regional planning and development.
The planner is left with a choice between a nodal and a uniform region. The nodal or metropolitan region is unsuitable for planning for development in the developing countries because of the tendency to concentrate planning efforts in the urban core, to the neglect of the surrounding areas. The uniform region has been more acceptable for planning purposes in the developing countries and the River Basin has evolved as the 'proper' uniform region for planning and development. The existing regions of Ghana, based on political and geographical factors, need to be revised for planning purposes, since the problems facing these regions transcend their boundaries.

Because of the complexity of regions, planning and development have evolved as a means of ordering physical and human factors to ensure balanced growth. Regional planning is mainly concerned with economic development and the physical and social implications.

The analysis of the geography, economy, transportation and population and settlement pattern of the Volta Basin reveal the fact that the Volta Basin is by no means a homogeneous region. Although the problems found in the Volta Basin are not confined within its boundaries, it is considered suitable for the purposes of regional planning and development for which it has been created. However, it is important that the Volta Basin regional planning unit be
defined in terms of the problems to be identified and solved and not in terms of its area of influence, since this involves the inclusion of practically the whole country; for the purposes of transport integration, the Volta Basin regional planning unit has been extended to include the Tamale area in the north and the Accra-Tema area in the southeast because of the tremendous flow of traffic between these areas.
CHAPTER III

THE PRINCIPLES OF INTEGRATED TRANSPORTATION
IN SELECTED COUNTRIES

Integration of transportation facilities has been approached in different ways by different countries depending on the political framework and the organization of the transport industry. In the U.S.S.R., where transport integration has been achieved from the socialist point of view and with reference to the whole country, it is difficult to examine the principle of integration without a consideration of the entire country. As distinguished from the capitalist countries, all transportation media in the Soviet Union belong to one 'master,' the socialist government; they are the possession of the government and the property of all the people. This is the basis of the unity that exists among carriers in the Soviet Union. In a free-enterprise country, like the United States of America (U.S.A.), transport integration has been approached from a different direction. The various regions of the U.S.A. have been given the opportunity to organize the transport industry as would best suit their economic requirements. However, transport integration has been a more difficult proposition in the U.S.A. than in the U.S.S.R., since any progress in integration must be the joint product of private carrier initiative and public policy. The
principles of integrated transportation, as manifested in the U.S.S.R. and the U.S.A., and also the administrative framework for integrated transport operation and the implications of integration are reviewed in the present chapter. This provides the basis for an integrated transportation system for the Volta Basin, which is proposed in Chapter IV.

1. THE U.S.S.R.

Soviet Transportation Policy: Many forces have generated the need for transportation in the Soviet Union. The large territorial dimensions of the Soviet Union, the uneven distribution of natural resources and the differences in the cultural and economic development of the regions of the Soviet Union have created an awareness for the improvement of transportation media, and the betterment of transport organization. Clearly, the need for transportation depends in part on certain fixed features of the geographic environment which cannot be altered by government policy. Yet the possibility of an enormous variety of locational patterns of economic activity, suggest a range of possibilities for the territorial organization of a growing economy, each with different transportation requirements. In order to draw the scattered resources of the Soviet Union into productive activity, there is the need for providing transportation facilities which would enable raw materials to be carried to
processing plants and finished goods to be distributed to markets. Soviet locational objectives have determined to a large extent the location of transportation facilities.

The Soviet goal of "building socialism" has been interpreted to mean, in the economic sphere at least, a determined drive to speed up the industrialization of Russia. The unevenness of growth which was associated with capitalism influenced Soviet location theory and policy in the post-revolutionary period. It became Soviet policy to locate economic activity more evenly, to raise the level of living of the backward regions and to move production closer to the sources of raw material and fuel, since these lie in relatively unproductive areas, and to obtain benefits of the economies of scale in production. This last policy did not only defeat the purpose of an even distribution of economic activity but it resulted in the over-use of transportation facilities within certain regions and the abandonment of facilities in other regions. The need for intensifying the utilization of Soviet transportation facilities has been felt by Soviet planners; and a large volume of resources and attention has been channelled to overcoming the transportation "problem".

The above policies were revised in the third, fourth, fifth and sixth five-year plans. New policies expressed in these plans included: an expansion of all branches of the national economy, advancement of agricultural produc-
tion, the comprehensive development of each of the main economic regions, the improvement of the material and cultural standards of Soviet people and the elimination of irrational shipments, crosshauls and excessively long hauls. Uneconomic freight consignments had been considered as the basis of transport difficulties in the Soviet Union, and not the lack or weakness of transportation facilities. Irrational shipments have been described as those which use 'unnecessary' amounts of transportation. Writers on Soviet transportation have, for example, often pointed out the convenience of locating sawmills at or near timber stands, or at least at transshipment point, since 25 per cent to 30 per cent of a log's weight is lost in the manufacturing process, and the capacity of the freight car used in transporting logs is being wasted. The phenomenon of crosshauling, involving the simultaneous movement of goods in opposite directions between two points, of identical products, has arisen in the Soviet Union through ignorance, scheduling difficulties and ineffective transport operation.

The Soviet Union has realized the importance of transportation in the location and development of productive forces. She has also realized that without improving the level of transportation operation and the level of services offered by the transportation network, it would be difficult to achieve her economic, social and physical objectives expressed in her five-year plans. A substantial increase in
goods as well as passenger traffic is envisaged at the end of the sixth five-year period (1956-1960); and in order to cope with the large volume of traffic the carrying capacity of all media of transportation has been expanded. Since rail transport has played a major role in freight transportation in the Soviet Union, the sixth five-year plan made provision for the building of new railways as well as the electrification of existing ones. River-borne freight has increased considerably in recent years although river transport accounts for only a small proportion of total freight and passenger movement in the Soviet Union. It has been the policy of the U.S.S.R. to intensify the use of inland waterways wherever possible. Road transport is developing fairly rapidly and it has been of tremendous importance in the industrialization of the country and in the socialist transformation of agriculture.

The greatest advance in Soviet transportation policy has been the planned integration of the various systems of transportation. This is intimately bound up with the planned development of productive forces in the Soviet Union. As pointed out in the United Nations Report on Inland Water Transport in the U.S.S.R. and Hungary:

Transport in the Soviet Union is planned in a co-ordinated manner. The plan is based on normal traffic flows, taking into account the trend of development of regional industries and consumption of goods. It provides for the distribution of
traffic among all forms of transport in the best interest of the national economy and resources.\textsuperscript{27}

In order to understand what transport facilities the Soviet Union is attempting to integrate, and the relative importance of each transportation facility in the integrated system, a brief review is given in the following section of the transportation composition and distribution of the Soviet Union.

The basic types of transport in the Soviet Union. Transportation in the Soviet Union has played a tremendous role in the historic advances of socialist construction. It has provided for the development of new industrial construction, the creation of new industrial centres and the elimination of the economic and cultural backwardness of the various regions. It has also strengthened the link between industry and agriculture and has promoted the elimination of the antagonism between town and country. With the improvement of the level of transport operation, there has been a consequent improvement in the transportation services of the vast 'oblasts' and republics of Russia. The Soviet transportation network comprises railways, inland waterways, highways, ocean transportation routes and air lines. For the purposes of this paper only rail, inland water and highway transport are reviewed.

The chief mode of transport in the U.S.S.R. and the one having the greatest influence on the life of the whole country is the railroad. In the vast continuous territory of the U.S.S.R., it is the railroad that has provided the most reliable form of transport and the most essential and vital connection between different parts of the country. Railroad transport has many advantages in the Soviet Union. The fact that the surface of the country offers no serious physical obstacles to construction facilitates the laying out of railway lines. Moreover railroads provide the transfer of goods on a mass scale at low cost and can operate without any interruption even in unfavourable climatic conditions.

Railway transport in the U.S.S.R. has undergone tremendous development. Because of the industrialization of the country, traffic in industrial freight has greatly increased. This increase in traffic is mainly concentrated on the routes serving European Russia, such as the Donbas to Volga Region, Donbas to Krivoy Rog, and the Donbas and North Caucasus to Moscow and Leningrad routes. Despite the growth of rail traffic, there are still numerous inefficient hauls and excessively long hauls. For the purpose of minimizing long railway hauls and of eliminating crosshauls, railway freight movement has been brought under regulation. In order to do this, industries have been moved closer to the sources of raw materials and to the regions of construc-
tion, the production of bulky goods has been expanded in a number of regions, and part of the rail freight has been transferred to water transport.

In spite of the importance of rail transport in the U.S.S.R. and in spite of its rapid development, the distribution of railway lines is very uneven. Railway lines are concentrated in the European section of Russia, particularly in the Donetz Basin and in the Moscow Region. Of the outlying regions of the U.S.S.R., only the Caucasus is as adequately provided with railroad communications as the European part of the country. The railway transport system of Siberia and Central Asia, in proportion to their territories, is much less developed. However, an increase in rail communication between the eastern and western sections of the country is envisaged with the opening of new railway lines, such as the Moscow-Kazan-Sverdlovsk and the Gorky-Kotelnich lines.

Railways in the Soviet Union do not only function as trunk lines connecting producing with consuming centres but they also function as feeder lines to inland water transportation routes. This second function is well exemplified in the Volga Region where railroad transport is closely linked with Volga River traffic. The railroads bring freight from such areas as Moscow, Leningrad, the Donbas, the Caucasus, the Urals and Siberia for transshipment along the Volga River to other river ports; the
railroads also transport cargo brought by river carriers to other inland points.

Although the Soviet Union is endowed with a vast network of waterways, inland water transport plays a less significant role in the overall transportation economy of the country; it however constitutes a large proportion of the freight and passenger movement of areas served by waterways. Table II illustrates the relative importance of inland water transport in the national transportation system.

**TABLE II**

**PERCENTAGE DIVISION OF TRAFFIC IN THE SOVIET UNION**

<table>
<thead>
<tr>
<th>Mode of Transport</th>
<th>1955</th>
<th>1958</th>
<th>1965 (Planned)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inland Waterways</td>
<td>5.8</td>
<td>5.4</td>
<td>5.6</td>
</tr>
<tr>
<td>Railways</td>
<td>83.4</td>
<td>81.7</td>
<td>73.2</td>
</tr>
<tr>
<td>Highways</td>
<td>3.7</td>
<td>4.0</td>
<td>4.6</td>
</tr>
</tbody>
</table>

The total length of waterways in the U.S.S.R. amounts to approximately 250,000 miles of which about 68,750 miles are utilized for transportation purposes. Thus the network of navigable rivers is almost equal to the country's railway network.

---

River transport in the U.S.S.R. is handicapped by the fact that the period of navigation is interrupted for four to five months each year by freezing. This has not ruled out the possibility of utilizing the waterways for the movement of goods. The economic significance of river transport compared to rail transport lies in the fact that the equipment and maintenance of water carriers require relatively small expenditures; secondly, water vessels have a greater capacity; thirdly, the means of traction used are less costly. Such reduced transportation costs make river freight traffic cheaper than that of railways, in spite of the long winter intervals in navigation which raise the overhead expenses of river transport. However, because of the slowness of river transport, only such bulky goods as timber, grain, salt, oil, et cetera are handled by the rivers, as shown in Table III.

**TABLE III**

**COMPOSITION OF RIVER TRAFFIC (1956)**

<table>
<thead>
<tr>
<th>Percentage of tons carried</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timber and wood fuel</td>
</tr>
<tr>
<td>Sand and gravel</td>
</tr>
<tr>
<td>Oil and oil products</td>
</tr>
<tr>
<td>Coal</td>
</tr>
<tr>
<td>Food grains</td>
</tr>
<tr>
<td>Salt</td>
</tr>
<tr>
<td>Others</td>
</tr>
</tbody>
</table>

Almost half of the river freight turnover falls to the Volga and its tributaries. The exceptional role played by the Volga in the total freight traffic of the inland water transport system is due to the fact that it is the largest river in European U.S.S.R. and that its basin is densely populated and economically developed. The Volga River attracts freight from distances of more than 125 miles and the tremendous flows of bulky raw materials transported by way of the Volga River attract industry into the region. All the big towns of the Volga region from Gorky up to the mouth of the river are located directly on the banks of the Volga at points where railway lines cross the river or closely approach it. Thus the Volga region, attracting freight, labour, industry and towns, represents an 'axis' around which economic districts have developed. A variety of transportation services and the extent of integration between these systems have been the mark of success of the towns and industries in the Volga Region.

Both water and railway transport must be served by inter-connecting highways which would distribute people in the U.S.S.R. and goods from terminals to other destinations. Highway transport has not gained the significance and importance that railway and water transport have acquired. Its role is, however, increasing and this has created the need for the construction of good roads and the improvement of existing ones. Highway transport handles intra-district
freight haulage over short distances and serves the approaches to railway lines and waterways, by carrying goods to and from railway stations and river wharves. In regions lacking in railway and river transportation systems, inter-district freight haulage over long distances is effected by highway transport. The sixth five-year plan anticipates a 100 per cent increase in highway transport in the Soviet Union.

**Principles of integrated transport development:**
The analysis of the elements of Soviet transport has revealed the fact that the transportation of goods and persons from one place to another calls for the utilization of more than one mode of transport. There is also an interdependence between such transportation systems as water, rail and road. The utilization of these facilities as a means of achieving the objectives of socialist planning has been the major reason for integrating transportation systems in the Soviet Union. The objective of transportation planning has been the provision of swift, safe and economical movement of both goods and people. This must be done within limited money resources and with respect for the requirements of the activities which use urban land. Since there are different ranges of conditions for which transportation facilities must be planned, more than one type of transportation service is often needed. Such different types of service must be planned to supplement one another so that, in total, they provide
an integrated system. In the Soviet Union, therefore:

... all types of freight carriers are linked into one integrated transport system working like a giant conveyor. The movement of major commodities is rarely limited to one type of carrier. Since, in most cases, the shipment of commodities from place of production to place of consumption entails joint transportation by two or more types of carrier, organization of joint rail-water-highway transport acquires a considerable significance.30

The attainment of a unified transportation system in the Soviet Union has been based on a number of principles. One of the fundamental principles of transport integration in the Soviet Union has been the fact that transportation has been regarded as a unified process for the transfer of commodities from the sphere of production to the sphere of consumption; and not merely that part of the process pertaining to the origination and termination of goods on a single system of transportation, such as from one rail terminal to another. Planning for an integrated transport system therefore requires the consideration of all transportation facilities involved in the movement of goods and also people from origin to destination. This unified transportation system involves the efficient utilization of all the inter-related transport media, personnel and organizations participating in the movement of commodities; and it includes all the components of a particular service, such as the types of equipment, transshipment terminals and

storage bases.

In the Soviet Union, the greater part of the unified transportation system, especially for bulk transportation, can be divided into three main stages, as shown in Figure 6 on page 84. As illustrated by this diagram, the first stage comprises the collection of the commodities from the producing centres and its presentation by the shipper for transportation on the general transportation network. Here, all the elements of transportation serving the producing areas are involved. The second stage accounts for the movement of the commodity within the general transportation network and it implies the utilization of all the elements of transport operations while the commodity is on the general transportation network. The final stage involves the distribution of the commodity from the point of destination to the consumer; and it includes all the elements of transportation from the moment the commodity is shipped from the point of destination on the general transportation network to the place of consumption.

The success of these phases of the integrated transportation process has been dependent upon a number of factors. The Soviet Union has devised methods of coordinating the activities of various systems of transportation by distributing traffic among the different modes of transportation, by a system of joint traffic scheduling and by a
FIGURE 6
PRINCIPAL PHASES OF THE UNIFIED TRANSPORTATION SYSTEM

I
Initial phase of the transportation process (in the production zone)

Collection of commodities from their points of origin.

Concentration of commodities in consignor's warehouses.

Movement of commodities to the points of departure of the general transportation system.

II
Phase of the transportation process (within the general transport system)

Loading into warehouses or rolling stock.

Movement of commodities within the general transportation system.

Unloading into warehouses or rolling stock.

III
Final phase of the transportation process (in the consumption zone)

Movement of commodities to the consumer's basic warehouses.

Storing in the consumer's basic warehouses.

Movement of commodities directly to the consumer.

rate structure that would take advantage of the economic significance of each form of transport. Figure 7 on page 86 illustrates the method employed in the Soviet Union in determining the distribution of traffic and facilities among different media of transportation and routes. As is evident from the diagram, this method of distributing traffic involves an examination of the balances of production, processing, storage and consumption of commodities in each region and in each branch of agriculture and industry. Secondly, a choice is made of the most advantageous route between the centres of production and consumption. This is determined by a consideration of the carrying capacity of the various routes, the operational and technological characteristics of the transportation service, including the length of haul, the speed of shipment, seasonal trends and the safety of the goods, and the indices of economic efficiency such as the volume of required capital outlay, the cost of transportation and transshipment, freight rates, et cetera.

In order for the coordination of transportation activities to be effective, the times of departure and arrival at terminal facilities have been worked out for each mode of transportation. The scheme of joint traffic schedules provides such information as the distances between freight stations, the time consumed by a freight carrier in travelling between terminals, and the time intervals between the departure of freight carriers. An example of such a
FIGURE 7
THE GENERAL METHOD OF DISTRIBUTION
OF TRAFFIC AND OF EQUIPMENT AMONG
VARIOUS FORMS OF TRANSPORTATION

A. Computation stages.

1. Evaluation of volume of traffic
   - Regional balances of production, manufacturing, basic storing and consumption
   - Required volume of regional and interregional traffic by commodities
   - National, political and defence requirements
   - Indices of traffic capacity of facilities and equipment of various forms of transportation
   - Indices of operating and engineering transportation conditions (kind of commodity, length of haul, speed of shipment, seasonal variations)
   - Indices of economic efficiency of service (capital investment, costs, rates, labour and fuel consumption, etc.)
   - Schemes of the distribution of traffic flows by forms of transportation and directions
   - Reserves and shortages of the traffic capacity of facilities and equipment
   - Characteristics of the most expedient transportation facilities and equipment
   - Required amount of transportation facilities and equipment
   - National traffic plan
   - Technical traffic plan
   - Traffic schedules, centralized traffic control

2. Distribution of traffic flows by principal forms of transportation and directions.

3. Computations of reequipment and development of facilities of the various forms of transportation.

4. Organisation of traffic.

Source: Zvonkov, V. V. Principles of Integrated Transport Development in the USSR, 1957.
scheme is shown in Figure 8 on page 88.

Transport charging has been used as an important means of bringing about the integration of transportation systems. It has, therefore, been the policy of the U.S.S.R. to design the rate structures so that traffic is channelled in such a manner that would ensure the economical utilization of the transportation resources of the country. Transport charging in the Soviet Union is based on the principle of cost and not on the value of the commodity. This is particularly true for inland water transport, for which rates are fixed at 15 per cent to 20 per cent below railway rates, in order to reflect the inherent low-cost advantage of water transport and to ensure that full advantage is made of this. Where river distance is so much, such as at river bends, that rate differential is rendered ineffective, the rates are calculated on the railway distance. The minimum distance charge for railway and waterways is 50 kilometers. Distances less than 50 kilometers falls within the sphere of road transport. In the U.S.S.R. roads offer little competition to waterways and railways since they act mainly as feeders.

Integration of transportation in the Soviet Union is not without problems. The most fundamental problem is the cost of transshipment operations. Although the mass movement of freight, by railways and by water carriers is very cheap, terminal costs of loading and handling are comparatively large. Where rivers are frozen during part of the
FIGURE 8
THE SCHEME OF JOINT TRAFFIC SCHEDULES

year, storage facilities raise the cost of joint rail-water or highway-water shipments still further. Soviet railroads have been experimenting with the use of large "containers" for handling less than carload shipments and this program of "kontainerizatsia" may provide a solution to the problems of high terminal costs. Another problem presenting difficulties to the joint use of transportation facilities has been the slow speed of water carriers. This has, however, been compensated for in the rate structure for integrated transportation. In spite of these difficulties, the Soviet Union has made considerable progress in integrating its transportation systems. The Soviet Union is more advanced in this aspect of transportation planning than countries like Burma and India which have also made some attempts at integrating their transportation facilities. The political system and the administrative set-up for the operation of the unified transportation system, have been important contributing factors.

**Administrative framework for integrated transport operation.** The successful functioning of an integrated transportation system does not depend only on such principles as traffic distribution and joint scheduling; it depends as well on an effective administrative framework by which the activities of the various transport organizations can be coordinated. Socialist planning in the U.S.S.R.
allows for the state ownership of transportation enterprises, compared to the capitalist countries where private enterprises are encouraged. The total transportation network in the Soviet Union is owned by the Russian government and the various ministries are responsible for the operation of the transportation industry. The development of transport and its distribution are determined by the corresponding ministries and the Gosplan or the State Plan Organization and these are then submitted for approval by the government.

Owing to the recent policy decision of the Soviet government to vest the republics with more powers for regional economic development, it has been found necessary to decentralize the administrative functions for transport operations. As a result, inland navigation and road transport are now administered independently by each republic. This is to ensure a healthy relationship between industry and transportation.

For the purposes of integrated transport administration, however, a centralized system of control has been found necessary, to ensure the efficient operation of equipment and transshipment terminals, to promote the coordination and fulfilment of the transportation plans and joint transportation schedules. This centralized system concerns itself mainly with the orderly organization of information dealing with shipment orders, condition and distribution of
equipment, the productivity of transshipment facilities; the centralized management and regulation of operations of equipment and transshipment and the allocation of capital resources. The integration of transportation facilities would have been a difficult undertaking, if it had not been for the centralized system of control utilized by the Soviet Union.

The implications of Soviet Transport integration for application in Ghana. It is important to note that integration has been achieved only for the movement of freight. Passenger transport in the Soviet Union has not been given the same attention that freight transport has been given and this aspect of transportation is seldom reviewed in the Soviet transportation literature. Any lessons that may be learnt from the Soviet experience of transport integration can be applied mainly to freight transportation. Although there are geographic, economic and political differences between the Soviet Union and Ghana, the principles of integrated transportation in the U.S.S.R. may provide a guide for the integration of transportation systems in Ghana. Ghana is a small country of approximately 92,000 square miles. Distances between different geographic areas are therefore not as extensive as distances between similar areas in Russia. Moreover, the extensive use of water transport is at its initial stages in Ghana; it is the creation of the Volta Lake that has aroused interest in water transport as an economical
means of moving people and goods. Railway transport, which is the dominant mode of transport in the U.S.S.R., is important only in the southern section of Ghana. Since the other areas are devoid of rail transport, roads have assumed a dominant role in the overall transportation system. It is hoped that water transport will be developed on an extensive scale to aid the areas far removed from the developed south.

Soviet transportation policy demonstrates the interrelationship between transportation policy and locational policies and objectives. Physical, economic and social development cannot be divorced from the development of transportation facilities. The development of the backward areas of the Soviet Union has been brought about by the provision of transportation facilities and a better level of transportation service. The concentration of developmental activities particularly in the industrial section without a timely enlargement of transportation facilities would lead to a serious crisis in the functioning of the economic system. Economic, social and physical policies must always be correlated with transportation policies, since the latter determine the concentration and dispersion of economic activities, the degree of social contact between areas and the settlement patterns of regions. The type of development conceived for an area will therefore influence to a great extent the transportation policy for the area concerned. In most cases the transportation policy includes efficiency and a higher level
of service. It is evident from the Soviet experience that integration of transportation modes is a means of achieving this policy.

The principles of transport integration in the Soviet Union bring to light some of the factors which must be taken into consideration in integrating transportation facilities. All transportation systems must be considered as a unified whole in an integrated system. The movement of people or goods is not considered complete until the final destination is reached. During this process the overall transportation resources of the region must be utilized. In order to eliminate delays at terminal points, a joint scheduling of the arrival and departure of carriers is of prime importance. Secondly, the different modes of transportation should be allowed to perform such functions as best suit their characteristics, and since there exists an interdependence between the various systems of transport, these functions should be performed as part of an integrated whole. This would involve the rational distribution of traffic among transportation systems. Thirdly, the rate structure of the transportation systems should be so designed as to make possible the utilization of water transport and its integration with other means of land transport. Fourthly, there is the need for a transportation agency to coordinate the activities and functions of the transportation modes involved in the unified system.
The application of the principles of transport integration in Ghana must take cognizance of the limitations of the Soviet system, the most important of which is transshipment. Since transshipment or rehandling, involves additional expense, loss of time and increases the possibility of loss or damage, the design of the operations of integrated transport facilities should be based on a minimum amount of rehandling. The current Soviet experiments with 'containers' provide a means of avoiding rehandling.

**Summary.** Transportation has been considered an indispensable tool for achieving socialism in the Soviet Union. The overall development of the country and the development of the backward regions of the U.S.S.R. have been found to depend largely on an efficient system of transportation. In order to provide the needs of the Soviet people, it has been necessary to transport goods from producing to market areas. In performing this function, the transportation resources of the country have been utilized.

Rail, water and highway transport are the major elements of the Soviet transportation industry. Railways have developed as the chief means of transportation in the country. This has been made possible by physical and climatic factors. Water transport, although the most economical means of transportation, has not acquired the importance that railways have acquired. It is the policy of the Soviet Union
to intensify the use of water transport for the movement of goods and people, in spite of its handicaps. Highway transport is gradually becoming a significant means of transportation. Because of the anticipated increase in road traffic, the Soviet Union has embarked on an extensive program of road construction. The review of rail, water and highway transportation systems revealed the interrelationships between them. Railways and highways have not only been constructed as trunk lines serving the various regions but they also act as feeder lines to water transportation routes.

In order to curb any competition that might exist between these modes of transportation, the Soviet Union has integrated their activities and functions within a unified system. This has contributed considerably in raising the level of transportation services offered to the public. Integration has been based on a number of principles such as joint traffic scheduling, distribution of traffic among the various modes of transportation, a rational rate structuring and a centralized system of controlling the integrated system. In spite of the successful operation of the unified system of transportation, it is limited by the increase in costs due to transshipment. Solutions have however been found to this problem.

The application of the principles of integrated transport to Ghana will be dictated by political, economic
and physical factors and the transportation and development goals of the country. These principles should therefore be adapted to the conditions of the country; and efforts should be made to eliminate the problems of the Soviet system.

2. THE UNITED STATES OF AMERICA

The Transportation policy of the U.S. In contrast to the U.S.S.R., where all modes of transportation are owned and operated by the Soviet Government, the transportation industry is both a public and a private concern in the United States. As a matter of historical accident, the various modes of transport have generally been separately owned and operated. This type of development has given rise to most of the problems which the transportation industry face today. These problems include the duplication of transportation facilities and the presence of a destructive competition which is often expressed in damaging rate-cutting which diminishes the carrier's revenue to the point where it becomes uneconomical to provide the necessary public service.

In order to solve these problems, the federal government has assumed a controlling responsibility both for the regulation of the transport industry and for the programming and financing of airports, airways, waterways, highways and ocean shipping. In fact the federal role has grown in scope and magnitude to a point where national policy exerts
a dominant influence on the future of transportation.

The importance of transportation as an essential element in the successful operation of the economic system and as a means of satisfying the needs of society has been realized by the U.S. as well. Transportation has developed as a means of stabilizing prices by making commodities available from more distant production areas in a shorter period of time, and in developing the backward regions of the U.S. The role of transportation in aiding regional growth is exemplified in the Tennessee Valley. The primary consideration of the Tennessee Valley Project was not the production of hydro-electric power but the improvement of navigation along the Tennessee River. This has greatly contributed to the development of the Valley as a whole, since the provision of cheap water transport and connecting land transportation routes has attracted not only industry but also people into the River Basin. Transportation has made it possible for the entire country to enjoy the advantages of specialization, and the benefits of the division of labour by making it possible for products to be brought great distances, thus avoiding the necessity for the local production of all needs. In spite of the size of the United States and the varied nature of its geographic and economic characteristics, provincialism has been kept to a minimum, because of the development of a transportation system which allowed the exchange of ideas and cultural backgrounds. In addition to
these economic and social influences of transportation, the increase of urbanization and the creation of the megalopolis are attributable to the development of transportation. It has, however, been recognized that the people of the U.S. can enjoy the advantages and benefits offered by transportation only if the transportation industry is brought under control.

In order to ensure an efficient and economical transportation service to the public, national transportation policies have had to be revised on many occasions. Between 1920 and 1935, federal regulatory attention was centred on the consolidation of railroads and the control of railroad operation. With the rapid development of other modes of transportation, regulatory measures were extended to the whole transportation industry. The following principles guided the formulation of national transportation policies:

1. The national interest requires at all times an adequate supply of transportation facilities provided without discrimination among individuals and communities and priced as low and as consistent with financial health of the carriers.

2. Unrestrained competition among transport enterprises tends to become 'destructive' leading to instability of transport supply and discrimination with respect to rates and service ...

3. In order to achieve maximum efficiency and economy the several individual forms of transportation must be coordinated or integrated with a view to serving the national interest rather than the financial advantage of any one agency.31

Governed by these principles, Congress passed the Interstate Commerce Act of 1940, and the transportation policy was defined as follows:

... to provide for fair and impartial regulation of all modes of transportation subject to the provisions of this Act, so administered as to recognize and preserve the inherent advantages of each; to promote safe, adequate, economical and efficient service and foster sound economic conditions in transportation and among the several carriers; to encourage the establishment and maintenance of reasonable changes for transportation services, without unjust discriminations, undue preferences or advantages, or unfair or destructive competitive practices . . . all to the end of developing, coordinating, and preserving a national transportation system by water, highway, and rail, as well as other means, adequate to meet the needs of the commerce of the United States ...

32

It is apparent from the above declaration that Congress has directed the Interstate Commerce Commission to maintain fair standards of competition among rail, highway and waterway agencies; to coordinate these agencies with a view to achieving efficiency in transportation; to foster sound economic conditions in transportation; and to protect transport users against rate and service discrimination. Congress pursued the above policy further for that period by appointing a Commission which was equipped with substantive powers to enable it to control discrimination; to set the standards of and to preserve effective competition; to determine how facilities and services should be integrated to maintain satisfactory

standards of safety and service in transportation; and to set the general level of rates. The transportation policies of the U.S. have been conceived in terms of the public interest in a unified national transportation system within which the inherent advantages of each mode of transportation are realized.

The basic elements of transport in the United States. Since it is the declared policy of the United States to integrate all transportation facilities, particularly rail, water and highway facilities, it is important to examine the importance of each of these modes in the overall transportation system and how it is organized. This would help understand some of the problems the U.S. has to cope with in its drive to integrate the functions of the transportation industry. The transportation service of the U.S. is performed by various modes; namely, railroads, water carriers, motor carriers, airlines and pipelines. Shippers may use these either independently or in cooperation with each other.

Railroads, up to the middle of the twentieth century, were the most important agency of inland transport in the United States. Even within cities, rail lines were the principal means of transport except for short distances. In 1920, railroads accounted for about 84 per cent of the total volume of intercity freight traffic and 85 per cent of the total intercity passenger-miles. The rail share of ton-mile
and passenger-mile services has declined substantially due to inroads by competing forms of transportation. In 1960, only about 45 per cent of the intercity ton-miles of freight and three per cent of the intercity passenger-miles were transported by railroads. Despite this decline in importance relative to other modes of transportation, railroads still maintain their primacy as the haulers of long distance freight traffic.

Railroad transportation in the United States is provided primarily by private companies, operating on an intercity basis and utilizing their own road, terminal and equipment facilities. The railroad industry is dominated by large "trunk line" systems which are designated by the Interstate Commerce Commission as Class I railroads. These constitute the most important portion of the industry in terms of earnings, investment and transportation service, performing more than ninety-nine per cent of the total rail service. In addition to the Class I railroads, there are smaller railroads (i.e., in terms of operation and capital investment) often owned or controlled and operated by the major systems. Many of the smaller railroads are regional carriers or lines feeding traffic into the larger systems. There are also a number of industrial railroads which serve primarily individual enterprises.

The railroad transport system of the United States, with the exception of facilities provided by contract
carriers, is made up entirely by common carriers. That is, the railroads stand ready to serve all those who seek transportation on publicly announced terms at reasonable prices. In this respect they differ from the other modes of transport in which the various enterprises may be common carriers or private carriers. The service offered by rail freight can be classified into carload service, less-than-carload service and the forwarding service. The shipper, therefore has available to him, a full range of services, ranging from the movement of one or more carloads in bulk to the pickup and delivery of a single package. Furthermore, railroads offer a wide variety in quality of services ranging from the movement of bulk products, such as coal and iron ore, to the transportation of high value merchandise requiring rapid and careful handling. Rail passenger traffic falls into the categories of long distance and commuter traffic. The increasing use of the private automobile has led to the decline of both types of traffic, while the airlines and the intercity bus companies have taken considerable amounts of the long distance traffic.

Railroad distribution in the United States is very uneven. The New England, Middle Atlantic and Midwest areas are intensively served with rail network, while in the southwest and far west, the network is less dense. The railroad network acts not only as trunk routes connecting the various regions but it also serves as a link between river ports and producing centres.
In comparison with railroad transport, water transport has not been developed intensively, since it suffers from certain distinct disadvantages which limit its scope. Firstly, the waterways of the United States are subject to the severe limitations of weather conditions. Secondly, water transport, as is always the case, is limited to the places located on the waterways, and cannot be extended beyond these areas. In spite of these handicaps, water transport provides an important mode of transportation in the United States.

The range of products which move on the domestic waterways of the country is fairly narrow. Because of the slow speed of water transport, only those products in which rapid movement is unimportant can move in any volume by water. Petroleum, ore, sand, gravel, steel products, chemicals and other heavy products moving in bulk make up the predominant share of waterway traffic. The great significance of a few products in water traffic has made private carriage very significant. Companies which can use water service to advantage find it feasible to acquire equipment for their own use. This is especially true of shippers who require some specialized facility to move material in bulk. Private ownership dominates the water transport industry. Private and contract carriers carry a large amount of the traffic moving on waterways in the U.S.A. Since the acquisition of water equipment requires a large investment, the industry is
usually organized on a corporate basis, although there are also a number of small scale operators. Because the commerce on inland waterways is concentrated on a limited number of commodities other modes which have the ability to compete for this traffic make the lot of the water carrier a difficult one. Competition for water carriers comes from railroads and pipelines. It is however hoped that such competition will be eliminated with the integration of transportation systems.

The United States has an extensive waterway system. This is the result of geographic phenomena which have given rise to the Great Lakes which penetrate nearly to the middle of the continent and the vast river systems. The Great Lakes system provides via the St. Lawrence Seaway inland access for ocean going vessels. The Mississippi, Ohio and Tennessee Rivers and their tributaries, form the heart of the inland waterway system. In combination, these rivers tap some twenty-five states in the mid-section of the United States. On the Pacific coast, the Columbia and Sacramento Rivers are the only inland waterways of importance for commercial shipping. In order to increase the use of her inland waterways, the U.S. has embarked on a program of modernization which involves the deepening and straightening of channels and the provision of larger lock chambers to permit the passage of larger tows. Water transport has greatly
contributed to the development of some of the backward regions of the United States. The Tennessee Valley Region indicates the importance of water transport in the development of a region; this is reviewed in detail in the following section.

Localities which cannot be reached by waterway or railroads are served by highways which have developed as the major mode of transportation in the United States. It is the largest conveyor of passengers at all levels and an important conveyor of freight. At the same time, motor transport is primarily local and relatively short distance. It serves as a substitute for rail, a feeder to rail and waterways and also as an independent means supplying services not provided by the other modes. The social and economic importance of a road to the people it serves, cannot be measured by costs or tax payments alone. The road or street that carries less than a score of vehicles a day is nevertheless essential to vital services such as the doctor, firefighter, the school bus, et cetera. Supplies must be moved in and crops shipped to markets. Thus every road and street, whether heavily or lightly travelled, provides for the necessities and convenience of the people.

The highway system of the U.S. consists of some 3.5 million miles of road, of which 46,000 miles consist of municipal roads and city streets, the remainder being made up of
rural highways. The main structure of the highway system of the country is comprised of the State highway systems and the national system of interstate highways. The highways are financed by both the state and federal governments and for this purpose they can be divided into four groups:

(1) The federal-aid primary system which includes the most important highways in each state.

(2) The urban extensions of system (1) which are financed by local governments.

(3) The federal-aid secondary system consisting of the principal secondary and feeder roads.

(4) The national system of interstate highways.

Freight movement on these highways ranges from the interstate line-haul transport of volume shipments to local retail delivery of single purchases. Line-haul freight service includes 'over-the-road' transport of products of farms, forests and mines in volume shipments from place of origin to processing plants, warehouses or markets; intercity carriage of volume shipments of finished goods from producer or manufacturer to warehouse or user and intercity carriage of less-than-truckload shipments of finished goods. Other types of freight trucking services can be grouped under city pickup and delivery services. These include local retail delivery service, such as food and other commodities to dwellings; city pickup and delivery of freight shipments which are a
continuing part of a line-haul movement; local delivery of bulk shipments of commodities such as petroleum products, coal, building materials, et cetera, and the local movement of raw materials and semi-finished goods between producers, factories, warehouses, and consumers. In these highway freight transport services, line-haul freight transport tends to concentrate on volume shipments from producer or manufacturer to warehouses or distribution centres, while the pickup and delivery service which forms the last stages of the transport movement is characterized by less-than-truck-load shipments.

The most important development in highway transportation is the trailer-on-flat-car railroad service often referred to as the 'piggy-back'. It is expected that this combination of railroad and truck service will reduce the amount of travel on some rural highways. However, it has been observed that for hauls of 100 miles or less, it is cheaper and faster to haul a trailer over the road rather than load it on a 'flat car'. About 300 miles has been found to be the average breakpoint above which there may be economies in 'piggy-back' service.

The organization of highway transport in the U.S. is a complex one, since it involves a large number of agencies, some of which act in a private capacity and some in a public capacity. The increasing use of the automobile has
even complicated the transportation scene in the U.S. National transportation policies therefore have to take account of both these public and private interests. It is a difficult proposition in the United States to provide a plan for integrated transportation development which can be applied to the whole country. The policy of the U.S. to utilize her overall transportation resources and to integrate the various transportation modes, has made it necessary for the regions in the U.S. to find ways and means of achieving this policy. A system of rate structuring and containerization have been two of the most important methods widely used in the U.S. to bring about integration. These methods are reviewed below with reference to the Tennessee Valley and the New York-New Jersey metropolitan area.

Principles of transport integration in the Tennessee Valley. The Tennessee Valley was one of the most depressed regions of the United States before the creation of the Tennessee Valley Authority. In 1933, the region faced problems which were particularly serious even in a land of general depression. Its people were living on incomes averaging $168. per person for the year, which was less than half the national average. Industrial growth had lagged and many of the assets needed for industry were absent. Two-thirds of the Valley's people depended on the soil for a living, most of them in a kind of agriculture, poorly suited to survive
the changes taking place in farming methods. Rivers were undeveloped and uncontrolled, soils were drained of plant food, forests suffered from overcutting and lack of fire protection. Today, the Tennessee Valley is an area of growing strength attracting people and industries from other parts of the U.S. Since 1933, there has been a net increase of 5,000 manufacturing and processing plants in the Valley. While the U.S. as a whole has achieved a spectacular rate of economic growth in the past thirty years, the Tennessee Valley region has more than matched it. The average income per person for instance has multiplied six times for the nation, but nearly nine times in the Valley region, where it has increased from forty-five per cent to sixty-six per cent of the national average. To the United States as a whole, this means a region which is less dependent and more productive for its own resources and a larger market for American industry in serving this region's higher living standards.

Numerous factors have contributed to the rapid growth in the Tennessee. These include T.V.A.'s efforts at a unified development of the Valley and most important of all the improvement of the Tennessee River for the purposes of navigation. T.V.A. came into existence in 1933 as part of the 'New Deal' in the United States to attack the economic, social and physical problems facing the Tennessee Valley Region. T.V.A. acting in the capacity of a private
corporation was to promote navigation and flood control and to market electric power. Because of the importance of transportation in the development of the region, considerable emphasis was placed on navigation which became the primary purpose of the Tennessee Valley Project.

The development of the nine-foot navigable channel throughout the length of the Tennessee River from its mouth at Paducah (Kentucky) to Knoxville (Tennessee), a river distance of 640 miles, has been achieved by a series of dams with navigation locks. These have converted the river into a chain of lakes varying in length from 185 miles to 15 miles. The navigation locks in each dam permit the passage of vessels from one reservoir to another. Before the improvement of the Tennessee River, forest products, sand and gravel comprised nearly all the freight traffic on the Tennessee. The provision of a deeper channel and the gradual extension of the river upstream have made possible longer hauls with larger vessels. The extension of the channel has opened up vast areas, and goods traffic in the Tennessee Valley include coal and grain products from the midwest, pig iron from Birmingham (Alabama), cotton goods, soap, canned goods, et cetera, mainly from the Ohio River area. The utilization of water transport has resulted in considerable savings on investment in navigation. Transportation savings on the 14.4 million tons of 1963 traffic were estimated to
total about $21.4 million. This gave a net transportation benefit of about $15.9 million, which represented about 8.7 per cent return on the net investment in transportation. Figure 9 on page 112 shows the annual costs and benefits of the navigation project in the Tennessee Valley.

Since most of the traffic using the Tennessee River for transportation purposes originates outside the basin, Tennessee River transport has had to depend largely on other transportation modes connecting Tennessee River ports with the producing as well as consuming regions. All the principal port cities and also other cities are reasonably well served by railroad services. Highway construction in the region has undergone an extensive program of expansion in recent years. There is a system of paved state highways and a network of improved sand-clay roads to supplement the major routes. The use of trucks and trailers has made possible a flexible system of rapid transportation for practically all types of commodities. Although motor trucks are a source of competition for water carriers on local short-haul freight business, in many instances the truck acts as a feeder for barge lines.

In order to fulfil the national transportation policy of preserving the inherent advantages of each mode of transport - water, highway and rail - and to maintain reasonable charges for transportation without unjust discrimination,
FIGURE 9
TENNESSEE RIVER NAVIGATION - ANNUAL COSTS AND BENEFITS

ACCUMULATIVE COSTS SINCE 1933 $91,496,330
ACCUMULATIVE SAVINGS SINCE 1933 $281,700,000

ANNUAL SHIPPER SAVINGS

ANNUAL FEDERAL COSTS

% RATE OF RETURN ON NET NAVIGATION INVESTMENT

MILLIONS OF DOLLARS

RATE OF RETURN PERCENT

CALENDAR YEARS FOR SHIPPER SAVINGS
FISCAL YEARS FOR FEDERAL COSTS

REvised MARCH 1964
TENNESSEE VALLEY AUTHORITY
NAVIGATION ENGINEERING BRANCH
3-6-58 C-NE-1-512477 9.6
T.V.A. has attempted to control transportation rates within the region. T.V.A. has realized that in order to provide effective transportation services for the public and in order to take advantage of low-cost water transportation, a varied but integrated transportation industry is essential. Since it is difficult to assign traffic volumes to the different modes of transportation, as has been done in the U.S.S.R. because of the multiplicity of agencies involved, in the transportation industry, the principle of joint rates has been employed. Common carrier barge lines join with railroads and common carrier truck lines in the establishment of through routes and joint rates. Where a through route and joint rate is in effect, the shipper deals with the carrier which accepts the freight in the first instance and pays that carrier the single rate covering all services from origin to final destination. In this system, land and water carriers deal with one another in transporting and interchanging the freight and then divide the revenue proportionately, with the barge lines taking care of river terminal service out of their share.

The principle of joint rates and through routes facilitates the process of transporting goods by means of various modes and also it makes it possible for the shipper to take advantage of the inherent characteristics of each mode. The shipper does not have to deal with a number of separate land and river carriers and river terminals. He
is also able to ship his goods at lower charges because the joint barge-rail or barge-truck rate is up to twenty per cent lower than the corresponding through rate entirely by land. Joint rates are necessary for the economic operation of river transport.

The T.V.A. has recently encountered difficulties in the application of the principle of joint rates to railroad operations outside the Tennessee Valley region. The southern grain rate case is a well-known example. The central issue in this case is the drastic reduction of rail rates by southern railways in order to attract the heavy grain traffic moving by barge. This would mean a serious economic blow to the Tennessee Valley Region and particularly the port cities with milling industries, which would result from a weakening of these industries and a crippling or destruction of common carrier transportation on the Tennessee Valley. Although T.V.A. does not object to rail freight reductions, it does object to cut-throat rates through which the railroads use their greater economic power against the weaker competitors, the barge lines. Any reductions in rates that might occur should be applied to all commodities and not grain alone. It is important to note that a large number of industries which have located in the Tennessee Valley region have done so to take advantage of the low transportation costs. Grain elevators which have located on the Tennessee waterway because of low barge grain costs
would see the effect of their savings evaporate because of the high rail rates they have to pay to transport grain from the Tennessee regions to other parts of the U.S. These industries would no longer be able to compete with other grain industries located at the Mississippi and Ohio River ports. This would result in the destruction of the present investment in elevators and mills at Tennessee River ports.

The southern grain rate case illustrates some of the consequences of the lack of coordination between the different transportation agencies and between the various modes. It is important in integrating transportation facilities to establish an agency whose duty would be to coordinate the functions of the transportation agencies and to ensure that maximum transportation services are offered to the public. The public interest therefore should guide the activities of this agency. There has been no literature published on how traffic scheduling has been achieved in the Tennessee Valley.

Principles of integration in the New York-New Jersey Metropolitan Region. In contrast to the Tennessee Valley Region where joint rates have been the major means of integrating transportation systems, the Port of New York Authority has succeeded in utilizing other means which would eliminate the problem of transshipment which is the main limitation of transport integration both in the U.S.S.R. and in the Tennessee Valley. The fact that ocean-borne commodity
movement is the means of water transport used in the New
York-New Jersey Metropolitan Region does not invalidate
the usefulness of the principles of integration for
application in the Volta Basin.

The Port of New York has been the leading port of
the United States with regard to the volume or value of
ocean-borne cargo or by the number of arrivals and depart­
tures of ship passengers. It is estimated that ocean-borne
general cargo through the port, foreign trade and domestic
coastwise trade combined, will increase about 37 per cent by
1980. Commodity movements are classified as either bulk or
general cargo. Bulk cargo is handled in loose, rather than
in packaged form; while general cargo is typically packaged
or bundled.

The Port of New York, like any other port - whether
river, lake or ocean, has to depend on land transportation
routes for the movement of commodities to and from the port.
Between a third and a half of the cargo shipped through the
Port of New York comes to or leaves the Port District by
railroad. This freight is classified as "lighterage" cargo
which is comprised of the following components:

(1) Cargo which moves between railroad terminal
and steamship terminal by marine equipment,
i.e., by lighters and carfloats operated by
or for the railroads.
(2) Cargo which moves over connecting tracks between the railroad freight stations and the steamship terminals.

(3) Cargo which is transported between the railroad stations and the steamship terminals by truck.

When a shipment originates or terminates with a rail haul, the delivering rail carrier is responsible for determining the method of terminal movement, i.e., whether to use car-floats or lighters. Similarly the railroad will determine whether to utilize trucking in lieu of lighterage, owing to light volumes of traffic or for operational reasons. Another large segment of total general cargo tonnage moves to and from the marine terminals of the port also by motor truck.

The movement of cargo over more than one mode of transportation presents a special terminal problem. The Port of New York Authority has obviated this problem by making use of piggyback for land movement and containerships for ocean transport. These have been the most significant developments in freight transportation in recent years, in the attempt to integrate the different modes of transportation. In both methods the key factor has been the use of the highway trailer as a shipping container. In piggyback, highway and rail transport are integrated by placing the trailer on a flatcar for rail movement and sub-
sequent highway transport to destination; in the containership operation, the trailer is placed aboard the ship for ocean transport. Attention is focused in this section on containership operation, since the Port of New York is the only port on the North Atlantic Coast providing such service. It should be noted that in integrating transportation facilities in the New York-New Jersey Metropolitan Area, the Port of New York Authority has been guided by the principles of increasing efficiency, of considering the movement of goods from origin to destination as one single process and of reducing cargo handling to a minimum. In order to put these principles into effect it has also been necessary to integrate terminal facilities and to standardize equipment.

The size of containers varies considerably, reflecting variations in the size of highway units and the requirements of particular trade routes. There are containers of less than highway-trailer size which have often been used for cargo which is susceptible to damage. These have been handled at conventional terminals. It has, however, been recommended by the American Standards Association that the lengths of shipping containers be standardized. The containership may be of the "roll-on-roll-off" or of the "lift-on-lift-off" type. The former requires the towing of the trailer aboard or the carrying of the trailer aboard with fork-lift trucks. In the latter type, the trailer is detached from its chassis and lifted into the ship by cranes.
For containership operations, terminal areas must satisfy the following requirements - water-depths capable of accommodating deep-draft vessels, sufficient open land and good highway access. If the operation is to provide for piggy-back transport, the terminal areas must have rail connections that permit the containers to be transferred to and from the rail cars quickly and economically.

Containership offers a number of advantages both to the ship operator and shipper and consignee. From the ship operator's point of view the principal advantages are the reduction in the cost of cargo handling and the reduction in port time. From the point of view of the shipper and consignee, the advantages are: delivery in shorter time, delivery in better condition, and delivery at low cost. The reduction of the number of handlings, reduces the total time in transit and there is less likelihood of damage to cargo. However, against the savings in operation costs must be offset the higher capital costs required.

No specific attempts have been made at integrating transportation facilities for the movement of people. The Tennessee Valley, for instance is rarely used for the transportation of people. Integration has therefore been designed to serve the movement of commodities. Likewise, the Port of New York Authority has concentrated its efforts in the field of freight movement and nothing has been done so far to
integrate transportation facilities in order to ensure the efficient movement of people from one area to the other.

The administrative framework for integrated transport operation. It has proved difficult in the United States to integrate transportation facilities at the national level because of the large number of both private and public agencies which must be taken into consideration. National transportation policies, as has been discussed, guide local governments in the development of their transportation resources. Local governments working towards the national policy of integrating transportation facilities have encountered many difficulties. The major difficulty is that of controlling private transportation development. There is the absence of an agency which is charged with the duty of coordinating the transportation functions of rail, water and highway. The success of such an agency in promoting integration has been demonstrated in the U.S.S.R.

The Tennessee Valley furnishes examples of some of the difficulties which might arise because of the absence of a coordinating agency. T.V.A. is mainly concerned with river navigation and it has little or no influence on railroad or highway transportation. This was the root cause of the southern grain rate case. The difficulty of establishing a centralized agency, as has been done in the U.S.S.R., can be appreciated if consideration is given to the fact that the objectives of the agency might differ from those of private
enterprise, whose main objective would be the maximization of profits. The Port of New York Authority on the other hand has been able to integrate the transportation systems serving the metropolitan area, because of the cooperation of the various transportation agencies and because of the coordination of their functions. This is of vital significance since containership operations are highly specialized and they demand a high degree of cooperation.

There is a missing link in the overall transportation administration of the U.S. The national transportation policy of the U.S. has some flaws. Since it is the policy to integrate all systems of transportation - particularly, rail, water, and highway, provision should have been made in the Interstate Commerce Act for an administrative machinery to implement this policy.

The implications of transport integration in the Tennessee Valley and the New York-New Jersey Metropolitan Area for application in Ghana. Like the U.S.S.R., transport integration has been achieved only for freight movement and not for passenger movement. Although transport integration in the New York Metropolitan Area has been between ocean transport and rail and highway transport, it provides many lessons which could be adapted to the Ghanaian scene. Transport administration in Ghana does not present the type of problems that the U.S. has to contend with. Since the transportation systems in Ghana are mainly owned and operated by
public agencies, it would be less difficult to establish a centralized form of control to coordinate transportation functions. Due attention will, however, have to be given to 'mammy' truck transportation, which is an individual responsibility and plays a significant role in the movement of both people and goods.

The principles of integration in the Tennessee Valley and the New York Metropolitan Area, reveal the fact that the process of transportation should be considered as a unified system although more than one mode may be involved. This is necessary because of the great degree of interdependence between modes. An integrated transportation system can function properly only if there is an effective method of rate structuring. Rates should be designed irrespective of the modes of transportation and for all types of commodity, to avoid cut-throat rates by certain transportation modes.

Containerization, which is the method used by the Port of New York Authority to integrate ocean, rail and highway transport, presents a solution to the problem of transshipment which is one of the biggest drawbacks of transport integration. The use of containers depends on such factors as the depth of the navigation channel or ocean, the efficiency of the highway system, the availability of capital, terminal facilities and the types of goods to be transported. The size of trailers permitted on the highways would depend
to a large extent on transportation regulations and this would determine the size of water carriers to be used. For the integration of transportation facilities in Ghana, due consideration must be given to the high level of integration achieved by the Port of New York Authority. The high cost involved in containerization must however be weighed against the benefits which would accrue from it.

**Summary.** The problems which face the transportation industry in the U.S. are enormous. The fact that transportation has developed as a public as well as a private concern has given rise to administrative as well as technical problems. In order to bring these problems under control, the federal government has assumed the responsibility of regulating the transportation industry. Because of the need for an efficient system of transportation as a means of satisfying societal needs and as a means of stimulating economic growth, it has been the policy of the U.S. to integrate her transportation facilities and to utilize the overall transportation resources of the country.

The movement of persons and goods in the U.S. is performed by such transportation media as railways, highways and waterways. The importance of railroads as the principal means of transportation has declined owing to competition from the other modes of transport. The railroads in the U.S. comprise mainly trunk line systems and feeder lines which serve as connecting links between trunk lines and producing
or consuming regions. Railroad transport in the U.S. is a private enterprise, and is made up almost entirely by common carriers. Water transport development in the U.S. lags behind rail transport development because of its severe limitations. Despite these difficulties, water transport still provides an important means of transporting goods and people. Highway transport has today emerged as the most important means of transportation in the U.S. It provides a large range of services, some of which cannot be provided by the other modes. The most important development in highway transport is the "piggy-back" service. It is hoped that this would reduce truck travel on rural highways.

Because of the vastness of the U.S. and because of the large number of agencies involved in the transportation industry it has not been possible to achieve integration at the national level. Some of the principles of integrated transport development in the U.S. are clearly manifested in the Tennessee Valley region and in the New York-New Jersey Metropolitan Area. Rate structuring and containerization have been the two methods employed in these areas to integrate and coordinate transportation functions. These areas have, however, not developed a system of traffic scheduling which is one of the tools used in the U.S.S.R. to achieve integration. The successful operation of integrated transport development in the U.S. is dependent upon the establishment of a centralized control either at the national or local
level to organize in a rational manner the transportation resources of the country. The application of the principles of integration to Ghana must take cognizance of the differences between the two countries.
CHAPTER IV

APPLICABILITY OF THE PRINCIPLES OF TRANSPORT INTEGRATION TO THE VOLTA BASIN

The comprehensive development of a country cannot be divorced from the provision of an efficient and adequate transportation system. Transportation has been considered as one of the major pre-requisites for industrial location; it has had great impact on the social and physical development of countries and it has been used as an instrument for encouraging development in under-developed or depressed areas. Efficiency in the transportation industry has been achieved in the U.S.S.R. and the U.S.A. through integration. The principles upon which transport integration have been based have been discussed in Chapter III. The application of these principles to the Volta Basin and the contribution of an integrated system of transportation towards the physical, economic and social objectives for the balanced regional growth of the Volta Basin are examined in the following sections. It is necessary at this point, to describe the regional objectives for development of the Volta Basin.
I. REGIONAL PLANNING OBJECTIVES FOR THE INTEGRATED DEVELOPMENT OF THE VOLTA BASIN

It is difficult to separate regional planning objectives from national planning goals and objectives, since the latter have also provided a guide for regional planning and development throughout the country. National planning goals and objectives have been formulated with reference to the over-riding goal of developing a socialist society in which each individual will be able to enjoy a modern standard of living. It is believed that a socialist form of society will ensure Ghana of rapid economic development without destroying the traditional way of life. Ghana's socialist policy is based on certain fundamentals which include the rapid and efficient development of the economy to ensure, within the shortest possible time, a high rate of productivity and a high standard of living for each citizen based on gainful employment; and the provision of adequate employment opportunities, and the equitable distribution of the nation's output. Like any other developing country, therefore, it is the main goal of Ghana to stimulate industrial development so as to alter the colonial structure of production, based on the export of primary products, which largely accounts for the low level of income in large sections of the country. This is closely associated with the national goal of providing assured full employment for the
citizens of Ghana. Social goals include the eradication of illiteracy throughout the country and the improvement of the facilities and practices of health and nutrition. National physical goals are mainly concerned with the distribution of growth in an optimum pattern, balancing resources, infrastructure and labour location; the translation of economic and social objectives into geographic patterns of industry, settlement and supporting facilities; the provision of adequate housing for the working force and the resettlement of communities from the Volta Lake inundation zone into larger communities with adequate social and physical facilities.

The attainment of these goals and objectives depends to a large extent on the transportation structure of the country. The objectives of the government in the field of transportation as outlined in the Ghana Seven Year Development Plan include the elimination of bottlenecks and the promotion of maximum utilization of existing facilities; the fostering of close coordination among transportation and communication projects in order to avoid uneconomic duplication and competition - road, rail and water to be complementary; and to provide a new network of roads and railways which would feed goods into the lake transportation system. Similar to the transportation policies of the U.S.S.R. and the U.S.A., it is evident that it is the policy of the Ghana Government to integrate the future Volta Lake Transportation System with road and railway systems.
The building of highways, railways and ports which would make possible the utilization of cheap water transport along the Volta Lake is, therefore, one of the major regional goals for the Volta Basin. As part of the industrialization process of the country, it is the policy of the government to introduce commercial agriculture and new irrigation systems; to start modern industries for the processing of farm and forest products, textiles and minerals by 1970. The industries and commercial farms will be established in the resettlement areas in the Volta Basin. They would provide an important source of income and employment to the resident population in these areas and would thus assist the fulfilment of the goal of expanding employment and occupational diversification in the Volta Basin. The achievement of the above goals would result in a higher standard of living and a better life for the people of the Volta Basin. The realization of the social, economic and physical goals for the Volta Basin could be hastened by the achievement of the transportation goals for the area. Although the provision of transportation facilities is an important step towards the realization of the growth potential of the region, these facilities must be adequate and efficient and must provide transportation services at low cost.
2. THE DEMAND FOR INTEGRATED TRANSPORT FACILITIES

The absence of adequate transportation facilities, in the Volta Basin, as reviewed in Chapter II, has been the major factor hindering its growth. Similarly, the slow development of Ghana's Northern Region and the neighbouring countries to the north has been attributed to the lack of transportation facilities and the high cost of transportation where it exists. The immense agricultural potential of these areas has therefore not yet been realized. Because of the considerable flow of traffic between the northern and southern sections of the country and between Ghana and such countries as the Republic of Upper Volta, parts of the Niger and Mali, it is inevitable that the navigable waters of Lake Volta would form an important trade route to the north. Given cheap water transport, these areas will, in effect, be brought substantially closer to Accra and the modern seaport of Tema, than they are today. The major north-south link has been a road from Tamale via Kumasi to Accra since the railway system does not extend beyond Kumasi. This route is indirect and the transportation cost is high and unreliable over such long hauls. Bolgatanga, in the Northern Region, for example, is 506 miles by road from Accra, but would be only 427 miles via the Lake Transportation System. The Volta Lake would not only serve the Volta Region, the Northern Region and the Southeastern section of the country,
but it would also provide economical transportation services to neighbouring countries. Consequently, the Lake Transportation System, in addition to providing a cheap, direct and reliable transport link between the northern and southeastern sections of Ghana and thus encouraging the effective integration of the economy of the country, would also make possible increased international traffic. The Volta Basin should take advantage of the traffic flow along the lake.

Potential Traffic for the Volta Lake Transportation System. Traffic surveys and projections by Kaiser Engineers indicate the potential traffic that will be tapped by the Volta Lake Transportation System. As pointed out by the General Manager of Ghana Railways and Harbours Authority, the Volta Lake will offer little competition to the existing railway systems of the country since commodities which are at present hauled by rail originate from places quite remote from the Volta Lake. However, the Volta Lake will be a major source of competition to roads, which have been the principal mode of transportation in the Volta Region and between Northern and Southern Ghana. In spite of this competition, which an integrated system of road and lake transport would eliminate, the Volta Lake will undoubtedly handle a large proportion of the freight and passenger movement in these areas. East-west movement along the lake will be of little significance.
The Kaiser Engineers in their report entitled "Lake Volta Transportation System - Outline Design, Volume I," divides the anticipated freight traffic along the Volta Lake into five main sources. These include traffic derived from existing north-south movement and defined as "the proportion of existing north-south traffic which would use the lake system plus the increment of growth of that traffic by 1970;" new agricultural development traffic, which is defined as "traffic arising from the agricultural projects of the Seven Year Development Plan," i.e., those projects which would generate long-haul north-south traffic; new industrial development traffic which is described as traffic derived from the new industries to be established as defined in the Seven Year Plan; new lake-community traffic, which includes "the traffic generated by the impact of the new communities of Lake Volta;" and finally new northern export-import traffic which is expected to arise from increased trade with neighbouring countries to the north of Ghana.

Table IV on page 133 shows the estimated tonnage of freight traffic through the principal Lake Volta ports for the above sources of traffic for the year 1970.


34Ibid., p. V-3.

### TABLE IV \(^36\)

**ESTIMATED ANNUAL TONNAGE OF FREIGHT THROUGH LAKE VOLTA PORTS, 1970. (IN TONS)**

<table>
<thead>
<tr>
<th>Source of Traffic</th>
<th>Akosombo/Apimso</th>
<th>Kpandu</th>
<th>Amanfram</th>
<th>Kete-Krachi</th>
<th>Tamale Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth of existing traffic</td>
<td>420,500</td>
<td>41,400</td>
<td>21,400</td>
<td>58,500</td>
<td>299,800</td>
</tr>
<tr>
<td>New agricultural development traffic</td>
<td>223,700</td>
<td>9,500</td>
<td>10,500</td>
<td>6,100</td>
<td>235,500</td>
</tr>
<tr>
<td>Traffic from industrial projects</td>
<td>65,100</td>
<td>2,000</td>
<td>2,000</td>
<td>5,000</td>
<td>56,100</td>
</tr>
<tr>
<td>New Lake Community traffic</td>
<td>58,000</td>
<td>9,000</td>
<td>9,000</td>
<td>9,000</td>
<td>29,000</td>
</tr>
<tr>
<td>New export-import traffic with neighbouring countries to the north</td>
<td>125,000</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>125,000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>892,300</strong></td>
<td><strong>61,900</strong></td>
<td><strong>42,900</strong></td>
<td><strong>78,600</strong></td>
<td><strong>745,400</strong></td>
</tr>
</tbody>
</table>

Existing north-south and east-west freight traffic at the principal ferry crossings is estimated at 580,000 tons as shown in Table V, below.

**TABLE V**

**ESTIMATED TOTAL FREIGHT TRAFFIC AT MAJOR CROSSINGS (1962)**

<table>
<thead>
<tr>
<th>Crossing</th>
<th>Estimated Annual Freight Tons Traffic</th>
</tr>
</thead>
<tbody>
<tr>
<td>North-South</td>
<td></td>
</tr>
<tr>
<td>Bamboi</td>
<td>70,000</td>
</tr>
<tr>
<td>Buipe</td>
<td>25,000</td>
</tr>
<tr>
<td>Yeji</td>
<td>135,000</td>
</tr>
<tr>
<td>Otiso</td>
<td>90,000</td>
</tr>
<tr>
<td>East-West</td>
<td></td>
</tr>
<tr>
<td>Adomi</td>
<td>260,000</td>
</tr>
<tr>
<td>Total</td>
<td>580,000</td>
</tr>
</tbody>
</table>

Based on these estimates, the volume of north-south traffic was projected for 1970. Although these estimates were found

---

to be incomplete, they provided a good indication of the steady growth in north-south traffic,

Between 1958 and 1962, the traffic count data indicates that total private truck capacity crossing Yeji ferry, in both directions rose from 104,000 tons to 178,000 tons. This represents a gain of about 72 per cent, or nearly 15 per cent per year. The total capacity crossing Otiso ferry in both directions grew from 47,000 tons to about 130,000 tons during the same period, an increase of 180 per cent.  

There is a tendency for the consumption of certain commodities to expand more rapidly than others in Ghana's growing economy. These commodities include petroleum products, meat, portland cement and cocoa. In 1962 a total volume of 22,600 tons of petroleum products were exported to the north over all ferries. There was 110 per cent increase in petroleum product shipments between 1957 and 1963. A further increase of 71 per cent is anticipated for 1970. Petroleum-product shipments may be greater than projected if trade negotiations with Ghana's northern neighbours could be undertaken. Meat consumption for the 'design year' of 1970, incorporating the targets of the Seven Year Development Plan for increased domestic production, involves a 50 per cent increase in the production of beef and mutton, from 12,000 tons to 18,000 tons and 100 per cent increase in pork and poultry production from a total of 8,800 tons to about 19,800 tons. In accordance with Ghana's program of encouraging and expanding trade

38Ibid., p. V-12.
between African states, there is likely to be a substantial increase of imports of cattle, sheep and goats. The Volta Lake would be of considerable importance to the livestock industry. Presently, most of the livestock is transported to the southern markets on hoof and thus arrives in the markets in poor condition. However, owing to the cost involved in shipping livestock, it would be more economical to transport the meat in processed form - either refrigerated or tinned - to these markets. The shipments of sacked cement to Port Tamale for distribution to other areas in the Northern Region is expected to increase by about 12 per cent over the 1962 estimate. Similarly, cocoa production in the Volta Basin would witness a total increase of 45,000 tons in 1970 compared to the total production of 30,300 tons in 1960/61 period.

New agricultural developments in the country are likely to generate traffic for the Volta Lake Transportation System. These developments are mainly concentrated in the savannah zone which comprises the Northern Region, the northern section of the Brong-Ahafo and Volta Regions, and the Accra Plains. Table VI on page 137 illustrates the location of planned agricultural development in Ghana, as outlined in the Ghana Seven Year Plan. It is quite clear that the achievement of Ghana's Seven Year Plan would result in an agricultural revolution in the savannah areas, since it is
## TABLE VI

LOCATION OF PLANNED AGRICULTURAL DEVELOPMENT, 1963-70

<table>
<thead>
<tr>
<th>Crops and Livestock</th>
<th>Savannah Zone</th>
<th>Forest Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Arable Crops</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cereals</td>
<td>Rice, Maize, Millet, Sorghum</td>
<td>-</td>
</tr>
<tr>
<td>Legumes and Oil Seeds</td>
<td>Groundnuts, Bambarra Nuts, Cowpeas, Beans, Peas, etc.</td>
<td>-</td>
</tr>
<tr>
<td>Roots</td>
<td>Cassawa, Yams, Sweet Potatoes</td>
<td>Cocoyams</td>
</tr>
<tr>
<td>Fruits</td>
<td>Pawpaws, Pineapples</td>
<td>Bananas</td>
</tr>
<tr>
<td>Fibres</td>
<td>Cotton, Urena Lobata, Sisal</td>
<td>-</td>
</tr>
<tr>
<td>Others</td>
<td>Tobacco, Sugarcane Grasses, Pastures</td>
<td>-</td>
</tr>
<tr>
<td><strong>Tree Crops</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil Seeds</td>
<td>Shea Butter</td>
<td>Coconut, oil Palm</td>
</tr>
<tr>
<td>Fruits</td>
<td>Mangoes</td>
<td>Citrus, Avocado Pears</td>
</tr>
<tr>
<td>Others</td>
<td>Cashew, Timber</td>
<td>Cocoa, Coffee, Rubber, Timber</td>
</tr>
<tr>
<td>Livestock</td>
<td>Cattle, Sheep, Goats, Pigs, Poultry</td>
<td>-</td>
</tr>
<tr>
<td>Vegetables</td>
<td>Tomatoes, Onions, Shallots</td>
<td>-</td>
</tr>
</tbody>
</table>

---

the policy of the Government of Ghana to intensify agricultural productivity in these areas. The significance of this policy can be related to the growing rate of urbanization, the rising standards of living and the need to produce sufficient foodstuffs with which to feed the urban population. Although the main markets for agricultural produce are in the southern section of Ghana, not all of the agricultural increases from the Seven Year Plan will generate traffic for the Lake Transportation System. Table VII on page 139 illustrates tonnage by commodity and shows the distribution between transport by road and transport by water.

In conformity with the Seven Year Development Plan which encourages the processing and manufacturing of industrial raw materials, a large number of industrial projects are planned both for the Volta Basin and for other parts of the country. Of these projects, the following will make the greatest contribution to Volta Lake traffic; the meat-packing plants to be established at Bolgatanga and Tamale, an oil-seed crushing mill at Bawku, a chemical fertilizer plant in the Accra-Tema area, a 500,000 ton metallurgical industry at Kete-Krachi, metal and machine industries at Akosombo, chemical industries at Ada and Adawso and a pulp and paper industry tentatively located at Akuse.

The other major source of traffic for the Lake Transportation System is the resettlement program, which involves the resettlement of flood zone residents and the
TABLE VII 40

LAKE AND ROAD DISTRIBUTION OF NORTH-SOUTH FREIGHT TRANSPORT REQUIREMENTS RESULTING FROM INCREASED AGRICULTURAL PRODUCTION IN 1970

<table>
<thead>
<tr>
<th>Commodity</th>
<th>1970 Production Increase requiring transport (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Origin</td>
<td></td>
</tr>
<tr>
<td>Rice</td>
<td>16,000</td>
</tr>
<tr>
<td>Guinea Corn and Millet</td>
<td>45,000</td>
</tr>
<tr>
<td>Yams</td>
<td>117,070</td>
</tr>
<tr>
<td>Groundnuts</td>
<td>80,000</td>
</tr>
<tr>
<td>Beans and Peas</td>
<td>20,000</td>
</tr>
<tr>
<td>Onions</td>
<td>5,010</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>12,000</td>
</tr>
<tr>
<td>Livestone (meat weight)</td>
<td>10,000</td>
</tr>
<tr>
<td>Sub-Total</td>
<td>305,090</td>
</tr>
<tr>
<td>Southern Origin</td>
<td></td>
</tr>
<tr>
<td>Fish</td>
<td>220,000</td>
</tr>
<tr>
<td>Palm Oil</td>
<td>15,010</td>
</tr>
<tr>
<td>Fruit</td>
<td>20,000</td>
</tr>
<tr>
<td>Maize</td>
<td>60,000</td>
</tr>
<tr>
<td>Cassava</td>
<td>40,000</td>
</tr>
<tr>
<td>Sub-Total</td>
<td>335,010</td>
</tr>
<tr>
<td>Road Transport Total</td>
<td>447,290</td>
</tr>
<tr>
<td>Lake Transport Total</td>
<td>212,810</td>
</tr>
</tbody>
</table>

40 Kaiser Engineers and Constructors Inc. Loc. op.cit. p.V-31
provision of financial and technical assistance to allow them to undertake new agricultural and economic developments, leading to higher levels of living. The agricultural produce grown in the hinterlands of these new ports and settlement areas would be marketed through the eight landings along the shores of Lake Volta and also Port Akosombo and Port Tamale. The estimates of new local traffic generated by Lake Volta community as shown in Table VIII below.

**TABLE VIII**

NEW LOCAL TRAFFIC GENERATED BY LAKE VOLTA COMMUNITY DEVELOPMENT, 1970

<table>
<thead>
<tr>
<th>Lake Volta Ports</th>
<th>Freight Annual Tonnage</th>
<th>Passengers Annual Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>In</td>
<td>Out</td>
</tr>
<tr>
<td>Port Akosombo</td>
<td>30,000</td>
<td>28,000</td>
</tr>
<tr>
<td>Adawso Landing</td>
<td>4,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Kpeve Landing</td>
<td>4,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Kpandu Landing</td>
<td>4,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Amanfrom Landing</td>
<td>4,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Dumbai Landing</td>
<td>4,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Kete Krachi Landing</td>
<td>4,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Yeji Landings</td>
<td>6,000</td>
<td>8,000</td>
</tr>
<tr>
<td>Monno Landings</td>
<td>4,000</td>
<td>5,000</td>
</tr>
<tr>
<td>Port Tamale</td>
<td>13,000</td>
<td>6,000</td>
</tr>
</tbody>
</table>

Of the major sources of future Volta Lake traffic identified more than half of the projected lake traffic for 1970 will result from traffic arising from existing commodity movements.42

Lake Volta, in addition to offering transportation services to freight movement will also provide services for the transportation of people between the northern and southern sections of Ghana. Of the four principal ferry crossings already mentioned, the Yeji ferry carried the greatest percentage of passenger traffic. In 1962, 395,000 south-bound passengers and 363,000 north-bound passengers were recorded at the Yeji ferry.

Although only a small percentage of the passengers crossing Yeji ferry today are going directly to Southeastern Ghana, it is expected that a fast and cheap passenger service between Port Tamale and Akosombo might draw 80,000 passengers annually in each direction. Furthermore, another 40,000 passengers each way might travel between Kete-Krachi and Akosombo if good service were available between these two ports.43

Substantial passenger traffic will also originate from the east-west flow between settlements located on the shores of the lake. The volume of passenger traffic which will originate from the various ports is shown in Table VIII on page 132.

---


Transport integration in the Volta Basin. The potentialities of the Volta Lake as a means of freight and passenger transport are enormous. Moreover, the use of the Volta Lake for transportation purposes would effect considerable savings in transportation investments; "for a total investment of $27.9 million an annual reduction of $15.6 million can be effected under the present cost of road transportation from and to the northern and lake regions." The optimum utilization of this system by Ghana and by other African states will depend on the quality of service offered and on the cost of transportation services. Soviet and American experiences indicate the necessity of linking lake, river or ocean ports by overland transportation routes. These can be either roads or railways and they must form an integrated part of the national system. Alternative combinations of water and land transport between Accra - Tema and Tamale, via Lake Volta have been considered by Kaiser Engineers and Constructors. Road - Lake - Road, Rail - Lake - Rail and Road - Lake - Piggyback combinations were analysed on the basis of capital and annual costs.

The road transport plan via Port Akosombo was based on trailers carried to Port Tamale by two-deck trailer barges on Lake Volta. The rail transport was based on Ghana's Railways from Tema/Accra to Koforidua with a new railway to

---

\(^{44}\) Kaiser Engineers and Constructors, Inc. Ibid., p. 1-11.
Port Apimso ... and from Port Tamale to Tamale. In the latter plan, loaded rail cars were to be carried on deck barges along Lake Volta. A third plan, ... was also considered, using road transport in the north with trailer barges across the lake and trailers carted "piggyback" on bogie flat rail wagons from Port Apimso to Accra/Tema.45

A summary of total capital and annual costs of the three systems is presented in Table IX below.

**TABLE IX**

**SUMMARY OF TOTAL CAPITAL AND ANNUAL COSTS**

<table>
<thead>
<tr>
<th>System</th>
<th>Capital Costs in thousand $ (approximate)</th>
<th>Annual Costs in thousand $ (approximately)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road/Lake/Road</td>
<td>17,799</td>
<td>5,697</td>
</tr>
<tr>
<td>Rail/Lake/Rail</td>
<td>34,116</td>
<td>6,609</td>
</tr>
<tr>
<td>Road/Lake/Piggy-back</td>
<td>27,693</td>
<td>6,177</td>
</tr>
</tbody>
</table>

On the basis of the capital and annual cost analysis, the Road/Lake/Road combination has been recommended as the most feasible system. It is important to note that capital costs alone do not provide the most logical criteria for judging between alternative systems. Since transportation facilities are designed to render service to the public and to aid the proper functioning of the economic system, alternative transportation plans must be evaluated with reference to the net benefits on the economy and the benefits that are likely to accrue to the public, from the implementation of

the plans. Cost-Benefit analysis offers a logical means for decision-making and for selecting one or more courses of action, since it takes into account factors which can and factors which cannot be measured in dollars and cents. The application of Cost-Benefit analysis to the alternative schemes would indicate the scheme with the largest ratio of benefits to costs, and hence, the most feasible.

Physical integration which involves an effective linking up of the transportation network, as shown in Figure 10 on page 145, does not provide a complete answer to the problem of integration. Transport integration aims primarily at the elimination of physical impediments to the movement of vehicles, goods and people, at the provision of a high level of service at low cost. In the planning of joint transport, the transportation process must be regarded as a unified means of moving commodities from sphere of production to sphere of consumption or as a means of moving people from origin to destination, i.e. from the southern to northern sections or from northern to southern sections of Ghana. This process should be effected in the shortest possible time with no or few transshipments. Since physical integration per se does not lead to the fulfilment of these purposes, it must be supplemented by other methods. The principles of transport integration in the U.S.S.R. and the U.S.A., as reviewed in Chapter III, indicate the methods by which a unified transportation system could be achieved.
FIGURE 10
PHYSICAL INTEGRATION OF VOLTA LAKE TRANSPORTATION SYSTEM WITH ROAD AND RAILWAY SYSTEMS

NORTHERN REGION

TRUCK TERMINAL

NORTHERN LAKE PORT

SOUTHERN LAKE PORT

SOUTHERN REGION

RAIL TERMINAL

TRUCK TERMINAL

LEGEND

→ ROAD TRANSPORT

--------------- RAIL TRANSPORT

→ WATER TRANSPORT
Because delays at terminal facilities and trans­shipment points are one of the major limitations of present conditions in the transportation industry where each trans­portation mode performs a separate function, a scheme of joint traffic schedules is essential for the integration of transportation facilities. Such a scheme should provide in­formation on the distances between the freight stations along Lake Volta, and highway and rail terminals, on the time consumed by a freight carrier in travelling between a highway or rail terminal and a port on the lake, the turnaround time of the freight carrier within a terminal, and on the time interval between the departure and arrival of freight car­riers. A similar scheme should be designed for passenger transport with emphasis on the arrival and departure of carriers.

Although joint scheduling ensures efficiency in time, it does not eliminate the forces of unhealthy competi­tion which might jeopardize the purposes of integration. The Tennessee Valley Region provides an example of the con­sequences ensuing from the absence of an effective rates policy. These difficulties can be overcome by a policy of joint rates which takes into account the economic and tech­nical advantages of each means of transportation and thereby induces users to avail themselves of the branches of the transportation industry which are most useful in the overall
interests of the national economy. Lake Volta transportation, must therefore be priced lower than highway or rail transport in order to bring out the economy of water transport. However, it is necessary for the joint rate policy to be applied to all modes of transportation irrespective of whether they are publicly or privately owned and operated. A shipper transporting goods over the Highway and Lake Transportation Systems will have to pay only a single rate covering all transportation services from origin to destination. The shipper therefore deals only with the carrier at the place of origin and does not have to negotiate with a number of separate land and water carriers. Joint rates also simplify to a considerable extent the problem of accounting. The revenue which accrues from the operation of the joint transport services of Lake Volta and the highway or railway systems will be shared between carriers, based on the overall contribution of each in the movement of goods and persons. The successful functioning of the unified transportation system calls for negotiations on the part of the Government with private enterprise. Difficulties might be encountered in these negotiations due to the large number of individual owners of "mammy trucks". It might be necessary to continue with the present system, whereby the shipper makes payments directly to the owner of the "truck". The rates charged should however be controlled. In the case of passenger
transport, joint rates should be established by arrangements between the Ghana Railways and Harbours Authority, Ghana National Construction Company (G.N.C.C.) which is responsible for road transport and the Volta River Authority or a new Lake Transport Authority that might be created to operate the Volta Lake Transportation System, which would enable passengers to travel over more than one system by means of a ticket covering the whole journey.

Although physical integration, joint traffic schedules and joint rates provide a logical and effective basis for integrating Volta Lake transport with highway and railway systems, they do not overcome the problem of transshipment or rehandling which involves additional expense and loss of time and increases the possibility of loss or damage. Containership operations as exemplified in the New York-New Jersey Metropolitan Area provide a solution to this problem. The type of barges and the type of trailers which will be used in the Volta Basin will be dictated by the lake conditions and road and railway regulations respectively. It is clear that transport integration in the Volta Basin cannot be based upon one or two principles.

The success of transport integration in the Volta Basin would depend upon the extent to which consideration is given to all the principles mentioned above. Transport integration would eliminate the duplication of transport facilities, the wastage of transport capacity, unhealthy competi-
tion; and would ensure the rational allocation of capital investment and freight between the various transportation modes, and a low cost of transportation services.

3. ADMINISTRATIVE MACHINERY FOR INTEGRATED TRANSPORT OPERATION

One of the major factors underlying the success of transport integration in the U.S.S.R. and the New York-New Jersey Metropolitan Area has been the establishment of an agency which acts as a coordinating body for railway, highway and waterway systems. This body does not only coordinate the activities of the various systems but it is also concerned with the proper functioning of the unified system. The absence of such a body in the Tennessee Valley Region has greatly endangered the successful operation of an integrated system of transportation. It is difficult to realize the advantages of an integrated transportation system in the absence of a body to undertake the implementation of policies for transport integration.

Due to the specialized nature of inland waterway, road trailer and piggy-back transport operations and due to the fact that Lake Volta Transportation System would combine several cargo and passenger services, a separate department under the Volta River Authority or a new Lake Transport Authority should be constituted to administer the integrated system. Administratively, the Volta River Authority has been
associated with present investigations into passenger and freight transport on the lake and has taken steps in promoting the development of lake transport. In addition, it is concerned, to a great extent, with the overall development of the Volta Basin which cannot be separated from transport development. This makes it logical for the Volta River Authority to continue with this initiative and to undertake to implement the proposals for transport integration. This could be achieved by the creation of a Lake Transport Department under the Volta River Authority and responsible to it. Although such an organization would facilitate the coordination of activities relating to the development of the Volta Basin, at the same time, it limits the decision-making powers of the Lake Transport Department.

Since transportation on Lake Volta would require the building up of a fleet of passenger and freight carriers, the establishment of workshops to do repairs, the registration of vessels, owners and operators et cetera, an autonomous Lake Transport Authority with adequate government status is needed. The Lake Transport Authority should be given legal powers which would allow it to make rational decisions relating to the efficient operation of the Lake Transportation System. Since Volta Lake transport cannot function independent of land transportation systems, Ghana Railways and Harbours and Ghana National Construction Company (G.N.C.C.),
and also the Volta River Authority should be represented on the Lake Transport Authority in order that activities of these bodies could be effectively coordinated. This is of vital importance since decisions taken by the Ghana Railways and Harbours and G.N.C.C. are bound to have repercussions on lake transport. The Lake Transport Authority would be responsible for devising a rates policy for the integrated system in consultation with Ghana Railways and Harbours and G.N.C.C. and for implementing it. The Lake Transport Authority is envisaged as a public corporation headed by a director who would be responsible to the President of Ghana.

4. INTEGRATED TRANSPORT AND VOLTA BASIN DEVELOPMENT

The regional objectives for Volta Basin development and the demand for integrated transport facilities have been examined in the previous sections. It is the purpose of this section to analyse the contribution of an integrated transport system towards the fulfilment of the developmental objectives of the Volta Basin. As was pointed out in Chapter I, transportation facilities in developing countries are provided not only for convenience, but they are also used as tools for achieving other objectives. The reason for the backwardness of large areas in developing countries has been due to the fact that rapid growth has located in the more "attractive" areas. Opportunities in these areas draw off certain resources, including capital and labour from the
backward regions; and the relative inaccessibility of the latter prevents their being integrated effectively with the focal points of growth. The improvement of the accessibility of the backward regions would greatly enhance their growth potentials.

The achievement of Ghana's major goal of economic reconstruction, which entails the equitable distribution of economic output and the processing of her raw materials depends on a number of factors of which transportation is an important one. The backward nature of the Volta Basin and also the Northern Region has been due to the lack of efficient and low-cost transportation facilities. The Volta Lake would provide an important means of movement and would open up large areas of the Volta Basin for development. Since Volta Lake transport cannot function as a separate system, it must be integrated with land transportation modes in order to provide jointly the low-cost transportation required for the development of the Volta Basin. Regional planning which is primarily concerned with the optimum utilization of natural resources is being employed as a means of stimulating development in the Volta Basin and of achieving both national and regional social, economic and physical goals and objectives. In order to facilitate and expedite such development, the accessibility of the Volta Basin needs to be greatly improved. The proposed principles
of integrating Lake Volta transport with highway and railway systems would provide the Volta Basin with an efficient and low-cost transportation service.

The attraction of economic activity into the Volta Region is clearly a competitive one. There are many things that the Volta Region can do to enhance its locational advantages, particularly with regard to facilities, as in improving transportation. Since its location within the country cannot be altered, an appraisal of its relative advantages and disadvantages with regard to 'input-output access' is an essential starting point for understanding the Volta Basin's growth potential. The question of "access" as the sum of the relative advantages and disadvantages for the production of a particular commodity at a given place implies more than just the resistance and hence costs, imposed by distance on the assembly of inputs and the distribution of outputs. The question of relative costs is very critical since a favourable opportunity at a given place might not be exploited because of the existence of a better opportunity elsewhere. Therefore "rivalry" and "opportunity" costs are important in the concept of "access" as in the concept of investment. The provision of integrated and therefore economical transportation facilities would make it possible for the assembling of raw materials within the Volta Basin and from other parts of the country to feed industrial establishments in the region. The availability of good access would also bring the Volta
Basin in close proximity to the Southern Region where the population is concentrated.

An examination of regions in terms of "input-output access", with regard to the requirements of economic activities would indicate the extent to which they vary in their prospects for growth. Figure 11 on page 155 illustrates the range of possible growth in a number of conceptual regions. Although this diagram may appear to be oversimplified, it provides a good index of the extent to which a region's general access characteristics may influence its growth potential. Region 4 in the diagram would have little prospect for growth, while Region 13 would have an unsurpassed growth potential. In the cases of Regions 1, 2, 3, 8, 12 and 16, reasonable access to inputs is offset by lack of market access. Since the Volta Basin transportation network would be linked up with the national network the problem of poor access to home markets does not arise. Similarly the inclusion of Tema Harbour in the area under consideration for the integration of transportation systems would facilitate the export of commodities to other countries and the import of goods to the Volta Basin.

In developing countries, transportation has been an important consideration in selecting a location for industry. Assuming that all costs to an industry, except those of transportation, are constant and the same at any
Figure 11
A Schematic Presentation of Types of Regions That Can Exhibit Different Growth Potentials

<table>
<thead>
<tr>
<th>Good access to basic inputs* from external regional and national sources</th>
<th>Good access to basic inputs in home region</th>
<th>Poor access to basic inputs in home region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good access to basic inputs in home region</td>
<td>Good access to basic inputs in home region</td>
<td>Poor access to basic inputs in home region</td>
</tr>
<tr>
<td>Good access to basic inputs in home region</td>
<td>Good access to basic inputs in home region</td>
<td>Poor access to basic inputs in home region</td>
</tr>
<tr>
<td>Good access to basic inputs in home region</td>
<td>Good access to basic inputs in home region</td>
<td>Poor access to basic inputs in home region</td>
</tr>
<tr>
<td>Good access to basic inputs in home region</td>
<td>Good access to basic inputs in home region</td>
<td>Poor access to basic inputs in home region</td>
</tr>
</tbody>
</table>

*Not only basic resources but important intermediate sources need to be considered.

Source: Perloff, H.S. and Dodds, V.W. How a Region Grows, 1963.
location, the choice of location is determined by ascertaining the site with the lowest transportation cost. Economical transportation via the Volta Lake and the improvement of transportation services by means of integration would greatly assist the planned regional development of the Volta Basin. However, since transportation is not the only criterion determining economic development, other factors such as the availability of skilled labour, the availability of internal as well as external markets must be taken into account.

The economic development of the Volta Basin would not only contribute to the implementation of Ghana's policy of economic reconstruction which encompasses the development of the underdeveloped regions of the country, but it would also contribute to the provision of gainful employment as well as a variety of employment opportunities for the people in the Volta Basin. As was pointed out in Chapter II, the resident population of the Volta Basin is comprised mainly of farmers who depend on the meagre revenues obtained from their farming activities for their livelihood. Since agriculture is exposed to the vicissitudes of the climate and conditions in both home and world markets, it does not provide a source for substantial employment. The encouragement of manufacturing industries to locate in the Volta Basin, thus diversifying the economic base of the area is a means of solving this problem, and of ensuring social stability within the area by lessening the probability of emigration.
Industrialization has been envisaged in Ghana as a necessary condition for increasing the national income and the revenues of the State in order to raise the level of living of every Ghanaian. As part of the industrialization process, a number of economic activities are expected to locate in the Volta Basin utilizing power from the Hydroelectric power project in the processing of raw materials. These industries would make substantial contributions to the national income which is tied up with the increase in the per capita income of both the rural and urban population of the Volta Basin and of the country as a whole. The key to economic development, which is needed for the betterment of living standards in the Volta Basin, as has been pointed out, is an economical transportation system. Integrated transportation facilities have little contribution to make towards the eradication of illiteracy or better health practices. However, the growth of population which might result from the industrial development of the Volta Basin would make it possible to support educational and medical facilities which will be established within the area.

The Volta Basin Regional Development Plan proposes the resettlement of the 70,000 floodzone residents into a hierarchy of settlements ranging from the 'Central Town' to clusters of traditional small villages around a school, market or park. The 'Central Town' would contain functions
such as industry, trade, service and government and would be located in areas where economic resources could be easily assembled. Since the confluence of transportation modes provides an ideal location for such towns, it is inevitable that the Lake Ports would develop as 'Central Towns'. Since these towns would serve as regional centres, they should be connected to the other settlements by efficient transportation facilities. Transportation can be used as an effective tool in implementing the resettlement scheme since the level of transportation service and modes of transportation available within an area influence to a considerable extent the pattern of settlement.

The provision of integrated transport facilities in the Volta Basin would make both direct and indirect contributions to the economic, social and physical objectives for integrated development of the Volta Basin. However, the greatest contribution would be made towards the achievement of economic objectives which have both social and physical ramifications. The resulting balanced development of the Volta Basin would be a desirable step towards a division of labour and a better integration of the economic, social and physical aspects of the country.

**Summary.** National planning goals and objectives have guided the development of both the country and the regions of which it is composed. Where specific regional
planning objectives exist, they have been formulated with reference to the national goals and objectives. Consequently, it is difficult to make a distinction between national goals and objectives and regional objectives. The overriding national goal of developing a socialist society has been based on economic development, provision of employment opportunities and the raising of the level of living of Ghanaians. Social and physical goals include better educational and medical facilities for all Ghanaians, resettlement, provision of adequate housing for the working force and the integration of water transport with highway and railway systems.

The underdeveloped nature of the Volta Basin has been mainly attributed to the lack of efficient and low-cost transportation facilities. The development of Volta Lake Transportation System would open up the Volta Basin for development. This would, however, depend on the demand for water transport both within and outside Ghana. Investigations by Kaiser Engineers indicate the range and vastness of future potential traffic for Volta Lake transport. Five major sources of traffic have been identified. These include traffic from existing north-south movement, traffic from new agricultural and industrial development and finally traffic from the new lake communities. The utilization of the Volta Lake for the movement of commodities derived from these sources and for the movement of people from the
northern to the southern sections of the country and vice-versa would create competition for road transport which has been the only means of transport within the region. Competition can be eliminated by the integration of Volta Lake transport with highway and railway systems.

Integration must be based on physical integration, traffic scheduling, joint rate structuring and containership operations. All these principles should be taken into account in order to attain efficiency within the integrated system. To implement the policies of transport integration and to coordinate the activities and functions of the transportation systems, a new Lake Transport Authority should be established. It should be given adequate legal powers to enable it to make rational decisions. Since activities of the Ghana Railways and Harbour Authority, the G.N.C.C. and the Volta River Authority would affect lake transport, it is necessary that these bodies be represented on the Lake Transport Authority.

Integrated transport, and hence low-cost and efficient transportation would greatly enhance the growth potential of the Volta Basin. Agricultural production would increase and industries would be attracted to the region. Economic development in the Volta Basin would mean a high level of income and a high level of living for the local residents. The increase in population resulting from industrial development and better employment opportunities would
make it possible to provide educational, medical and other community facilities and services within the area. The pattern of settlement in the Volta Basin would be greatly influenced by the characteristics of the transportation network and nature of the transportation service. It is clear that integrated transport would contribute to the economic, social and physical objectives for the development of the Volta Basin although the contribution would be more towards the achievement of economic and physical, rather than social, objectives. Contributions towards the implementation of social objectives are mainly indirect.
CHAPTER V

SUMMARY AND CONCLUSIONS

This concluding chapter serves two main purposes. Firstly, a review and summary of the arguments presented in the previous chapters, substantiating the need for integrating transportation facilities, are presented, with particular reference to Ghana. Secondly, the potential contribution of integrated transport facilities towards the achievement of the economic, physical and social objectives for the balanced development of the Volta Basin is evaluated.

I. SUMMARY

The major purpose of this study is to investigate the possibility of utilizing an integrated transportation system as a means of promoting regional planning and development in the Volta Basin. With this objective in view, it is contended that the material and economic well-being of the underdeveloped regions of Ghana and, in fact, of developing countries, would be greatly improved by the provision of low-cost and efficient transportation services. The investigation was undertaken on the basis that the competition between transportation modes, the expansion of transportation facilities and the optimum allocation of capital resources within the transportation industry are some of the
problems facing developing countries. Moreover, the low-
level of development of these countries has been a result of
the lack of adequate transportation services. It is em-
phasized that of the problems mentioned above, the most
pressing is the development of rivalry between transportation
modes, although these are mutually interdependent and perform
complementary functions. A review of the characteristics of
rail, water and highway carriers, revealed this fact. Water
transport was found to be the victim in this competitive
situation. Since water transport is localized and since
many developing countries have embarked on H.E.P. projects
which also include the improvement of river channels for
purposes of navigation, a regional approach to transport in-
tegration is considered to be necessary.

It is felt that the utilization of the Volta Lake,
which will be created as a result of the Volta River Project,
for transportation purposes, will probably constitute a
source of competition to existing modes of transport, par-
ticularly road. In order to make possible the use of this
economical means of transport, ways and means should be found
to integrate lake transport with road and railway systems.
This would not only result in an optimum utilization of the
transportation resources of Ghana, but it would also result
in the creation of a better climate for development and in-
vestment in the Volta Basin.
In order to find solutions to this problem of integrating transportation facilities, it was necessary to review the concept of transport integration. This preliminary consideration was made in Chapter I. It is observed that transport integration, in contrast to transport coordination, takes place where more than one mode of transportation exist and it is concerned with the employment of each mode of transport in the economic circumstances best suited to its characteristics. Transport integration, therefore, implies the use of the principle of efficiency in transportation planning and adjustment.

Since an integrated transportation system is proposed as a tool for achieving regional planning and development, the process of regional planning and development and the viability of the Volta Basin as a unit for planning and development was analyzed in Chapter II. In order to do this, the discussion was preceded by a review of the regional concept. It was noted that the variety of functions for which regions can be defined has created difficulties in the delineation of regions. Two main categories of regions which are employed by social scientists, for analytical and descriptive purposes, are identifiable. These are 'single-factor' regions which are defined on the basis of the homogeneity of their physical or human elements; and "multi-factor" regions, which are measured in terms of several
phenomena, both physical and human, which give the regions their character. These regions are not considered to be the most appropriate areal divisions for regional planning and development.

In his search for an optimum unit for planning and development, the regional planner is left with a choice between a nodal and a uniform region. The nodal region is synonymous with the metropolitan region which can be discarded as unsuitable for the comprehensive development of resources which developing countries seek. The uniform region, which is described in terms of its uniform problem characteristics is more acceptable for planning purposes in the developing countries since it makes possible the development of regional resources within a national framework. Following the example of the Tennessee Valley Authority, the River Basin is identified in the developing countries as the 'proper' uniform region for planning and development. With these concepts in mind, the administrative and geographical regions of Ghana were analyzed. It is evident that the problems facing the regions of Ghana transcend the arbitrary boundaries which separate them. New regions must therefore be defined for the purposes of planning. The only attempts that have been made to define regions for planning and development are in connection with the Accra-Tema-Akosombo plan and the Volta Basin Regional Development plan.
Since regions comprise a range of physical and human factors, it is necessary to find ways of ordering these factors to ensure balanced growth. Regional planning and development has come to be considered as the means of achieving this. A review of the concept of regional planning and development, which is found necessary in order to understand the regional planning objectives of developing countries, reveals the fact that regional planning, by being concerned with the systematic ordering of the natural and human resources of a region, has as its main purpose economic development and the physical and social implications. The fact that planning is being done on a local basis in Ghana, means disregard for the inter-relationships which should exist between town and country. A more comprehensive approach is needed.

In the light of the concept of the region and the definition of the process of regional planning and development, the viability of the Volta Basin as a unit for planning and development was evaluated. An analysis of the geography, economy, transportation and population and settlement reveal the heterogeneous character of the Volta Basin. The problems encountered within the Volta Basin extend beyond its boundaries. However, the Volta Basin regional planning unit was created because of the urgent need for the solution of problems which would arise from the Volta River Project. Using the criteria of the purpose, scale and process of
planning as the basis for evaluation, the Volta Basin regional planning unit is considered as a suitable unit for the purposes for which it had been designed. The definition of the region should be based on the problems to be solved, however, and not based on the area of impact of the Volta River Project, since this means the inclusion of practically the whole country. For the analysis of the problem of transport integration with which the present study is mainly concerned, it is necessary to extend the region to include Tamale in the North and the Accra-Tema area in the southeast because of the tremendous flow of traffic between these two areas. Chapters I and II, therefore, are a means of orienting the reader with reference to the nature of the problem being tackled especially as it applies to Ghana and the basic concepts involved.

Having established the basic concepts and having defined the extent of the region within which transport integration could be achieved, it is necessary to propose methods of integrating transportation facilities in the Volta Basin. In order to suggest these methods, the case-study approach was employed and the principles upon which transport integration have been based in the U.S.S.R.; the Tennessee Valley Region and the New York-New Jersey Metropolitan Area in the U.S.A., were presented in Chapter III. In spite of the political, economic, social and physical differences between the U.S.S.R. and the U.S.A., transport
integration has been a major problem. Consequently, it has been the policy of these countries to find a means of integrating their transportation systems, since an efficient transportation system is regarded as a means of achieving economic, social and physical development.

Rail, road and water transport were reviewed for the U.S.S.R. and the U.S.A. together with the role played by each of these modes in the transportation industry. In the U.S.S.R., railways have emerged as the chief means of transportation mainly because of physical and climatic factors. Water and road transport have not acquired the same importance as rail transport although the Government of the U.S.S.R. is intensifying the use of water transport and improving the road network. In the U.S.A., the role of railroads has declined tremendously and highways have become the major means of transportation, while water transport has lagged behind both rail and highway transport. Unlike the U.S.S.R., where transportation is a public enterprise, the U.S.A. has to depend on both private and public enterprise for the development of its transportation facilities. This has created some problems with respect to the operation of integrated transportation facilities. In both countries, railways and highways serve not only as trunk lines but they also act as feeder lines to water transportation routes; and attempts at integrating transportation facilities have been concerned with integrating water transportation
facilities with rail and highway systems.

The process of transport integration has been achieved in the U.S.S.R. through implementation of principles. These include joint traffic scheduling, distribution of traffic among the various modes of transportation, rate structuring and a centralized system of control. The major limitation of the unified transportation system resulting from these principles is the high cost of transshipment. In the Tennessee Valley Region and the New York-New Jersey Metropolitan Area of the U.S.A., transport integration has been achieved by the use of joint rate structuring and containerization operations respectively. The use of joint rates in the Tennessee Valley Region does not provide a solution to the problem of transshipment; this is, however, eliminated in the New York-New Jersey Metropolitan Region through the use of 'containers'. However, the major problem facing transport integration in the Tennessee Valley Region is an administrative one, because of the lack of a centralized form of control to coordinate the functions of the various transportation agencies.

These principles provide a basis for the proposed method of integrating the Volta Lake transportation system with railway and highway systems, as presented in Chapter IV. The freight traffic potential of the Volta Lake is enormous. Five main sources of potential traffic are identifiable.
These include traffic from existing north-south movement, traffic derived from new agricultural and industrial development and the new lake communities to be established in the area, and new northern export-import traffic. Passenger traffic will be generated from both north-south and east-west movement. The Volta Lake, will therefore serve not only Ghana but will also be an important transportation artery for the neighbouring countries. The extent to which this will be possible will depend on the level of service provided and the cost of transport. Integration is recommended as a means of achieving a high level of service and a low cost of transportation as well as a means of utilizing more than one mode of transport. Integration of Volta Lake transport with rail and road systems is based on the principles discussed in Chapter III. It is concluded that in order for transport integration to be effective in the Volta Basin, due consideration should be given to all the principles employed in the U.S.S.R., the Tennessee Valley Region and the New York-New Jersey Metropolitan Area, and a Lake Transport Authority should be established to implement integrated transportation policies. Since it is contended that integrated transportation would contribute to the economic, physical and social objectives for the balanced development of the Volta Basin, the regional planning objectives were reviewed. These are found to be identical with national planning goals and objectives which include
the development of a socialist society by means of rapid economic development, the provision of adequate employment opportunities and the improvement of the level of living of every Ghanaian citizen. Other goals are the integration of rail, road and water transport, the eradication of illiteracy, the reorganization of flood zone residents into larger communities, the introduction of processing plants and commercial farming into the Volta Basin.

An examination of the potential contribution of integrated transportation facilities towards the achievement of the above objectives reveals that the potentialities of a region for growth could be greatly enhanced by good access to both local and national markets. A unified transportation system would ensure the provision of an efficient transportation system both to local markets within the Volta Basin and to the large urban centres in the southern-eastern section of the country. Low transportation costs would attract industries into the Volta Basin. This would mean the diversification of the economic base of the region, and therefore, the provision of better employment opportunities.

All this would lead to a higher level of living, larger communities and a rational distribution of settlements. It is concluded that integrated transport would have both direct and indirect effects on the balanced development of the Volta Basin. As it contributes to the fulfilment of
regional planning objectives, it is also contributing to the process of regional planning and development in the Volta Basin.

2. EVALUATION OF THE CONCEPT OF TRANSPORT INTEGRATION AND ITS USE AS A MEANS OF ACHIEVING BALANCED REGIONAL DEVELOPMENT IN THE VOLTA BASIN

In the process of providing transportation facilities as a means of overcoming the uneven distribution of resources on the earth's surface, a number of problems have emerged. Technological advancement has made it possible for man to choose between a variety of transportation modes. The lack of an effective means of regulating the functions performed by the various transportation media has often resulted in either monopoly or excessive competition. Competition between road, rail and water transport has become the most pressing problem facing the transportation industry in both developing and developed countries. It has meant the destroying of the interdependence and mutual inter-relationships between the various modes, the duplication of administration and facilities, and operation at high cost.

The problem of competition between transportation modes has existed in Ghana since the beginning of the twentieth century. With the decline of water transport in the country, this problem was confined to road and rail transport.
The absence of any regulations which might eliminate this competitive situation made it impossible for the early realization of the economics of rail transport. The revival of water transport, with the use of the Volta Lake, in Ghana would add to the transportation problems already in existence. In order to take advantage of low-cost transportation via the Volta Lake, solutions must be found to the 'transportation problem', especially because water transport has to depend on road and railways to complete a haul.

Proposals for integrating Volta Lake transport with rail and road transport are based on the assumption that future increase in traffic would warrant the utilization of the Volta Lake for the purposes of transportation and the provision of rail and more road facilities in the Volta Basin. The second assumption is that when the Volta Lake transportation system is provided, it will be utilized for the transportation of both goods and persons. It was established in Chapter IV that there exists a large potential of freight and passenger traffic which would allow the utilization of the lake for transportation purposes. The provision of more road facilities in the Volta Basin is inevitable since most of the roads in the region will be inundated by the Volta Lake and there is a need for establishing continuity in the national road network. The provision of rail facilities, on the other hand, is dependent on
the choice made between the alternative combinations mentioned in Chapter IV.

The integration of transportation facilities in the Volta Basin, based on the principles of joint rates, traffic scheduling, the rational distribution of freight among the various modes, containership operations, and a centralized form of control would contribute to a great extent, towards the solution of the "transportation problem". It would ensure an economical and efficient transportation service and the optimum utilization of transportation resources of the country, with each transportation system performing the function best suited to its characteristics.

The lack of adequate transportation facilities has hindered the development of the Volta Basin. A unified transportation system for the region would constitute not only a means of solving the "transportation problem" but it would also be a means of stimulating development in the region. It has been substantiated that an integrated transportation system would have considerable influence on the objective of encouraging industrial and economic development in the Volta Basin. This would mean a diversification of its economic base and the provision of more employment opportunities and a better level of living. The increase in population, which would result from the location industries
within the region, would make it possible to establish larger communities and therefore to provide more community facilities and services.

An integrated transportation system for the Volta Basin would make substantial contributions to the balanced growth of the Volta Basin, i.e. the development of its economic, social and physical aspects. These contributions are both direct and indirect, since economic development towards which it makes the greatest contribution has both physical and social implications. It is important to note that integrated transport is not the only factor which must be taken into account in the implementation of the developmental objectives for the Volta Basin; other factors such as the availability of capital and markets, the provision of public utilities, services, et cetera, must be taken into account. But since it is not the contention in this paper that a unified transportation system would be the only means of achieving balanced development in the Volta Basin, the hypothesis that an integrated system of railway, road and lake transportation would contribute towards the achievement of the balanced economic, physical and social objectives for development of the Volta Basin is therefore considered valid.

3. CONCLUSION

In conclusion, it may be said that the development of an integrated transport system would assist Ghana and
other developing countries to solve the problems facing the transportation industry today, by making it possible to preserve the interrelationships between transportation modes, to employ each transportation medium in the economic circumstances for which it is best suited and to allocate capital resources in a rational manner.

Moreover, integrated transport facilities offer a logical tool by which developing countries could achieve their goal of economic development; since the provision of such facilities would stimulate agricultural production and would attract industries into the backward regions of these countries. Secondly, transport integration would indirectly lead to the raising of living standards and the provision of more employment opportunities. Thirdly, a rational distribution of settlements could be effected and the need for movement could thus be reduced to a minimum. Fourthly, the increase of population, which would result from a diversified economic base would make it possible to support community facilities and services which are, at present, at a low level of development in some of the regions of the developing countries.

It can be said, therefore, that transportation integration is not an end in itself but a means of attaining developmental objectives.
SELECTED BIBLIOGRAPHY

A. BOOKS


B. PUBLICATIONS OF GOVERNMENTS, LEARNED SOCIETIES AND OTHER ORGANIZATIONS


---


---


---


---


---


---


---


C. PERIODICALS


---


D. ARTICLES IN COLLECTIONS


E. ENCYCLOPEDIA ARTICLE


F. UNPUBLISHED MATERIAL