

Summary of Study Results

Summary of Study Results

Contents

I.	Purpose of the study	(1)
II.	General circumstances	(1)
	1. Geographical conditions	(1)
	2. Meteorological and maritime conditions	(1)
	3. Economic conditions	(2)
	4. Transportation network	(4)
III.	Present situation and problems of the Lagos Ports Complex	(6)
	1. Outline of main facilities	(6)
	2. Problems of the port of Lagos	(6)
	3. Feasibility of expansion of the port of Lagos	(7)
IV.	Concept and functions of the New Ocean Terminal	(7)
	1. Basic concept	(7)
	2. Functions of the New Ocean Terminal	(7)
	(1) Functions as a modern port	(8)
	(2) Functions as an industrial centre	(8)
	3. The New Ocean Terminal Project as regional development project	(9)
V.	Traffic forecast and development scale of the New Ocean Terminal	(10)
	1. Concept and methodology of the traffic forecast	(10)
	2. Hinterland	(11)
	3. Result of traffic forecast	(11)
	4. Development scale of the New Ocean Terminal	(12)
	(1) Annual handling capacities of wharves	(12)
	(2) Development scale of the New Ocean Terminal	(13)
	5. Study on the industrial development	(13)
VI.	Proposed site for the New Ocean Terminal	(14)
VII.	Studies to be made within one or two years	(18)
	1. Study items	(18)
	2. Cooperation and undertakings of the Federal Government, etc., for the study	(18)

Summary of study results

I. Purpose of the study

The Government of the Federal Republic of Nigeria is studying construction of the New Ocean Terminal as a project in the next stage to the completion of the Tin Can Island Port in the Lagos Ports Complex and the Third Apapa Extension to be completed shortly.

This study was conducted as one in the preliminary stage to an ordinary feasibility study with the following as main themes:

- (1) Selection of the most suitable location of a new port in the Lagos metropolitan area;
- (2) Proposal on the scale of the port development upon a long-term prospect; and
- (3) Proposal on the matters to be studied hereafter.

II. General circumstances

1. Geographical conditions

Nigeria (latitude 4° - 14° N, longitude 3° - 15° E) is located in West Africa and faces the Gulf of Guinea. It has an area of approximately 924,000 km² and the largest population in Africa estimated at about 80 million in 1973.

Lagos is the capital of the Republic and is located at the southwestern end of the country. A frequent air service links Lagos with the major cities in Western Europe by only six hour flight, but Nigeria is one of the remotest countries from Japan.

The capital Lagos is situated at the tidal estuary of Lagos Lagoon and creek. It forms a Lagos metropolitan area and is the centre of the commercial and industrial activities of the country as well as Lagos State. The Lagos metropolitan area comprises an area shown in Fig. 2-1-1 with a population allegedly reached 3,500,000 in 1976.

2. Meteorological and maritime conditions

The climate of Nigeria is classified clearly into the dry season (November to April) and rainy season (May to October). In the dry season, a strong NE wind prevails

generally, but in the area near the seashore, the wind is not so strong, and daily land and sea breezes are dominant. In the rainy season, a SW wind is prevailing.

The thunder storm which is a characteristic phenomenon in the tropical region is not rare in Nigeria. Particularly, it occurs frequently at the onset and end of the rainy season and is most vigorous.

Waves along the coast of Nigeria are relatively calm during the period of from October to April. In the rainy season when the SW wind is prevailing the coast is assaulted by high waves, with the highest wave height of 3.5 m noted according to the result of wave observation for one year.

The meteorological conditions of the Nigerian coast are fairly stable and are not much different from place to place.

3. Economic conditions

The economy of Nigeria depending largely on the export of crude oil had been stagnant because of a slump in the export of crude oil, but in 1976, it came out of the slump in the preceding year and recorded a gross domestic production of ₦18,600 million. With the population assumed to be 80 million, the GDP per capita is ₦233 (or 388 dollars, with ₦0.6 = 1 US dollar).

Now looking the percentage distribution by sector of GDP in 1976, the mining sector including production of crude oil is at 32.2 per cent, and the agriculture, forestry, fishery and livestock sector at 28 per cent, these two sectors thus constituting a greater part. However, in the growth rate by sector in 3 years of 1974 to 1976, the manufacturing industry is the largest in growth, while the mining sector still falls short of the level of 1974.

Taking the revenue of the Federal Government, the direct taxes are the largest as the source of revenue, followed by the revenue relative to the mining industry. The former is comprised largely of the petroleum profit tax, and the latter the royalty on oil and gas. These constituting about 74 per cent of the revenue, the national treasury is dependent greatly on the revenue from oil.

Looking the balance of payments, the export trade amounted to about ₦6,700 million in 1976, showing a considerable improvement over the preceding year.

Such improvement is due to increase in the export of crude oil and elevation of the price. The proportion of oil in the total export is as high as about 94 per cent. On the other hand, the import is increasing greatly in these years. In 1976, it is in a scale 3 times that in 1974. Such a rapid increase of import is causing serious congestions in the port of Lagos, etc. Now seeing the pattern of foreign trade, the West European countries and the U.S.A. are the major counterparts for both export and import, but for the import, Japan takes part in. In the trade with Japan, Nigeria is in deficit in the balance.

The overall balance of payments in 1976 turned into red, although not in an appreciable degree, from the black in 1975 notwithstanding the improvement in the foreign trade balance, and the external assets as of the end of 1976 seems to have declined from the previous year to about ₦3,500 million.

The increase of commodity prices has been in the level of more than 20 to 30 per cent over the preceding year since 1975. In 1977, the commodity price will rise at a high rate successively.

The industries in Nigeria are expanding rapidly in these years. But, the proportion of the industrial (manufacturing) sector in GDP is low barely at 10 per cent in 1976. Further, the manufacturing is composed largely of light industries which do not require a high level of technology such as foods, drinkings, tobacco, textile and clothing. For the metal processing, metal assembly and metal furniture are dominant, while the industries of general, electric, transport and precision machines and instruments are not yet developed. Only the oil industry constitutes 9.4 per cent in terms of the total value added.

Taking the manufacturing establishments by scale, their overwhelming majority is of minor scale. Seeing the geographical distribution, more than two-thirds of the establishments are concentrated in the Lagos City and States thereabout.

The development of heavy and chemical industries is a problem to be resolved hereafter, and the Federal Government is tackling the problem of industrial development actively with the revenue accruing from export of crude oil in the background. However, on account of shortage in fund due to sluggish export of crude oil resulting from the worldwide recession in these years as well as in the technical faculty,

materials and machines, and skilled labour and management stratum, a greater part of the major industrial development projects are behind the schedule. Except some, these projects are carried on at remote places from Lagos.

As stated at the outset, the economy of Nigeria is dependent greatly on the export of crude oil, so that its quantity and price cause various influences directly and indirectly onto the operation of economy. Thus, if the worldwide recession continues as in these days, the oil export will become slack and the high growth rate of the economy now experienced (for example, the growth rate to previous year of GDP in 1976 is 13.1 per cent in real term) will not be expected. It appears to us that the shortage of fund required for the implementation of various projects is already appreciable, and that there is an increasing trend of relying on external loans. It has been said that on account of the shortage of the engineering skill or, more specifically, shortage of engineers as well as materials and machines in the construction sector and also the inflation now in progress consecutively, the progress of the Third National Development Plan (1975-1979) being carried on presently will be delayed considerably and some of the projects will be carried over into the next plan period.

In the existing National Development Plan, an emphasis is placed on the development of infrastructures -- particularly, that of the transport sector. It was told that in the next five-year plan, an emphasis would be put on agriculture and industry. For the development of these sectors, a well balanced development of social overhead capital is inevitable. Judging from the present situation of railways, ports and harbours as well as roads, there seems to be a need to give priority to continued investments in these sub-sectors of infrastructure.

4. Transportation network

Among the various means of transportation, the road transportation is playing the most important role. The construction of Class A roads is under the jurisdiction of the Federal Ministry of Works, while the other roads are under the jurisdiction of the competent State Governments. The construction of the Lagos Ring Road which will display effects in resolution of the traffic congestion

in the Lagos Island and in its vicinity, that of Class A roads connecting the major cities in the country with one another and also leading to the neighboring countries and that of expressways from Lagos to the peripheral cities are being carried on energetically by the hand of the Federal Government.

The railways under the jurisdiction of the Nigerian National Railways were originally built for the purpose of transporting the agricultural products in the northern part of the country to the ports then under the jurisdiction of the Railways for export. Consequently, the present railways are extremely shortcoming as a countrywide network. Further, due to various causes, the railway transportation is losing a competitive force with the road transportation except some kind of freight. There is also no plan of constructing a new line except some section.

The inland water transport mainly on the Niger and Benue Rivers is playing only a very limited role because of the development of the road transport network on one hand and instability of the waterways on the other. The coastal shipping is also playing a limited role to the extent of transporting refined oil from the ports in the Delta to the port of Lagos.

The ports in Nigeria are under the jurisdiction of the Nigerian Ports Authority established under the federal law. The Ports Authority administers all of the ports, channels, navigational aids and pilotage in Nigeria. Each port is managed by a Port Manager who is responsible for daily operations of the port (or port area).

The major ports of Nigeria are the ports of Lagos and Port Harcourt, the former handling 70 per cent, and the latter 19 per cent, of the total general cargo traffic of the whole country. Beside them, there are some minor commercial ports, but in general, the ports of Nigeria are river ports except the crude oil terminals for large tankers, and the port of Lagos is also located at the tidal estuary of the Lagos Lagoon. For this reason, it is difficult to improve or expand these ports to permit the entry of large container ships or bulk carriers.

III. Present situation and problems of the Lagos Ports Complex

1. Outlines of main facilities

The main facilities of the port of Lagos are the Apapa Quay (water depth, 8.23 m; and quay length, 2,393 m) existing from the olden days and the modern Tin Can Island Port (design water depth, 13.5 m; and quay length, 2,500 m) completed in October 1977. In addition, the Third Apapa Extension Project (tentative water depth, 11.5 m; quay length, 1,500 m; and container/ roro wharf, 6 berths) will be completed shortly. The basin in the port allows anchorage of about 25 vessels.

The entrance channel has shortly been dredged to a width of 250 m and a depth of 11 m except part near the Tin Can Island Port. Upon such widening, it is apprehended that the volume of maintenance dredging will increase greatly.

2. Problems of the port of Lagos

(1) The cargo traffic through the port of Lagos is shown in Tables 2-5-1, 3-2-1 and 3-2-3. The number of incoming vessels, etc., are shown in Table 2-5-2. Because of sharply increasing import cargoes, chronic port congestions have prevailed. It has been said that the waiting time of tramp vessels has been reduced greatly with the Tin Can Island Port placed in service. But, at the time of our survey, any appreciable degree of dissolution of the congestion was not observed.

(2) The congestion in the port of Lagos seems to be accelerated by the increasing volume of cargoes as well as the following reasons.

- a) Cargoes staying for a long period of time in the transit sheds on the Apapa Quay,
- b) A number of cargo waiting lorries staying disorderly in the Apapa Quay to interrupt the cargo handling operations, -
- c) Traffic congestion in the Lagos City precluding smooth carriage of cargoes out of the port.

(3) The access channel to the Third Apapa Wharf (now under construction) and

Tin Can Island Port is curving rather sharply, so that it is required to improve the channel for lengthy vessels mooring along these quays.

3. Feasibility of expansion of the port of Lagos

When the port of Lagos is expanded with the present port entrance used, the space for expansion is nowhere found except that near the Tin Can Island Port. But, if the port facilities are planned for large vessels with a channel depth of 11 m or more, the amount of capital dredging of the channel and of the maintenance dredging will become an enormous volume. As the urbanization of Lagos is proceeding toward west along the Badagri Road, it will be required that the adjustment of the port expansion to the land use program of the Lagos metropolitan area be made intensively.

IV. Concept and functions of the New Ocean Terminal

1. Basic concept

The New Ocean Terminal which the Nigerian Ports Authority desires is a modern port permitting free entry and exit of large container vessels, etc. The commercial ports of Nigeria are not facing the open sea, so that it is very difficult to expand or improve them for admission of such large vessels. For this reason, it is very appropriate to plan the New Ocean Terminal as the next stage of development of the port of Lagos.

Considering that the Lagos metropolitan area is a large market of consumption in Nigeria and is the largest area of concentration of industries, the first New Ocean Terminal in Nigeria should be planned in the Lagos metropolitan area.

This modern shipping terminal should, of course, contribute directly to the industrial development of Nigeria as a social overhead capital. That is, the New Ocean Terminal is a place of seaboard industries. Such industrial function will also increase the economy of the project.

2. Functions of the New Ocean Terminal

The functions which the New Ocean Terminal should have are listed specifically in the following.

(1) Functions as a modern port

Functions as a strategic point of commodity distribution provided with modern container wharves to cope with the containerization in the regular liner routes and facilities for large grain and other bulk carriers.

Such a port can perform the functions as a transit port to the adjacent West African countries.

(2) Functions as an industrial centre

The Federal Government of Nigeria has the industrialization as one of the most important policies along with the agricultural development. Particularly, it is taking a policy of industrial dispersal to curb the excessive flow of population into the Lagos metropolitan area. Considering from the present condition of expanding population and urbanization of the Lagos metropolitan area, we feel that the following opinion maintained by the Lagos State Ministry of Works and Planning is correct: the industries to be located in the Lagos metropolitan area should be restricted to those of the Lagos Port dependent and large city dependent types. Nevertheless, we would like to stress the importance of industrialization in the area close to the Lagos metropolitan area with the construction of the New Ocean Terminal taken as an incentive. The reasons are as given below.

- a) The population once flowed into a large city scarcely goes back to rural areas, while it seems that the population will continue to flow into the Lagos metropolitan area. For this reason, in order to give an employment opportunity to the excessive labour force in this area, industrialization of an area close to the metropolis, to which the labour force can easily move, should be accelerated.
- b) By the construction of the New Ocean Terminal, the advantage of marine transportation by means of large vessels is usable to the maximum extent. That is, the New Ocean Terminal to be constructed at the peripheral part of the Lagos metropolitan area plays a very important role as an infrastructure for the location of seaboard industries. It also plays a useful role to help resolve the urban

problems of the Lagos metropolitan area.

As the suitable industries for location at the New Ocean Terminal, the industries requiring their own waterfront must be added to those chosen by the Lagos State Ministry of Works and Planning as already stated. Specifically, the following industries may be considered suitable. A concept of their scales and land areas is illustrated in Table 5-3-1.

- Shipbuilding and repairing yard
- Iron and steel mill
- Petroleum oil refining and petrochemical industry
- Flour mill
- Automobile assembling factory
- Fertilizer manufacturing plant

3. The New Ocean Terminal Project as regional development project

As stated in the foregoing, the New Ocean Terminal is planned not only as a mere commercial port but as an industrial port having a vast industrial zone. Accordingly, this project becomes one of a large scale and accompanies projects of related infrastructures such as housing, road, water supply and electricity. The project must then be understood to be a comprehensive regional development project upon a balanced combination of such various projects. As a specific image, it is the construction of a coastal satellite city with the port as a nucleus.

It is required of this new city that it will realize the easy movement of population from the Lagos metropolitan area and thus serve to alleviate the present overpopulation of Lagos and, at the same time, function as a new ocean terminal serving for the present hinterland of the port of Lagos. Therefore, it should be located close to the Lagos City within the range of 50 to 60 km.

Because of such large scale, multifarious character and accompanying sub-projects, it appears to us that it will be difficult for the project to be implemented by the Nigerian Ports Authority alone. Therefore, we consider that it is very important to have close consultations and maintain tight coordination with the government organizations concerned from the initial stage of the project planning.

V. Traffic forecast and development scale of the New Ocean Terminal

1. Concept and methodology of the traffic forecast

Forecasts of cargo traffic is made along the economic policy of the Federal Government of Nigeria, but necessary corrections are, of course, made with due consideration to the influence of the stagnant world economy and other problems with which the economy of Nigeria is confronting.

In view of the character of the project, the year of 2000 A.D, is taken as the target year of forecasting, but study is also conducted for some intermediate years.

The forecasting of general cargo traffic was made macroscopically in relation to the assumed future growth rate of GDP (except the mining sector) which has a strong correlation with the cargo traffic. That is, since it was not conceivable that such a high rate of economic growth as 14 to 16 per cent lasting in these three years would be maintained continuously over a long period in the future, the cargo traffic in 2000 was forecasted in use of 9.8 per cent, the average rate of growth during the past six years. Such a macroscopic procedure forecasts the total cargo traffic in the whole country of Nigeria, and for the share to be borne by the port of Lagos, it was assumed, upon examination of the progress of development of the other ports and the population in the projected hinterland, that the share of Lagos in 2000 would decline from the present level of about 70 per cent to 50 per cent.

The Nigerian Ports Authority defines the general cargoes in a very broad sense, including bagged cement and rolling stocks. Among the general cargoes, the import of containerized cargo will increase sharply with improvement of port facilities. Thus, for prediction of the import containerized cargo, the containerizable rate of general cargoes (except cement) in 2000 was determined to be 50 per cent upon examination of the details of general cargoes at the port of Lagos, and it was assumed that all of these containerizable cargoes would be containerized (that is, 100 per cent containerization).

Further, for the petroleum products and wheat which were considered to be important for the port of Lagos among the special cargoes other than general cargoes, forecasting was made individually upon analysis of the relationship between production and demand. The import of cement included in general cargoes was assumed

to be reduced to zero in 2000 with establishment of the self-supply system.

2. Hinterland

The hinterland of the port of Lagos including the New Ocean Terminal is assumed, in consideration of the transport network of road, etc. and its relative position to the other ports, to be comprised of the following nine States:

Lagos, Oyo, Sokoto, Ogun, Kwara, Kaduna, Ondo, Niger and Kano.

Fig. 5-1-2 shows the hinterland of the port of Lagos. The area of the hinterland of the port of Lagos is 435,000 km² or 47 per cent of the whole land area of the country, and the population is 24 million (according to the 1963 census) or 52 per cent of the total population.

3. Result of traffic forecast

The result of forecasting the general cargoes (including the containerized cargoes) of the whole country of Nigeria and of the port of Lagos is shown in Fig. 5-1-3. Also, the result of forecasting of the cargo traffic through the port of Lagos is represented in Table 5-1-20. However, as stated in the preceding chapter, the cargo traffic due to industrial development at the New Ocean Terminal are not included.

In Table 5-1-20 are also shown the export containerized cargoes. The export cargoes of Nigeria are, if the crude oil is excluded, largely agricultural products and are not containerized presently. But, with progress in containerization of import cargoes, the containerization of export cargoes will be expedited. In this forecasting, therefore, it was assumed that about 20 per cent of the export cargoes would be containerized.

The total cargo traffic through the port of Lagos including the New Ocean Terminal in 2000 A.D. is about 38 million tons or 5.5 times that in 1975-76, but the general cargoes (including the containerized cargoes) increase by 7 times from the present 4 million tons to 28 million tons. It is one of the characteristics of this forecasting work that a great progress is prospected of containerization with the construction of the New Ocean Terminal taken as a premise.

4. Development scale of the New Ocean Terminal

(1) Annual handling capacities of wharves

For determination of the development scale of the New Ocean Terminal, there was employed a method of first calculating the cargo handling capacity of the current facilities of the port of Lagos, then estimating the required additional facilities for handling the cargoes in 2000 forecasted as above.

Generally, the annual cargo handling volume of a deep-water general cargo wharf is estimated to be 150,000 to 200,000 tons per berth. In this project, a capacity of 150,000 tons per berth was assumed for the Apapa Quay, and that of 200,000 tons for the modern Tin Can Island Port and the New Ocean Terminal. For the lighter berth, the annual handling cargo volume was assumed to be 400 tons per metre of the berth.

The annual handling cargo volume of a container wharf is estimated to be 60,000 20 foot containers in the case of the New Ocean Terminal or 50,000 containers in the case of the container wharf of Apapa where the yard is not spacious. If the container loaded rates are 100 per cent for import cargoes and 10 per cent for export cargoes and the cargo volume per container is 15 tons, the annual cargo handling capacity of a container wharf is 400,000 tons in the case of Apapa Quay or 500,000 tons in the case of the New Ocean Terminal.

The capacity of a grain wharf handling wheat, etc., is usually governed by the capacity of unloaders. For the wharf of the New Ocean Terminal designed for super-large vessels, the annual handling capacity is set at 1,440,000 tons upon the premise that two units of unloaders having a capacity 400 tons an hour are installed per berth, and for the bulk cargo berths of the Apapa Quay and Tin Can Island Port, it is set at 50 per cent of the foregoing value or 720,000 tons.

The annual handling capacity of the oil terminal is set at about 2 million tons per berth upon the premise that the oil products are carried to Lagos from the port of Port Harcourt and with 10,000 DWT class vessels taken as projected objectives.

Based on the foregoing annual cargo handling capacities per berth, the cargo handling capacity of the port of Lagos including the Third Apapa Wharf now under

construction is calculated as given below (Unit: 1,000 metric tons).

a) General cargo wharves	
Apapa Quay (14 berths)	2,100
Tin Can Island Port (7 berths)	1,400
Lighterage terminal (2,700 m)	1,080
<hr/>	
Total	4,580
b) Container/ro-ro wharves	
Third Apapa Wharf (6 berths)	2,400
Tin Can Island Port (2 berths)	1,000
<hr/>	
Total	3,400
c) Bulk cargo wharves	
Apapa Quay (1 berth)	720
Tin Can Island Port (1 berth)	720
<hr/>	
Total	1,440
<hr/>	
Grand total *	9,420

* Oil Terminal and Ijora Quay are excluded.

(2) Development scale of the New Ocean Terminal

If the capacities of the current facilities are calculated by kind of cargo as shown above, and all of the shortcoming facilities are planned in the New Ocean Terminal, the required number of berths will be as shown in Table 5-2-6. That is, up to 1999-2000, there should be developed the general cargo wharf, 50 berths; container wharf, 19 berths; wheat wharf, 1 berth; and oil wharf, 3 berths. In Table 5-2-6 are also noted the required berths in the intermediate years. As will be seen from these figures, it is in and after 1985 that the berthing facilities are really placed in service in the New Ocean Terminal.

5. Study on the industrial development

While the kinds and scales of the industries which are suitable to locate in

the New Ocean Terminal have been described in Chapter IV, the required industrial land area amounts to about 17 million m² including the land for related industries and to 22 million m² if the land for public facilities such as roads and railways is included additionally.

With such a scale of industrial development, there will be formed a new city of a population of about 150,000 comprising about 20,000 persons of labour force as a basis and including their families and population in the commerce and related services.

In planning the port facilities in relation to the location of seaboard industries, the largest ship size must first be determined in consideration of the form of transport of raw materials and products. In the case of this project, with the assumption that the iron ore for the steel mill is imported from Brazil, etc., it is considered to be desirable to plan an access channel and basin allowing entry and exit of the 200,000 DWT class carriers.

In this report, only a general concept has been proposed on the industrial development, but such a scale of industrial development far exceeds the scale of development of the New Ocean Terminal as a commercial port. Further, it is not known whether or not the realization of the industrial development is paralled with the construction of the commercial port. However, it is considered to be very important to formulate the master plan of the New Ocean Terminal including such industrial development.

VI. Proposed site for the New Ocean Terminal

The construction site of the New Ocean Terminal having the functions and development scale so far examined must be chosen from places located outside the built-up area of the Lagos metropolis and facing the open sea.

A discussion has emerged from among the officials concerned of Nigeria on the possible location of the new terminal; viz. east or west of the Lagos City. Here, we have chosen two places shown in Fig. 6-1-1 for comparative studies. The site-A is located immediately west of the urban area of Lagos and is of low and swampy land; while the site-B is a vast undeveloped area located about 50 km

east of Lagos City. It is a place having no appreciable undulation and covered with scrub.

In addition to these two sites, other two or three sites were examined. But, finally, these two sites were chosen and compared with each other from the points of view of port planning and urbanization and also from the technical point of view.

The result of study is listed in the table given in the following. Such study is not always based on any theoretical or quantitative analysis, but the construction of the New Ocean Terminal at the site-B may be of higher cost than the development of the site-A. We are, however, of the opinion that the development of the site-B will extremely contribute to the long-term development of the Lagos metropolitan area.

TABLE 6-1-1 RESULT OF COMPARATIVE STUDIES OF SITES-A AND B

	Advantageous points	Disadvantageous points
Site - A	<ol style="list-style-type: none"> 1. At the initial stage of construction, the entrance of the present port of Lagos is usable, so that the initial investment is less than that of the site-B. 2. Being located closer to the Lagos urban area, the construction cost of the access road is less than that for the site-B. 3. The related infrastructures of the Lagos metropolitan area being available, the project cost will be generally smaller than that for the site-B. 4. With two port entrances provided, the port function is not suspended should one of the entrances be closed due to an accident, etc. 5. As the creek is usable as part of the channel or basin, less dredging is required. 	<ol style="list-style-type: none"> 1. Being located very close to the densely populated area of Lagos and from the fact that the urbanization is spreading westward, large scale development of this area has a possibility of causing adverse effects onto sound development of the Lagos metropolitan area. 2. Being located at the south-western end of the country, it is hardly said to be a correct policy, from the balance in the whole country, to develop a port or industrial zone. Also, contrary to the policy of the Federal Government to disperse industries. 3. Excavating the beach to the creek to open a new harbour entrance will have adverse effects upon the hydraulic characteristics of the present entrance (such as increasing amount of sediment due to decreasing tidal flush). 4. Located near the site is the source of water supply, so that infiltration of saline water due to excavation of the new harbour entrance may have adverse effects on the water resource. 5. Lengthy breakwater protecting the new entrance channel causes erosion of the seashore between the new and old entrances. Then, the resulting change in the littoral drift may cause adverse effects on the maintenance of the existing entrance channel.

TABLE 6-1-1 (Cont'd.)

	Advantageous points	Disadvantageous points
Site - B	<ol style="list-style-type: none"> 1. Being an entirely undeveloped area with scarce inhabitants, large scale development is enabled without causing adverse effects onto the regional environment. 2. There is little possibility of adverse effect onto the Lagos metropolitan area. 3. Being a virgin land for development with no geographical restriction, multi-farious planning is enabled. 4. Complying with the Federal Government's policy of industrial dispersal. 5. Being an undeveloped area, any change caused to the features of the seashore in the vicinity by excavation of a new harbour entrance poses no particular problem. 	<ol style="list-style-type: none"> 1. Being the construction of a new city in a virgin area, an enormous amount of fund is required. 2. The improvement of the road from Lagos to Epe are required. 3. Extra cost is required for access to railway. 4. In the absence of available water surface such as creek, dredging for construction of the port is much greater than that at the site-A.

VII. Studies to be made within one or two years

1. Study items

Once a site is chosen for construction of the terminal, the natural conditions at the site and its periphery must be investigated prior to formulation of a master plan. Investigation of the natural conditions includes normally the following items:

- (1) Topography, (2) Geological condition, (3) Wind, (4) Waves,
- (5) Longshore current and littoral drift and (6) Tides.

Among these, the wave characteristics are very important for estimation of the littoral drift, layout and design of breakwaters and prediction of the calmness in the harbour basin. But, since the continuous wave observation in use of sophisticated instruments is expensive, we consider that the observation of wind and wave is preferably started after the decision was made by the Federal Government on the implementation of the New Ocean Terminal project.

The studies to be conducted in 1978 are represented briefly in the following.

- . Aerial photographic survey (Area 100 km²).
- . Depth sounding (Area 30 km²).
- . Geological survey
 - borings (4 holes on land and soil tests).
 - sonic prospector survey (sea area 30 km²).

2. Cooperation and undertakings of the Federal Government, etc., for the study

Since the access to the proposed site is not easy and the study is conducted at a remote place from the existing built-up area, the cooperation and undertakings of the Nigerian Federal Government and Ports Authority are indispensable in order for the study to be conducted successfully and smoothly. Specifically, such cooperation and undertakings should be directed to the followings.

- (1) Providing a security system for the study staffs and equipment and an emergency communications system.
- (2) Prompt processing of the matters to be approved or authorized such as, for example, helicopter landing and takeoff at the study site, and use of radio equipment.

- (3) Appointment of counterparts (2 or 3 persons).
- (4) Guaranty of the trespassing to the study area, and explanation of the purpose of study to the inhabitants concerned.
- (5) Loan of survey boats free of charge.
- (6) Loan of lodgings to the field labourers free of charge.

Contents

List of Tables

List of Figures

CONTENTS

	Page
1. Introduction	1
1-1. Acknowledgement	1
1-2. Purpose of the study	1
2. General circumstances	3
2-1. Geographical conditions	3
2-2. Topographic conditions	4
2-3. Meteorological and maritime conditions	5
2-3-1. Meteorological conditions	5
2-3-2. Maritime conditions	11
2-4. Economic conditions	14
2-4-1. Recent trend of gross domestic product	14
2-4-2. Federal budget and balance of trade and payments	16
2-4-3. Gross capital formation	20
2-4-4. Price movements	21
2-4-5. Present condition of Nigerian industries	21
2-4-6. Bottlenecks to the economic development	29
2-5. Transportation network	30
2-5-1. Roads	30
2-5-2. Railways	32
2-5-3. Inland waterways and coastal shipping	32
2-5-4. Ports	32
3. Present situation of the Lagos Ports Complex	41
3-1. Introduction	41
3-2. Cargo traffic	42

	Page
3-3. Channels and anchorages	43
3-4. Mooring berths, transit sheds and warehouses.....	49
3-5. Transportation of cargoes to and from the hinterland	50
3-6. Port operations	51
3-7. Port planning aspects	52
4. Concept of the New Ocean Terminal and its functions	53
4-1. Basic concept	53
4-2. Functions of the New Ocean Terminal	53
4-2-1. Most modern marine terminal	54
4-2-2. Centre of light and heavy industries	54
4-3. Conclusions	58
5. Traffic forecasts and development scale of the New Ocean Terminal	61
5-1. Traffic forecasts	61
5-1-1. Principles of forecast	61
5-1-2. Hinterland	64
5-1-3. Traffic forecasts	67
5-2. Proposition on the development scale of the New Ocean Terminal	86
5-2-1. Cargo handling capacities of current facilities	86
5-2-2. Development scale of the New Ocean Terminal	94
5-3. Study on industrial development	95
5-3-1. Purpose of study	95
5-3-2. Kinds and scales of industries to be located	95
5-3-3. Industrial land area, port facilities, etc., required for industrial location	98
5-3-4. Problems in industrial development	100
6. Location of the New Ocean Terminal	103
6-1. Conditions for the site selection	103
6-2. Comparisons from the port planning and urbanization point of view	105

	Page
6-2-1. Site-A	105
6-2-2. Site-B	106
6-3. Comparisons from the engineering point of view	107
6-3-1. Site-A	107
6-3-2. Site-B	108
6-4. Conclusions	108
7. Studies to be made within one or two years	111
7-1. General studies on natural conditions	111
7-2. Contents of each study item	112
7-2-1. Topographic condition	112
7-2-2. Geological condition	114
7-2-3. Maritime condition	116
7-3. Cooperation and undertakings of the Federal Government of Nigeria and the Nigerian Ports Authority	117

APPENDICES

1. Scope of Work	119
2. Formation of the study team	122
3. Itinerary of study works	123

LIST OF TABLES

TABLE NO.		Page
TABLE 2-4-1	SELECTED ECONOMIC INDICATOR COMPARISON OF PLAN FORECAST WITH CURRENT ESTIMATES	15
TABLE 2-4-2	GROSS DOMESTIC PRODUCT AT CONSTANT 1974/75 FACTOR COST	16
TABLE 2-4-3	EXPORT OF MAJOR COMMODITIES 1974/75 - 1976/77	18
TABLE 2-4-4	ANALYSIS OF IMPORTS BY END USE	19
TABLE 2-4-5	IMPORTS AND EXPORTS BY COUNTRIES 1976/JAN. - JUNE	20
TABLE 2-4-6	GROSS CAPITAL FORMATION AT CURRENT PRICES	21
TABLE 2-4-7	STRUCTURE OF MANUFACTURING BY VALUE ADDED AND EMPLOYMENT PERCENTAGE DISTRIBUTION	22
TABLE 2-4-8	NUMBER OF ENTERPRISES BY TYPE AND EMPLOYMENT SCALE	25
TABLE 2-4-9	INDUSTRIAL OUTPUTS BY STATE	27
TABLE 2-5-1	GENERAL CARGO HANDLED FROM 1955/56 TO 1976/77	35
TABLE 2-5-2	NUMBER OF VESSELS ENTERED AND THEIR NET REGISTERED TONNAGES: 1955/56 TO 1976/77 ...	37
TABLE 2-5-3	BERTHING FACILITIES (HARD QUAY) PRESENTLY AVAILABLE AND CONTEMPLATED DURING 1975 - 80 PLAN PERIOD	39
TABLE 3-2-1	CARGO TRAFFIC WITH COMMODITY BREAKDOWNS (1975/76)	42
TABLE 3-2-2	CARGO TRAFFIC IN THE PAST 11 YEARS	43
TABLE 3-2-3	CARGO THROUGHPUT LAGOS PORTS COMPLEX	45
TABLE 3-6-1	LABOUR PRODUCTIVITY AT THE PORT OF LAGOS (AT APAPA QUAY)	51
TABLE 5-1-1	AREA AND POPULATION OF THE HINTERLAND OF THE PORT BY STATE	66
TABLE 5-1-2	CARGO TRAFFIC (NIGERIAN PORTS) AND GROSS DOMESTIC PRODUCT	68
TABLE 5-1-3	ACTUAL AND PROJECTED GROWTH RATES OF GDP	69

TABLE NO.		Page
TABLE 5-1-4	FORECAST OF THE GENERAL CARGO TRAFFIC THROUGH NIGERIAN PORTS	70
TABLE 5-1-5	SHARE OF THE PORT OF LAGOS IN THE GENERAL CARGO TRAFFIC	71
TABLE 5-1-6	FORECAST OF THE GENERAL CARGO TRAFFIC THROUGH THE PORT OF LAGOS	72
TABLE 5-1-7	TREND OF THE IMPORTS OF CEMENT	74
TABLE 5-1-8	FORECAST OF CEMENT IMPORT	75
TABLE 5-1-9	RECENT TREND OF CONTAINERIZED CARGO THROUGH LAGOS PORTS COMPLEX	76
TABLE 5-1-10	ESTIMATE OF CONTAINERIZED CARGOES	76
TABLE 5-1-11	FORECASTS OF CONTAINERIZED CARGO	78
TABLE 5-1-12	CALORIES INTAKE FROM FIVE IMPORTED FOODS ITEMS	79
TABLE 5-1-13	ESTIMATE OF DEMAND FOR FIVE IMPORTED FOOD ITEMS	79
TABLE 5-1-14	PRODUCTION PLAN OF THE FIVE ITEMS	80
TABLE 5-1-15	FORECAST OF WHEAT IMPORT	81
TABLE 5-1-16	CONSUMPTION OF PETROLEUM PRODUCTS	82
TABLE 5-1-17	PETROLEUM OIL HANDLED AT LAGOS PORTS COMPLEX	83
TABLE 5-1-18	CONSUMPTION OF PETROLEUM PRODUCTS BY STATES	84
TABLE 5-1-19	FORECASTS OF THE DOMESTIC CONSUMPTION OF OILS AND THE TRAFFIC THROUGH LAGOS PORTS COMPLEX	85
TABLE 5-1-20	FORECASTS OF THE TOTAL CARGO TRAFFIC THROUGH LAGOS PORTS COMPLEX	85
TABLE 5-2-1	CARGO TRAFFIC THROUGH APAPA QUAY	87
TABLE 5-2-2	OPTIMUM ANNUAL CAPACITY OF CONTAINER WHARF	88
TABLE 5-2-3	NUMBER OF CONTAINERS HANDLED IN 1977	89
TABLE 5-2-4	RATE OF LOADED CONTAINERS	89
TABLE 5-2-5	PNEUMATIC UNLOADERS ON PUBLIC WHARVES (EXAMPLE IN JAPAN)	91

TABLE NO.		Page
TABLE 5-2-6	DEVELOPMENT SCALE OF THE NEW OCEAN TERMINAL	94
TABLE 5-3-1	DEVELOPMENT SCALE OF WATERFRONT INDUSTRIES	101

LIST OF FIGURES

FIG. NO.		Page
FIG. 2-1-1	LAGOS METROPOLITAN AREA	4
FIG. 2-3-1a	PRESSURE AND WINDS IN JANUARY	6
FIG. 2-3-1b	PRESSURE AND WINDS IN JULY	6
FIG. 2-3-2a	RAINFALL - RAINY SEASON, MAY TO OCTOBER	7
FIG. 2-3-2b	RAINFALL - DRY SEASON, NOVEMBER TO APRIL	7
FIG. 2-3-3	FREQUENCY DISTRIBUTION OF THUNDER STORMS IN NIGERIA	8
FIG. 2-3-4	FREQUENCY DISTRIBUTION OF WINDS BY DIRECTION AT IKEJA	10
FIG. 2-3-5	MAXIMUM WIND VELOCITY AND RECURRENCE PERIOD	11
FIG. 2-3-6	AVERAGE SIGNIFICANT WAVE HEIGHTS	12
FIG. 2-5-1	TRANSPORT NETWORK IN NIGERIA	31
FIG. 3-3-1	LOCATION OF FACILITIES IN THE LAGOS PORTS COMPLEX	48
FIG. 5-1-1	PROCEDURES FOR THE ESTIMATE OF CARGO TRAFFIC	63
FIG. 5-1-2	HINTERLAND OF THE PORT OF LAGOS	65
FIG. 5-1-3	FORECASTS OF GENERAL CARGO TRAFFIC	73
FIG. 5-3-1	PROCEDURES FOR THE STUDY OF THE INDUSTRIAL AREA DEVELOPMENT	96
FIG. 6-1-1	POSSIBLE SITES FOR THE NEW OCEAN TERMINAL ..	104
FIG. 7-2-1	TOPOGRAPHIC SURVEY AREA	113
FIG. 7-2-2	LOCATION OF BORE HOLES	115

1. Introduction

1. Introduction

1-1. Acknowledgement

The Japanese Team visited, in addition to the Nigerian Ports Authority and the Federal Ministry of Transport, the Central Planning Office of the Federal Ministry of Economic Development, the Federal Ministry of Civil Aviation, Lagos University, the Federal Ministry of Works, Master Plan Project Unit of the Lagos State Ministry of Works and Planning, the Nigerian Railway Corporation and the Federal Ministry of Industries.

We would like to express our appreciation of the help and kindness we have received during our study work. Our thanks are particularly due to Alhaji B. M. Tukur, the General Manager, to Mr. D. P. Opara, Assistant General Manager (Development and Productivity) and to Mr. N. N. Sharma, Ag. Controller of Development, of the Nigerian Ports Authority. Our thanks are also due to Mr. I. E. Odumodu, our counterpart official of the Nigerian Ports Authority, who performed an excellent job for us to conduct various study works.

1-2. Purpose of the study

In accordance with the agreement reached in October 1977 by the Japanese Port Mission headed by Mr. T. Hirota of the Japan International Cooperation Agency and the Nigerian Ports Authority, the Government of Japan decided to send a study team headed by Mr. S. Maeda of the Overseas Coastal Area Development Institute of Japan to Nigeria to carry out studies for the New Ocean Terminal Project in the Lagos metropolitan area.

The objective of the study has been specified as follows in the Scope of Work which was agreed upon in October 1977:

- (1) to select the most suitable location of a new port in the Lagos metropolitan area and
- (2) to propose the scale of the port development with a long-term prospect.

And items of further studies to be made must be identified.

Keeping these subjects in mind the Japanese Government Mission for the New Ocean Terminal Project, Lagos (hereinafter referred to as "the Japanese team") stayed in Lagos for one month from January 14, 1978 to collect data and information, to examine the present situation of the Lagos Ports Complex and possible sites for the New Ocean Terminal, and to exchange views and opinions with Government officials and high-ranking personnel in various sectors concerned.

Upon completion of this report the Provisional Observation Report made by the Japanese team during its stay in Nigeria and submitted to the Nigerian Ports Authority on February 10, 1978 is no longer valid.

2. General circumstances

2. General circumstances

2-1. Geographical conditions

(1) The Federal Republic of Nigeria (latitude 4°-14°N, longitude 3°-15°E) is situated in West Africa and has an outlet to the Gulf of Guinea.

Nigeria is bounded on the west by the People's Republic of Benin (formerly called Dahomey), on the north by the Republic of Niger, on the northeast, across the Lake of Tchad, by the Republic of Tchad and on the east by the Republic of Cameroun.

The Niger, the third longest river in Africa enters Nigeria from the north-west and then runs in a southeasterly direction till it receives the water of its principal tributary, the Benue, at Lokoja about 547 Km from the sea. From Lokoja, the Niger flows southwards to the large delta, dividing into numerous interlacing channels to empty itself into the Gulf of Guinea.

Nigeria occupies an area of about 924,000 Km² and has the largest population in Africa. Although no census has been made since 1963 it has been estimated that the population in 1973 reached approximately 80 million.

Lagos, the capital city of the Republic is situated at the southwestern tip of the country, near to the border with Benin. A frequent air service links Lagos with major cities in Western Europe by only six hour flight, but Nigeria is one of the furthest countries from Japan.

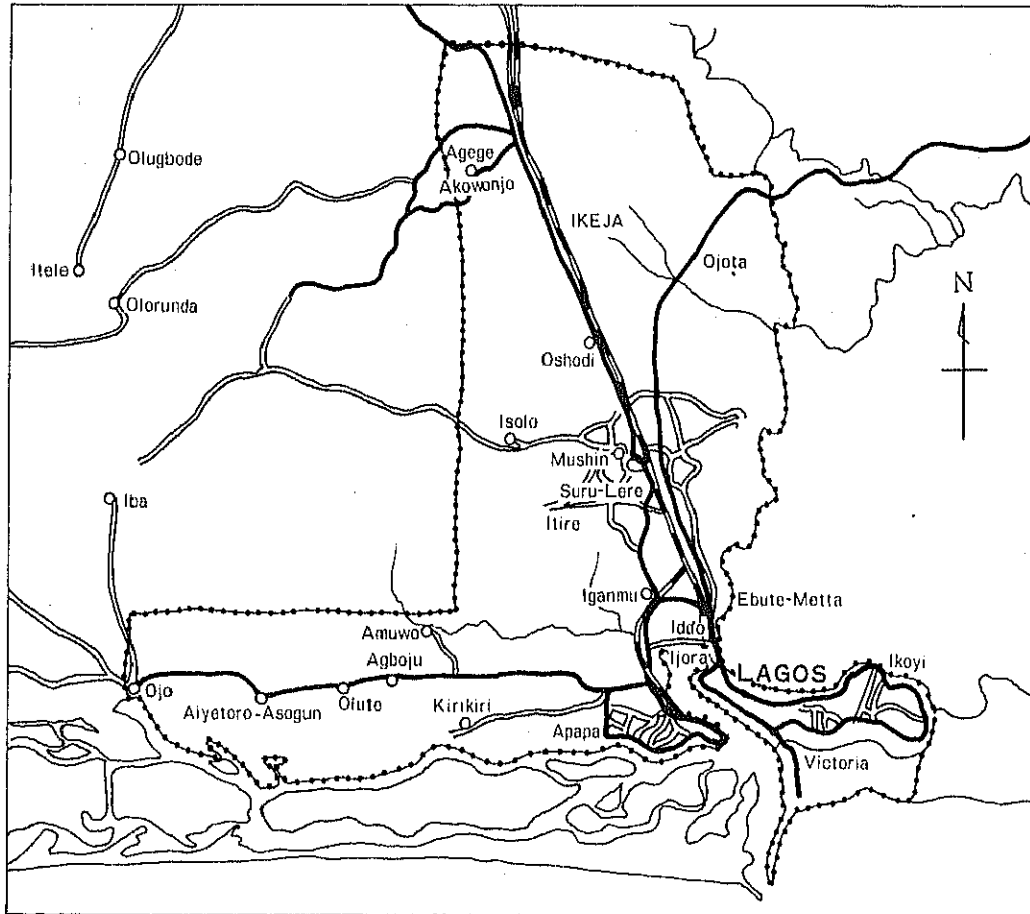
There are two principal deep-water ports - Lagos, the port under our review, in the capital city of the Republic and Port Harcourt in the eastern part of the country.

(2) The Federal Capital Lagos, situated at the tidal estuary of Lagos lagoon and creeks, has developed to form the Lagos metropolitan area, and has become the centre of the Federal and State administration, commercial and industrial activities.

According to the information obtained at the Lagos State Ministry of Works

and Planning the Lagos metropolitan area includes Lagos City Council area, Ikeja, Mushin, Agege, Oshodi-Sogunle and Ajeromi areas in the State of Lagos as shown in Fig. 2-1-1, and it has been said that the population of the area in 1976 is not less than 3.5 million.

FIG. 2-1-1 LAGOS METROPOLITAN AREA



2-2. Topographic conditions

(1) Behind the flat low land along the coastline is a hilly land with an altitude less than 600 metres. At the centre of the country there is the Jos Plateau higher than 1,000 metres from the sea level, while high mountains lie along the border with Cameroun.

(2) The Lagos metropolitan area is located mostly on the flat low land. The area is bounded on the east by a spacious water surface of the Lagos lagoon, while its western part is separated with the Bight of Benin by creeks. The terrain descends from the north to the continental shelf of the shores of the Atlantic Ocean at the south.¹⁾

Generally in central Lagos area the subsoil condition is poor to build heavy infrastructures.

2-3 Meteorological and maritime conditions

2-3-1 Meteorological conditions

The Federal Republic of Nigeria is situated close to the Doldrum Belt or a tropical low air pressure belt. During the dry season (November through April), this belt exists practically along Nigeria's coastline or somewhat south to the coastline. With the approach of the rainy season (May through October), the belt moves northward and at the end of June it stays in the vicinity of the Shara Desert or the northernmost place. Trade winds blow into this belt from both sides at all times. For this reason, strong northeasters blow in the area north of the coastline which forms most of Nigeria's national land in the dry season when the Doldrum Belt stays along the coastline of Nigeria, whereas the winds are weak and land and sea breezes are predominant every day in the periphery of the coastline which turns out to be the centre of the belt. In the rainy season when the belt is situated in the north, however, strong southwesters blow all over the national land of Nigeria. Figs. 2-3-1a and b indicate the wind directions and the positions of the belt both in dry and rainy seasons. Particularly in the dry season when the powder-like sand of the Sahara Desert is brought in by the north-easters, enveloping the entire sky of Nigeria, and the weather looks as though it were cloudy every day. This phenomenon is known as the harmattan.

These seasonal changes in the wind direction are closely associated with

1). "Characteristics and Problems of Urbanization in Lagos", December 1976, Master Plan Project Unit, LSMWP, UNOTC.

FIG. 2-3-1a PRESSURE AND WINDS
IN JANUARY

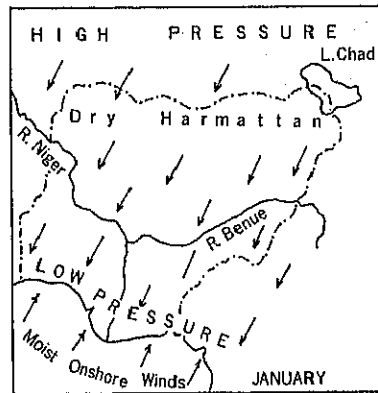
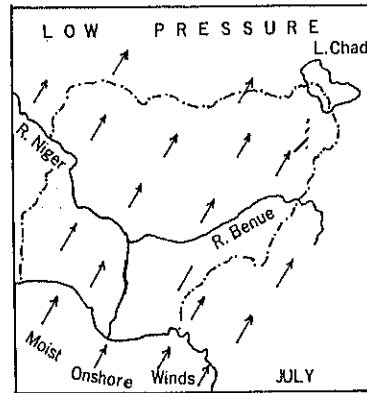


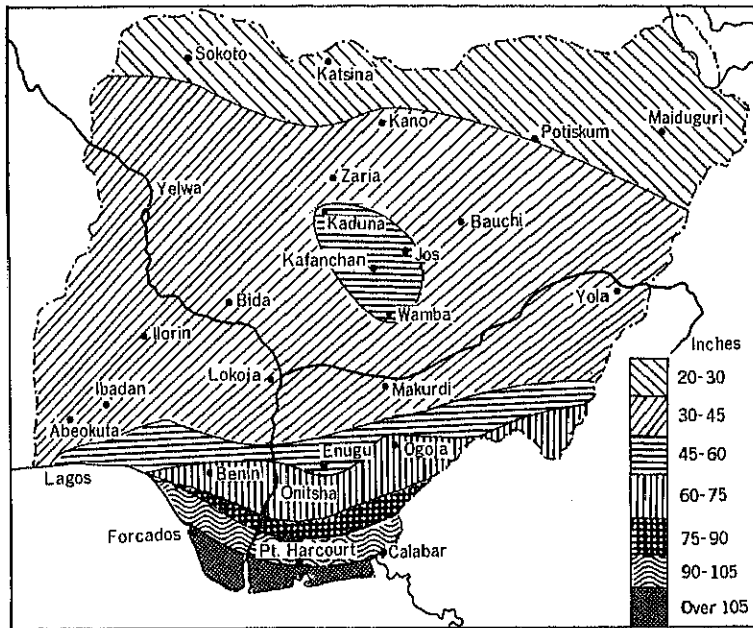
FIG. 2-3-1b PRESSURE AND WINDS
IN JULY



the characteristics of Nigeria's rain. In the dry season there is few rain because northeast wind is extremely dry, while the southwester of the rainy season blow in across the Gulf of Guinea and the winds contain much water which results in much rain. Particularly along the coastline, it heavily rains. Precipitation in the dry season (November through April) and the rainy season (May through October) is indicated in Figs. 2-3-2a and b. As will be discernible from these figures, the precipitation of the dry season stands at about 1/5-1/10 of that of the rainy season, and the farther a given area from the coastline, the smaller the precipitation. In the rainy season, there is much rain in Jos and its periphery, because the area is situated on a plateau.

The thunder storm which is a phenomenon unique to a tropical area attacks Nigeria all year round. The outbreak is frequent particularly at the beginning and end of the rainy season and the intensity is greatest. The thunder storm moves from east to west at 10-13 m/sec. It produces very strong winds at one time but later becomes moderate. The thunder storm is accompanied by a squall, and the floods caused by the squall constitute most of the damage associated with the thunder storm. The frequency distribution of thunder storms in Nigeria is demonstrated in Fig. 2-3-3. As will be discernible from this figure, a thunder storm frequently blows up in the area close to the coastline, and the

**FIG. 2-3-2a RAINFALL-RAINY SEASON,
MAY TO OCTOBER**



**FIG. 2-3-2b RAINFALL-DRY SEASON,
NOVEMBER TO APRIL**

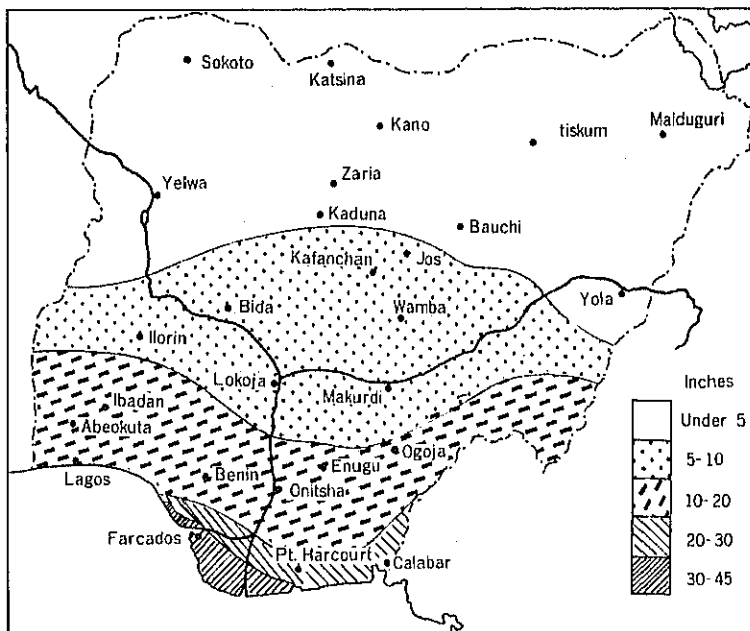
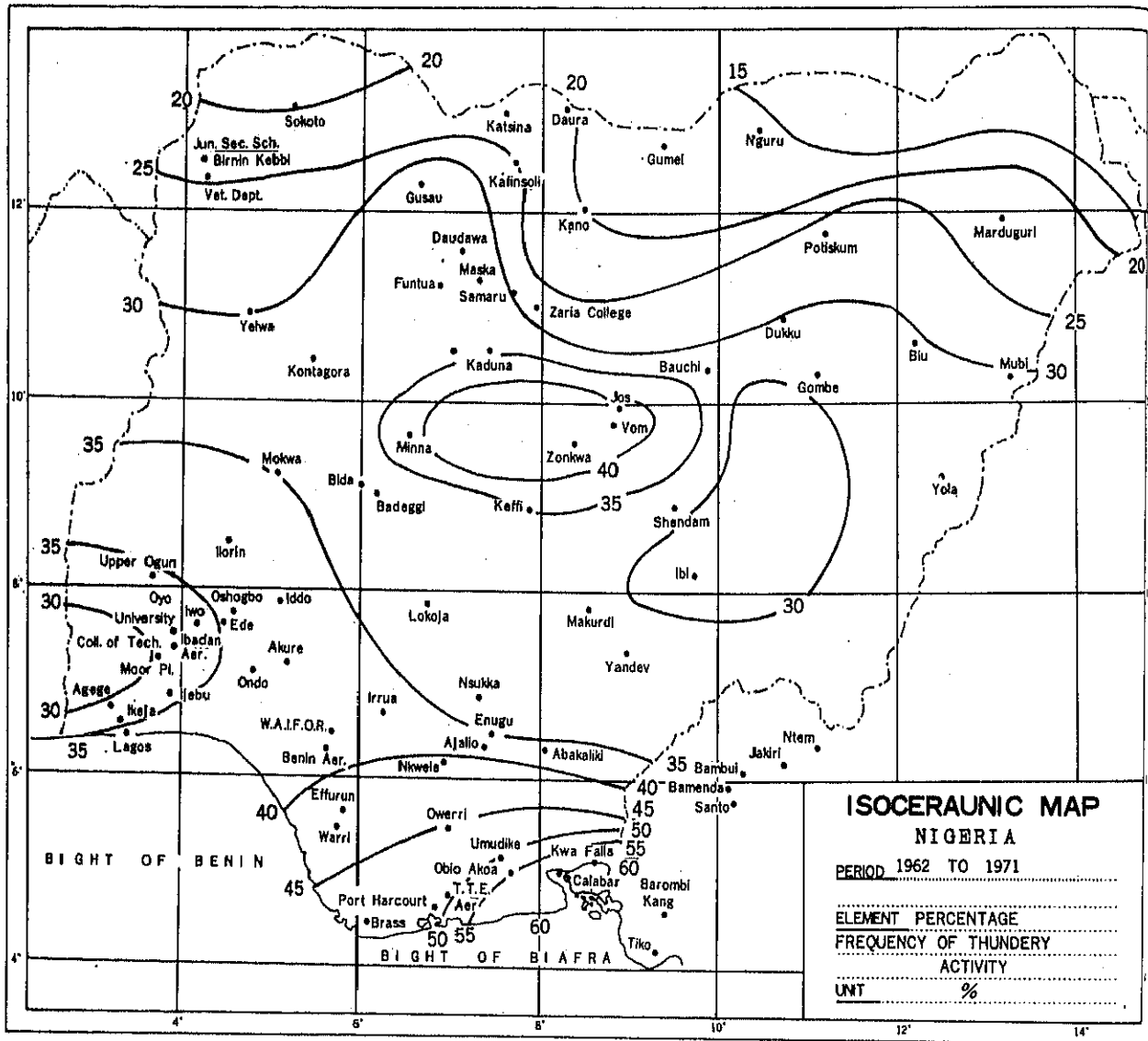


FIG. 2-3-3 FREQUENCY DISTRIBUTION OF THUNDER STORMS IN NIGERIA



frequency is particularly high on the southeastern seacoast. With respect to the scale, central barometric pressure and route of thunder storms, few values of observation are available and there are many points that have yet to be clarified.

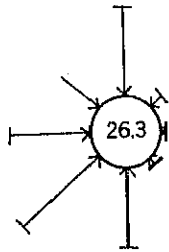
In the foregoing, the meteorological characteristics of Nigeria's entire land has been outlined. Described next will be the meteorological conditions of Greater Lagos, where the construction of a new ocean terminal is under plan, and its periphery. Greater Lagos faces the Bay of Guinea. Judging from the aforementioned characteristics of Nigeria, it may be said that there are much land wind in the nighttime and much sea wind in the daytime during the dry season, and that the strong southwesters are predominant during the rainy season. Fig. 2-3-4 indicates the frequency distribution of winds by direction for each month as observed by the Ikeja Observatory situated north to Greater Lagos or about 30 km inland from the seacoast. As will be discernible from this figure, the southerly winds are predominant in the rainy season (May through September), whereas not only the southerly winds but the northerly winds considerably blow in the dry season (October through April). Particularly in July and August, the southwesters account for 80% of the windy days with the winds dying down on the remaining 20% of the days. The northerly and southerly winds which blow every day in the dry season are presumably generated by land and sea winds. Thus, the observation results at the Ikeja Observatory are consistent with the findings of an estimate on the meteorological conditions of Greater Lagos on the basis of the conditions of Nigeria's entire land.

As regards the precipitation, the rainfalls in Greater Lagos are not so great as on the southeastern seacoast as will be discernible from Fig. 2-3-2, standing at about 1,500 mm a year.

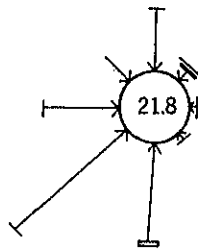
Fig. 2-3-5 indicates the relations between the maximum wind velocity and the recurrence period based on the available data on the maximum wind velocity at Ikeja in the last 17 years. The maximum wind velocity in the last 17 years is 64 kt (32 m/sec). Presumably, it represents the strong winds generated by a thunder storm, but the scale, central barometric pressure and route of this thunder storm are unknown due to lack of information.

FIG. 2-3-4 FREQUENCY DISTRIBUTION OF WINDS BY DIRECTION AT IKEJA

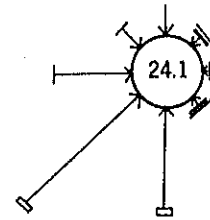
JANUARY



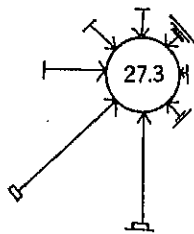
FEBRUARY



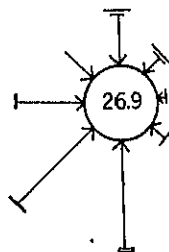
MARCH



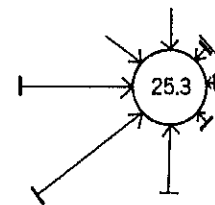
APRIL



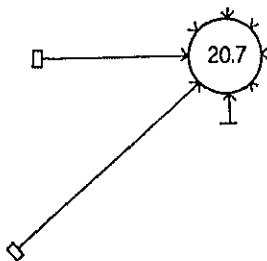
MAY



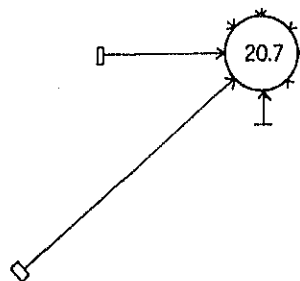
JUNE



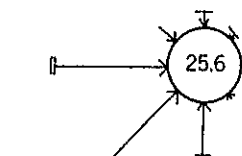
JULY



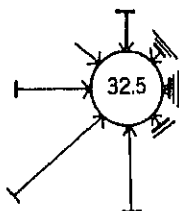
AUGUST



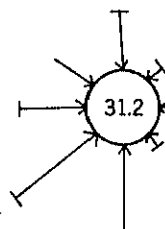
SEPTEMBER



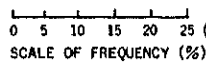
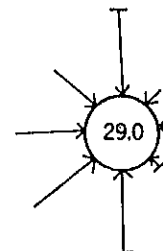
OCTOBER



NOVEMBER



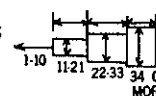
DECEMBER



SCALE OF WIND SPEED

LESS THAN 0.3%
GREATER THAN 0.3% BUT LESS THAN 0.5%

SCALE OF FREQUENCY



THE FIGURE INSIDE THE CIRCLE INDICATES THE PERCENTAGE OCCURRENCE OF CALMS.

SCALE OF WIND SPEED (Kt)