III-6-2. Beach Erosion

(1) Shoreline Evolution on the Nigerian Coast

On the West African coast facing the Bight of Biafra, littoral drift is carried from west to east because swell from the southwest direction prevails throughout the year. When a breakwater is constructed, accretion will therefore occur on the west side (updrift side of the sediment transport) while erosion will occur on the east side (downdrift side). In the case of Lagos Port, for example, accretion is observed on the shore west of the West Mole (Lighthouse Beach) and erosion on the east side of the East Mole (Victoria Beach). Fig. III-6-2 shows the positions of the shorelines around Lagos Port in 1900, 1945 and 1959[2]. The moles of Lagos Port were constructed in 1908 – 1913.

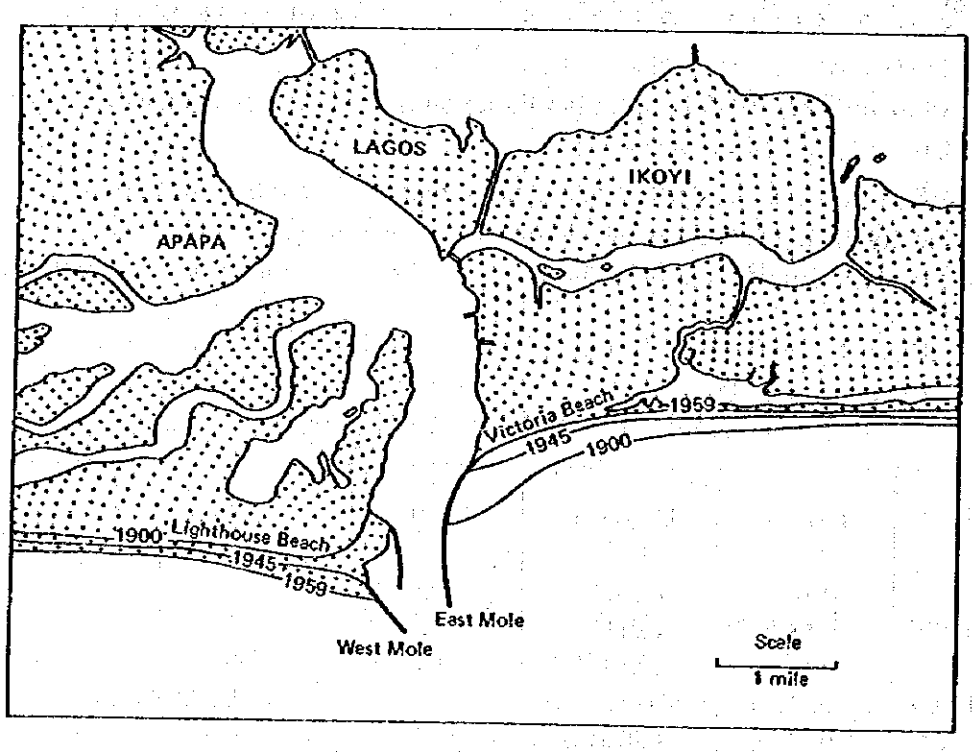

Fig. III-6-2 Shoreline Changes around Lagos Port (after Webb)

The likelihood of this sort of shoreline change occurring on the east coast depends on whether or not littoral drift from west to east exists on this coast. Fig. III-6-3 shows the directions of waves and currents around the Niger Delta shown by Allen[3]. Swell from the southwestern direction prevails and it is considered that littoral drift is carried from west to east.

2) Webb, J.E.; The erosion of Victoria Beach, its cause and cure, Ibadan University Press, 1960.
3) Allen, J.R.L., Coastal geomorphology of eastern Nigeria, Beach-ridge barrier islands and vegetated tidal flats, Geology en mijnbouw, 1965

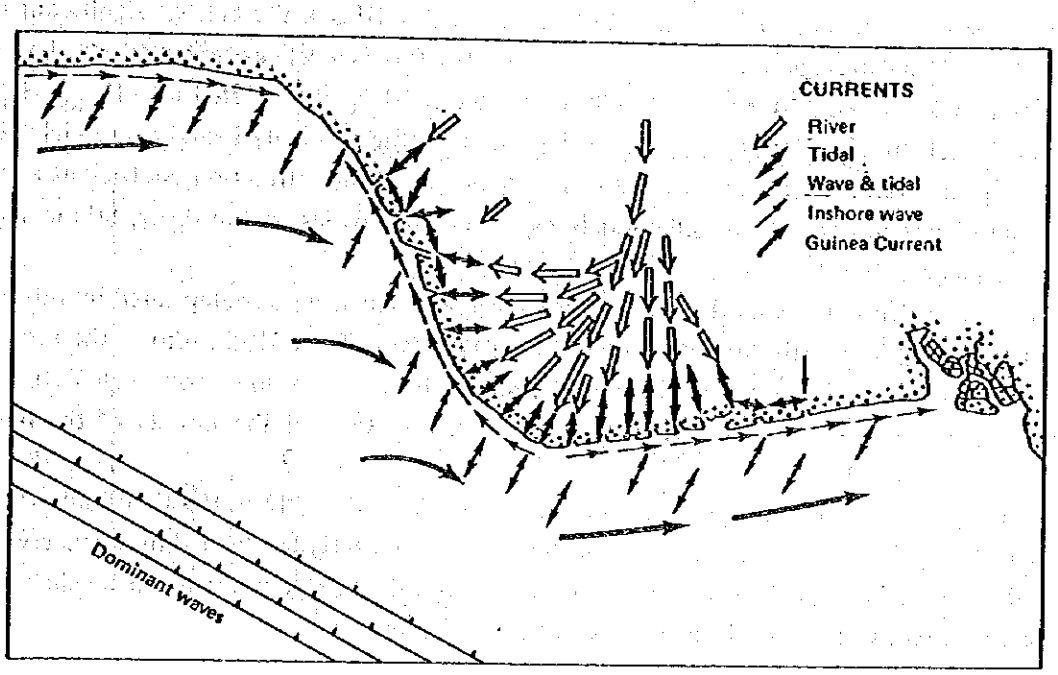

Fig. III-6-3 Nature and Direction of Forces Moulding Niger Delta (after Allen)

(2) Shoreline Evolution around Lagos Port

Under these considerations, we attempted to reproduce the shoreline changes around Lagos Port shown in Fig. III-6-2 using a beach mathematical model, then studies the order of wave heights, wave directions, and wave periods – the input data for mathematical simulation.

The beach mathematical model[4] is a model used to forecast shoreline evolution. The following equations are solved by the finite difference method:

1) The continuity equation of longshore sediment transport
2) The equation for the volume rate of alongshore sediment
3) The equation showing the relation among the breaking wave crests, the baseline, and the shoreline.

Table III-6-2 shows the annual frequency distribution of significant wave height and period at 5°23′ N and 5°00′ E off Forcados (water depth –50 m). Table III-6-3 shows the annual occurrence frequency of significant wave heights and directions at the same point. These tables can be used for the beach mathematical model around Lagos Port, because wave characteristics off Forcados are approximately the same as those off Lagos. Table III-6-4 shows the distribution of energy flux $(\rho g H_m^2 \cdot n \cdot c \cdot N)/8$, calculated using Table III-6-2. Here, ρ is the density of water, g is the acceleration due to gravity, H_m is the wave height in Table III-6-2, n·c is the group velocity of waves, and N is the probability in Table III-6-2. When the probability of energy flux, p, is

4) Ozasa, H. & A.H. Brampton; Mathematical modelling of beaches backed by seawalls, Coastal Engineering 4, 1980

obtained for each period and each wave height from Table III-6-4, the average significant wave height $\overline{H}_{1/3}$, and the average ware period, $\overline{T}$, where energy flux is most concentrated, can be obtained by $\Sigma p \cdot H$ and $\Sigma p \cdot T$. $\overline{H}_{1/3}$ is 1.67 m and $\overline{T}$ is 12.5 sec. If $\overline{H}_{1/3}$ is converted into $\overline{H}_{rms}$, $\overline{H}_{rms} = \overline{H}_{1/3}/1.42 = 1.18$ m. The input wave height, H_b, used for the beach mathematical model is $H_b = \gamma \cdot K_r \cdot K_d \cdot \overline{H}_{rms}$. Here, K_r is the refraction coefficient, K_d is the diffraction coefficient and γ is the constant determined by the sediment transport characteristics on the shore, taking a value within the range of $0 \sim 1$.

The wave direction to be used in the beach mathematical model was determined by refraction calculation, using SW as the direction of deep water waves. Table III-6-5 shows the results of refraction calculation using assumed parallel contour lines. From the above calculation, we decided to use the refraction coefficient and the wave direction for the vicinity of the breaker zone (water depth – 4 m).

Since K_d at Lighthouse Beach is 1.0, we used $\gamma = 0.58$, so that $382 \sim 459$ thousand m^3/year, the longshore sediment transport rate reported by the Delft Hydraulic Laboratory, could be obtained. The sea bottom slope is $\tan \beta = 1/40$; the water depth below which profile changes are negligible is 5.0 m; and the height of the beach berm is 3.6 m.

Table III-6-2 Average Annual Frequency Distribution of Significant Wave Height and Period (at 5°23' North, 5°00' East at Approximately –50 m Depth)

Period (sec)	Significant Wave Height ($H_{1/3}$) (m)							Total
	0–0.6	0.6–1.2	1.2–1.8	1.8–2.4	2.4–3.0	3.0–3.6	3.6 plus	
0–3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2
3–5	0.8	0.5	0.0	0.0	0.0	0.0	0.0	1.3
5–7	1.8	2.3	0.2	0.0	0.0	0.0	0.0	4.3
7–9	3.2	4.5	1.4	0.3	0.0	0.0	0.0	9.4
9–11	7.2	12.2	4.9	1.5	0.3	0.1	0.0	26.2
11–13	6.2	11.8	7.0	3.0	0.8	0.3	0.1	29.2
13–15	3.9	7.7	3.9	1.9	0.4	0.1	0.0	17.9
15–17	1.8	5.0	1.6	0.5	0.0	0.0	0.0	8.9
17–19	0.5	1.4	0.6	0.1	0.0	0.0	0.0	2.6
Total	25.8	45.3	19.4	7.3	1.6	0.5	0.1	100.00

Source: A.H. Glenn and Associate: Meteorological-Oceanographic factors affecting design and planning of petroleum operations in Nigerian oil company offshore leases.

Table III-6-3 Average Frequency of Occurrence of Wave Height-Direction Groups (at 5°23′ North, 5°00′ East at Approximatelv -50 m Depth)

Direction	Significant Wave Height (m)							Total
	0–0.6	0.6–1.2	1.2–1.8	1.8–2.4	2.4–3.0	3.0–3.6	3.6 plus	
N	1.1	0.8	0.2	0.0	0.0	0.0	0.0	2.1
NE	1.3	0.7	0.0	0.1	0.0	0.0	0.0	2.1
E	1.9	0.6	0.1	0.0	0.0	0.0	0.0	2.6
SE	2.5	2.4	0.7	0.2	0.1	0.0	0.0	5.9
S	6.3	9.9	3.6	1.1	0.3	0.1	0.0	21.3
SW	7.9	22.6	11.2	4.6	0.9	0.3	0.1	47.6
W	3.0	7.2	3.2	1.2	0.3	0.1	0.0	15.0
NW	1.8	1.1	0.4	0.1	0.0	0.0	0.0	3.4
Total	25.8	45.3	19.4	7.3	1.6	0.5	0.1	100.00

Table III-6-4 Distribution of Energy Flux

H(m) / T (sec.)	0.3	0.9	1.5	2.1	2.7	3.3	3.6	Total	p	ρT
1.5	34	0	0	0	0	0	0	34	0.0000	0
4	275	1,548	0	0	0	0	0	1,823	0.0010	0.004
6	927	10,678	2,580	0	0	0	0	14,185	0.0081	0.049
8	2,232	28,302	24,462	10,275	0	0	0	65,271	0.0372	0.298
10	6,827	104,323	116,408	69,848	23,093	11,499	0	331,998	0.1891	1.891
12	7,434	127,591	210,283	176,645	77,870	43,622	17,305	660,750	0.3763	4.516
14	5,577	99,299	139,729	133,429	46,436	17,342	0	441,812	0.2516	3.522
16	2,930	73,408	65,262	39,975	0	0	0	181,575	0.1034	1.654
18	886	22,360	26,623	8,697	0	0	0	58,566	0.0334	0.601
Total	27,122	467,509	585,347	438,869	147,399	72,463	17,305	1,756,014		
p	0.0154	0.2662	0.3333	0.2499	0.0839	0.0413	0.0099			
pH	0.005	0.240	0.500	0.525	0.227	0.136	0.036			

$\bar{H} = \Sigma pH = 1.67$
$\bar{T} = \Sigma pH = 12.5$

Table III-6-5 Refraction Calculation at Lagos Coast

h (m)	h/Lo	Kr	α
20	0.0889	0.88	25°
18	0.08	0.87	24°
16	0.0711	0.86	22°
14	0.0622	0.85	21°
12	0.0533	0.85	19°
10	0.0444	0.84	17°
8	0.0356	0.83	15°
6	0.0267	0.83	13°
4	0.0178	0.82	10°
2	0.0089	0.80	5°

h = Sea depth
Lo = Wave length in deep sea
Kr = Refraction coefficient
α = Predominant wave angle from south

Fig. III-6-4 shows the shoreline changes at Lighthouse Beach in the field as well as in the mathematical model. The positions of the shorelines in 1910 are assumed not to have changed significantly since 1900, as the construction of the moles was completed in 1913. The axis of abscissas, x, shows a base line which is approximately parallel to the shoreline. According to Fig. III-6-4 the direction of the shoreline in the field is more inclined to the SE-NW direction than the direction of the shoreline calculated by the mathematical model on the west side of the west mole (Station Nos. 2–6). This is probably because the refraction pattern has changed on the west side of the west mole and the direction of the shoreline has shifted in accordance with this change. With this exception, our reproduction of the shoreline change on Lighthouse Beach is considered to be generally satisfactory. The longshore sediment transport rate at a point sufficiently distant from the west mole is about 395,000 m^3/year in the west to east direction.

Fig. III-6-5 shows the shorelines on Victoria Beach in the field and the shorelines calculated by the mathematical model. Victoria Beach has eroded quite seriously since the construction of the mole. The sandy beach was prone to complete erosion in the vicinity of the east mole, although it is now being maintained by the dumping of sand dredged from Lagos Port. We have calculated the shoreline changes on the assumption that seawalls lie on the position of the shoreline in 1959 at the area of Station Nos. 50–58 (Station No. 50 is in the beach on the south of Eko Hotel). The calculation is also based on the assumption that the wave height is somewhat smaller at Station Nos. 53–59 than elsewhere because of the effects of diffraction by the west mole. According to Fig. III-6-5, we have managed to reproduce the general trend of beach erosion, although the shoreline change in the field and the calculated shoreline change are not in exact agreement.

From the above calculation, it is judged that the beach mathematical model can be used for the purpose of predicting the shoreline changes on the Nigerian coast, and that the following conditions can be taken up in the model:

a. $\gamma = 0.58$

b. Use of values at a water depth of about -- 4 m for wave height and wave direction.

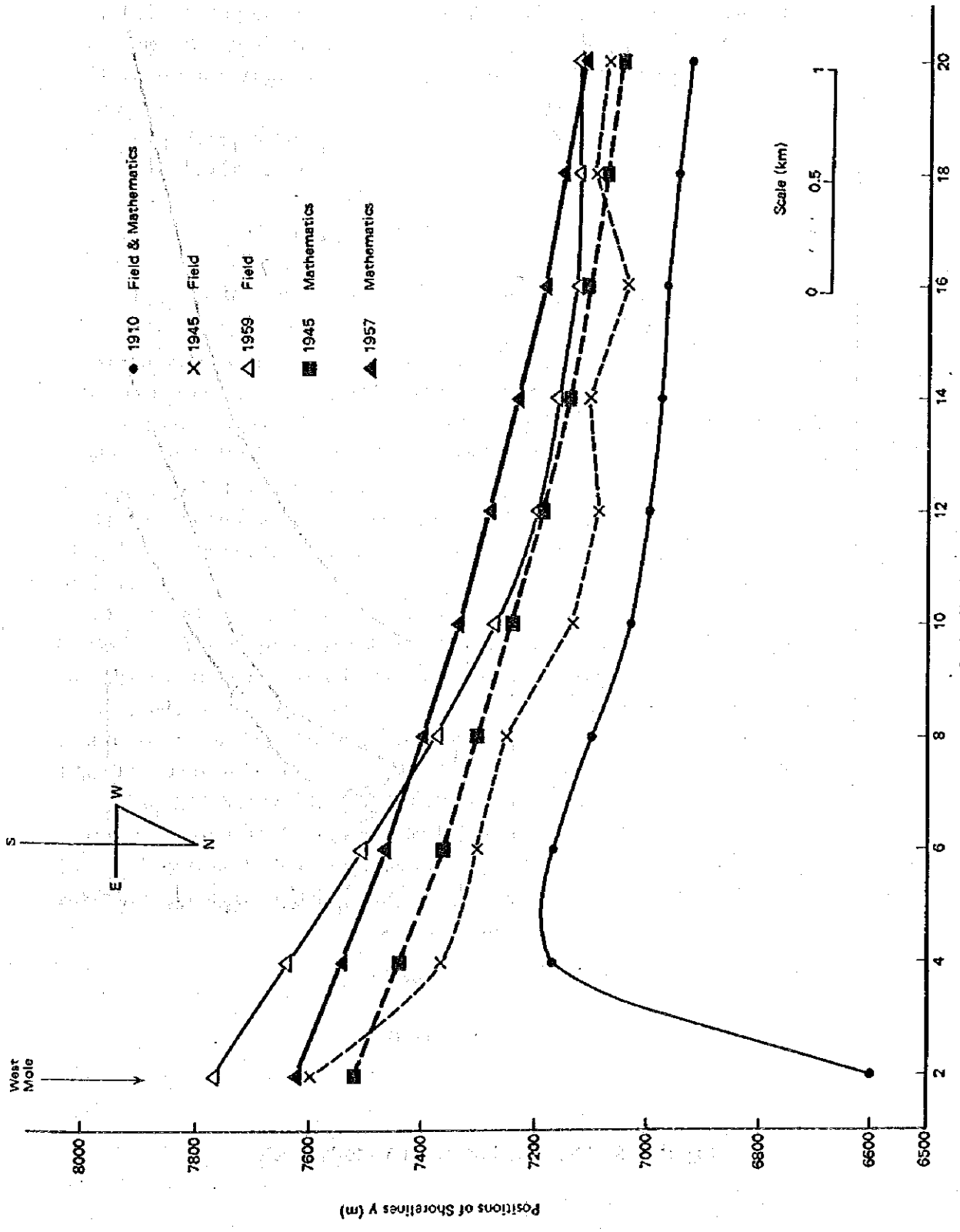

Fig. III-6-4 Shoreline Changes at Lighthouse Beach

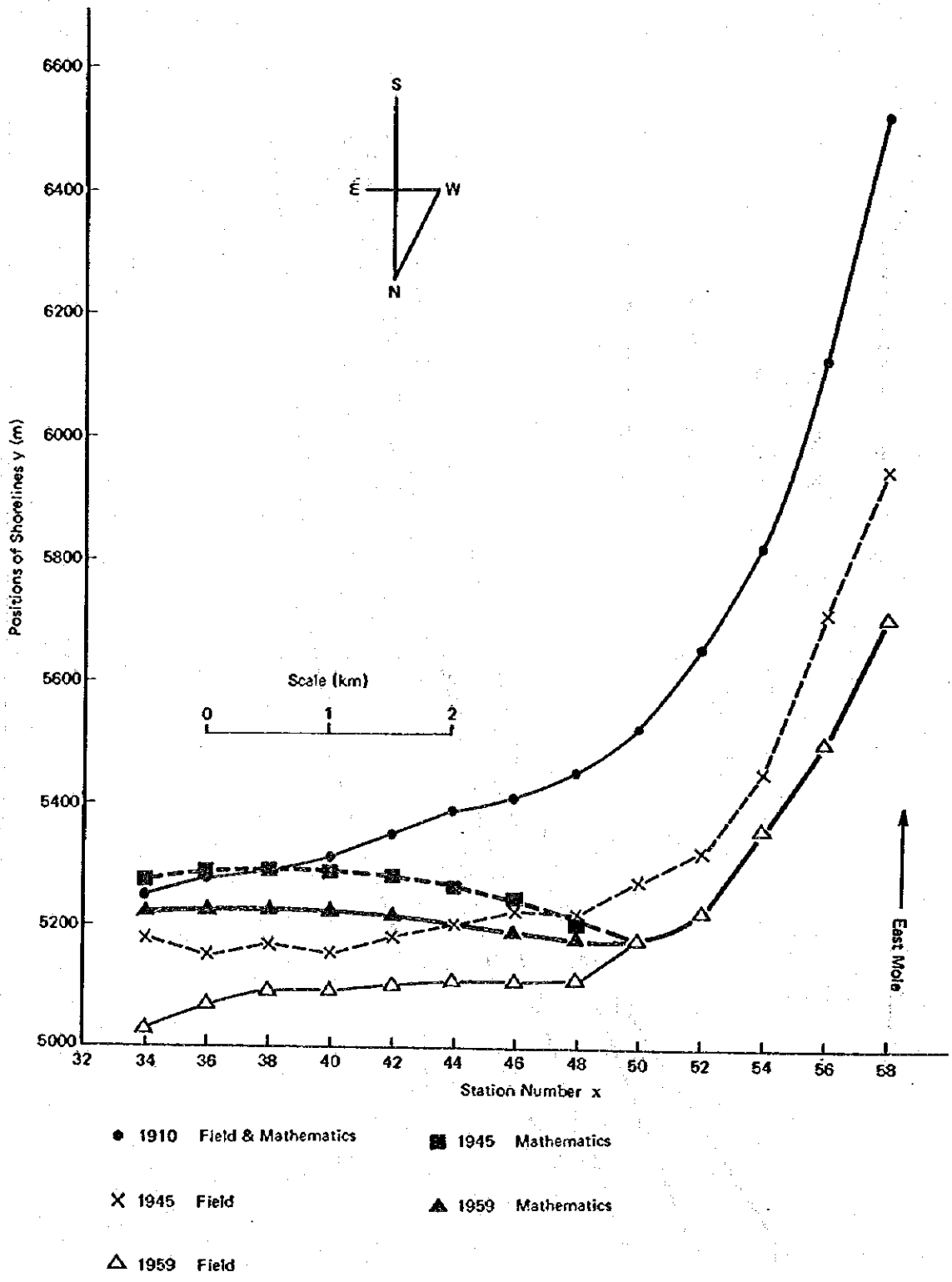

Fig. III-6-5 Shoreline Changes at Victoria Beach

(3) Shoreline Evolution around NOT-east

The shoreline changes around NOT-east were calculated by referring to the shoreline changes reproduction for the vicinity of Lagos Port under the following conditions:

1) Calculation were made for the beach to the west of the training jetty; the beach between the training jetty and the west breakwater: and the beach to the east of the east breakwater.

2) As for the input data for the calculation, wave height was calculated by the following formula:

$$H_b = \gamma \cdot K_f \cdot K_r \cdot H_{rms}$$

In the above, $\gamma = 0.58$

$K_f = 0.45$

$\overline{H}_{rms} = 1.18$ m

$\overline{H}_{rms} = 1.18$ m is the value used in calculating shoreline changes around Lagos Port. K_d and K_r were obtained from diffraction calculation and refraction calculation at the NOT-east site.

3) Projected shoreline configurations of 10, 20, 30, 40, and 50 years after the construction of the breakwaters were calculated, assuming the present shoreline as the initial shoreline.

Figs. III-6-6~ III-6-8 show the results of calculation conducted under the above conditions. It should be noted that these shoreline changes are those which would be expected to occur in the case where no shore protection facility was provided.

1) On the beach to the west of the training jetty, the shoreline gradually accretes. Alongshore sediment transport rate is about 50,000 ~ 90,000 m^3/year from west to east. (Fig. III-6-6)

2) Fig. III-6-7 shows the shoreline changes between the training jetty and the west breakwater. The shape of the shoreline is concave toward the sea. There is accretion to the immediate west of the west breakwater and erosion (maximum erosion speed: 2.7 m/year) on the east side of the new estuary created by the short-cut. The erosion of the latter can be controlled by building groins and seawalls. The alongshore sediment transport rate is about 10,000 ~ 50,000 m^3/year.

3) Fig. III-6-8 shows the shoreline changes to the east of the east breakwater. On this beach, little change occurs in the present plan shape of the shoreline. Though the vicinity of Station No. 10 is slightly eroded, shore protection facility is not necessary there because it is away from the NOT site and only sparsely inhabited.

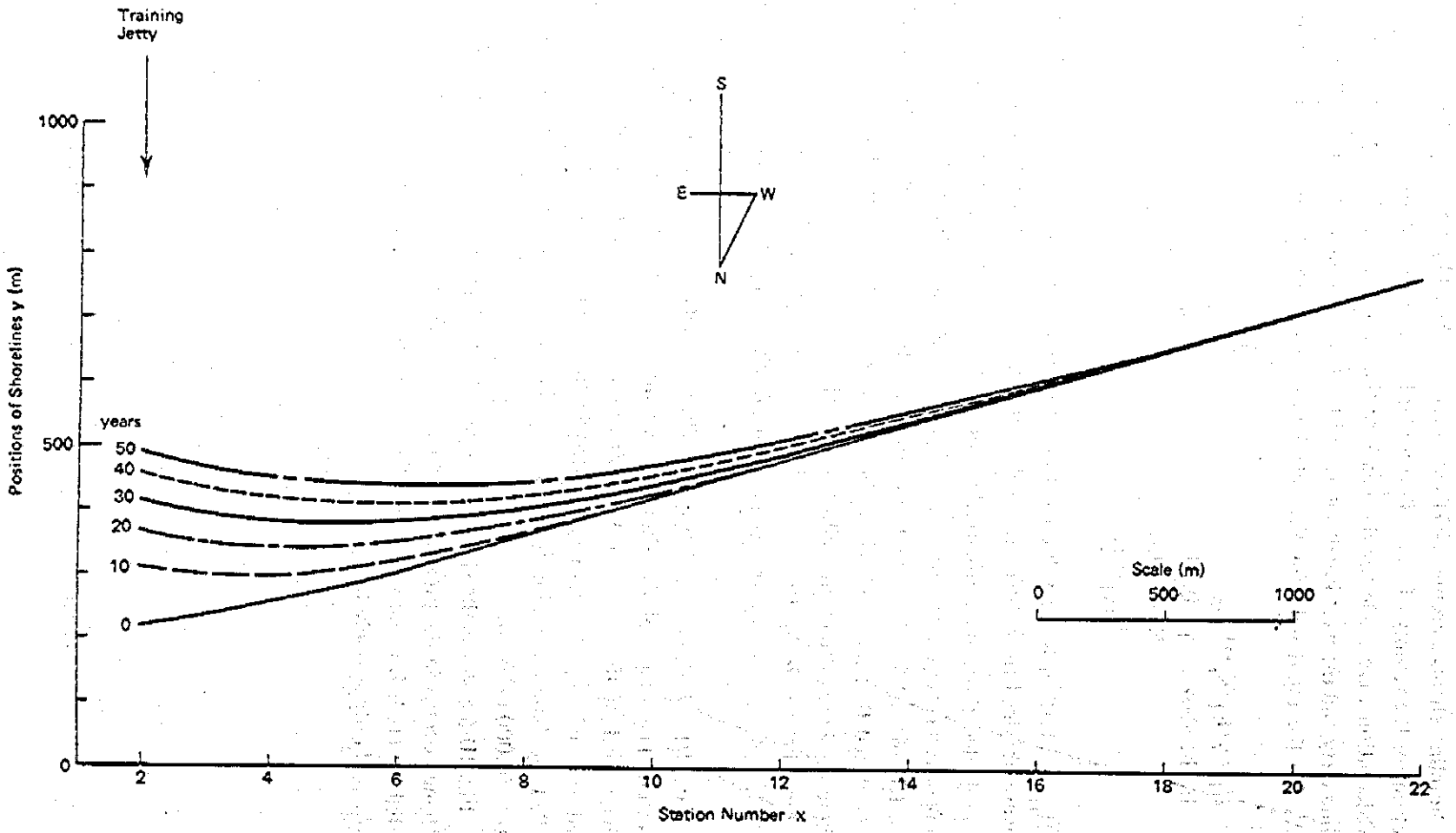

Fig. III-6-6 Shoreline Changes to the West of the Training Jetty

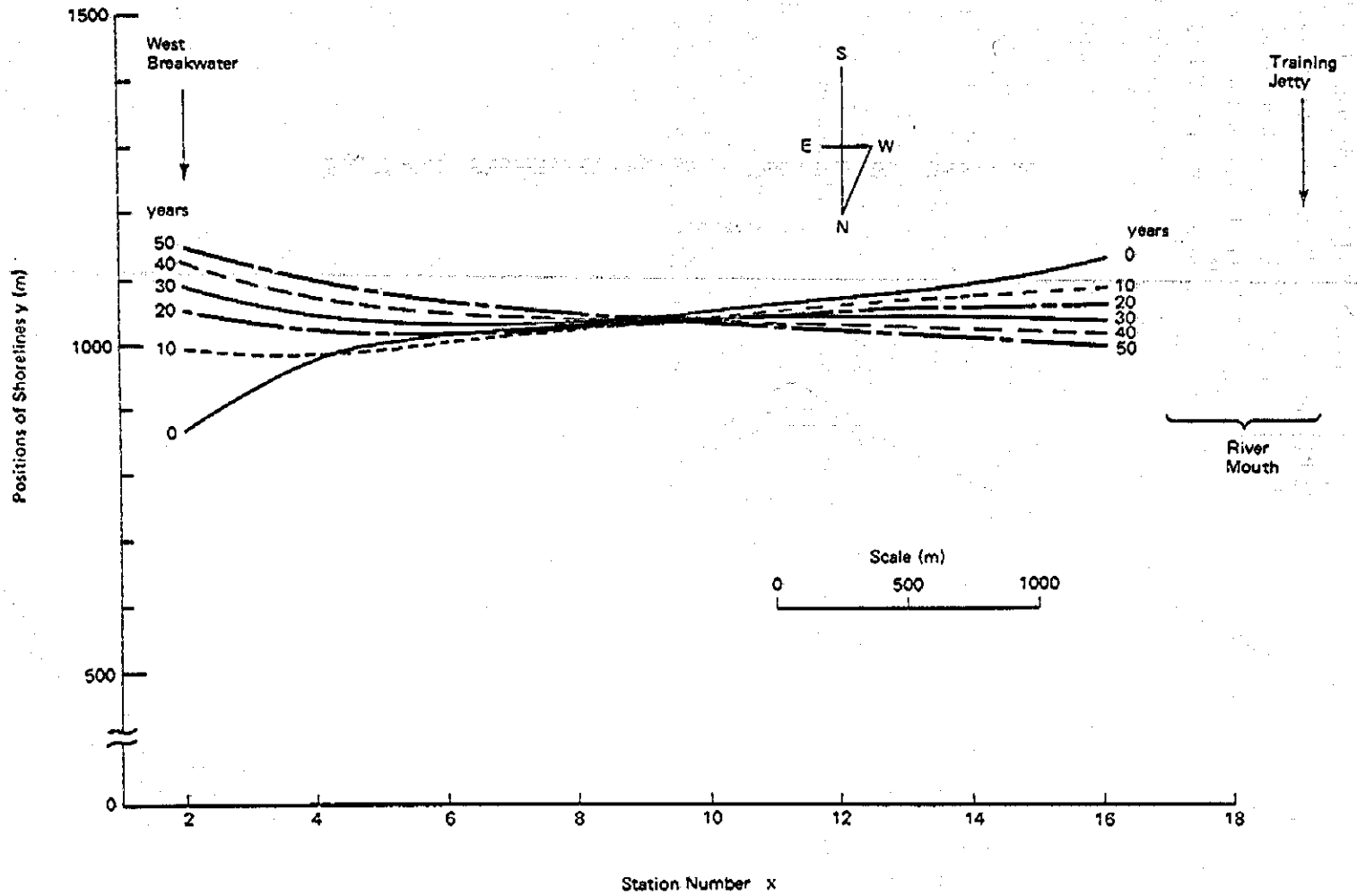

Fig. III-6-7 Shoreline Changes between the Training Jetty and the West Breakwater

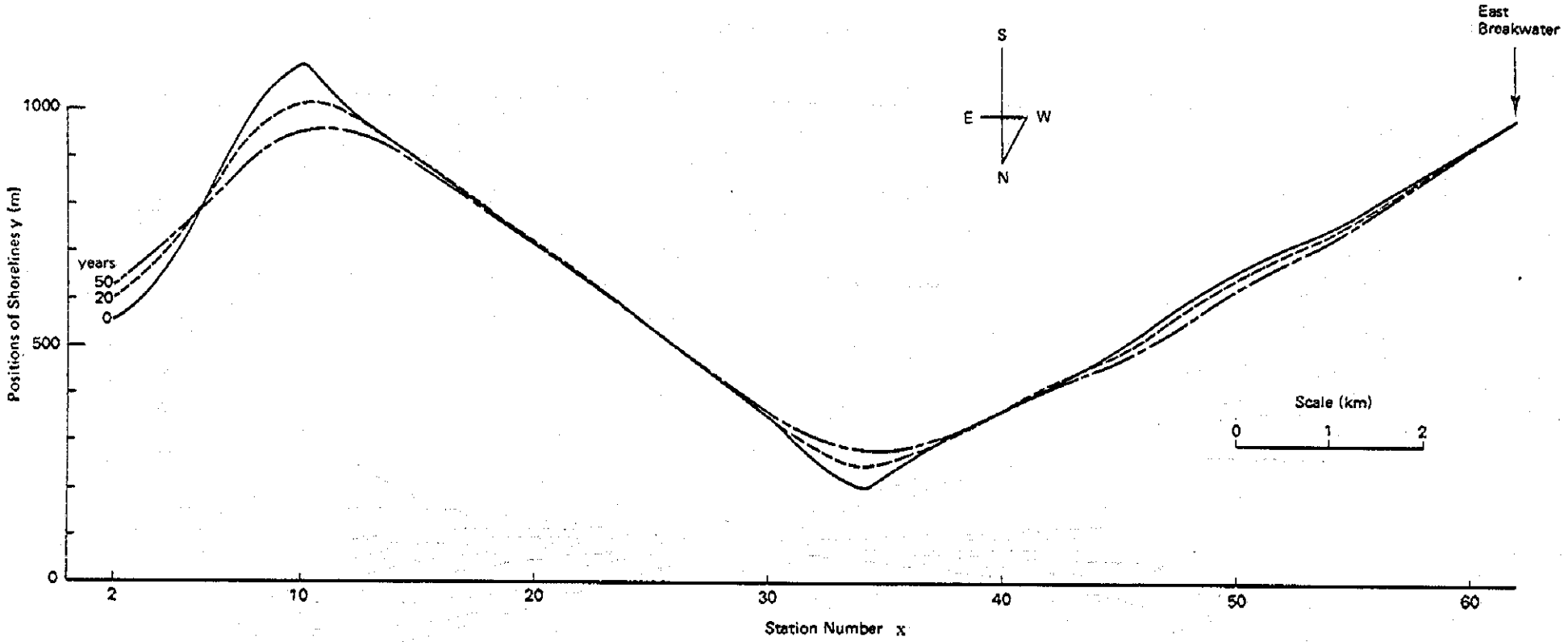

Fig. III-6-8 Shoreline Changes to the East of the East Breakwater

III-6-3. Calmness inside the Harbor

Layout of the breakwaters was determined in III-3-2.

Fig. III-6-9 shows the spatial distribution of diffraction coefficients inside the harbor for deep water waves of wave direction SW and wave period 12 sec. In the calculation we assumed that the coefficient of wave directional concentration, Smax, is 75; the average water depth inside the harbor -18 m for the datum level of M.S.L.; and the reflection coefficient by the breakwater 0.9. According to Fig. III-6-9, the diffraction coefficient, K_d, inside the harbor is less than 0.05, indicating sufficient calmness.

III-6-4. Seiche

Since predominant wave period measured at the Nigerian coast is fairly long (about 12 sec.), there is a possibility that longer waves, with periods exceeding 1 minute could occur. These long waves could produce seiche inside the harbor.

Lagos Port is said to have a seiche problem, but as no data is available on long period waves observed at Lagos port, the characteristics (dimensions, wave period) of the seiche are not clearly known. It is recommended that thorough observation of long period waves inside Lagos harbor be conducted.

The eastern coast of Nigeria is so flat that edge waves which cause seiche could be generated. Observation of long period waves should be conducted before the construction stage of port facilities, and necessary countermeasures should be taken if long period waves prove to exist.

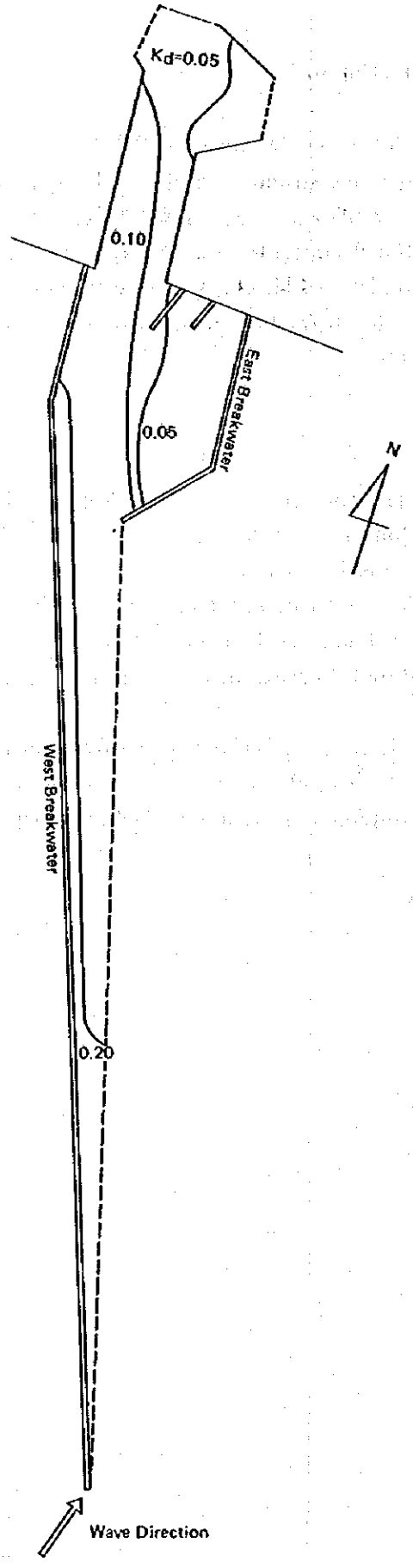

Fig. III-6-9 Calmness inside the Harbour (diffraction coefficient)

CHAPTER 7. EFFECTS OF THE DEVELOPMENT

III-7-1 Comparison of Transportation Cost

(1) Scope of Comparison

The scope of comparison of transportation cost between the two proposed sites of NOT is as follows:

1) The objects and cargo traffic of comparison.

a. The objects of comparison are commercial and industrial cargoes. They are projected in the Report on the New Ocean Terminal Project, Lagos (Phase II) (Table III-1-1 and III-7-III-7-1).

b. The calculation and comparison of transportation cost are limited to inland transportation for the following reasons:

① There is no change of the origin of imports and the destination of exports even if the New Ocean Terminal site changes.

② With the change of the New Ocean Terminal site, the transporting distance between the site and the foreign origin of imports or the foreign destination of exports may increase or decrease. Since, however, cargo transporation to or from two opposite directions – east and west, for example – is likely, any increase or decrease of transporting distance may be offset. Further, as the distance between the Lagos and East sites is about 600 km by sea and increase or decrease due to this distance hardly affects the total cost of ship transportation and can be thus considered negligible.

c. The cargo volumes for comparison are 18,912,000 tons for commercial cargo and 7,595,000 tons for industrial cargo. These were derived by subtracting the following cargo volumes from their total volume in the Phase II Report.

① Cargo volumes for the manufacturing industries of NOT, motor vehicle parts, etc.)

- Commercial cargo; 3,852,000 tons (imported fuel oil)
- Industrial cargo ; 3,056,000 tons (fuel oil, naphtha for fertilizer, steel for shipbuilding and repair)

② Total volumes of petroleum products for general use.

- Commercial cargo; 3,698,000 tons (imported fuel oil)
- Industrial cargo ; 7,784,000 tons

It is assumed that these petroleum products will be delivered via the pipeline network to be constructed throughout the country. Pipeline freight rates are not yet available and the flexibility of pipeline transportation should preclude any major difference in transportation cost regardless of the site chosen for NOT.

Table III-7-1 Flow of Industrial Cargo at NOT

Type of Industries (Production Scales per year)	Cargo Volume of Products ('000 tons)	Cargo Volume for Domestic Use ('000 tons)			Incoming Cargo Volume through the Public Wharf
		Total	Within NOT	Outgoing	
Iron and Steel (Crude Steel 6 million tons)	Steel 5,400 (30% for export)	3,780	100	3,680	Fuel Oil 92
Petroleum Refining (400,000 barrels/day)	Petroleum Products 17,900 (40% for export)	10,740	2,956	7,784	
Petrochemicals (400,000 tons ethylene basis)	Derived Chemical Products 1,930 (50% for export)	965		965	Fuel Oil 73
Chemical Fertilizer (500,000 tons)	Fertilizer 500	500		500	
Automobile Assembly (200,000 vehicles two shift)	Motor Vehicles 195	195		195	Parts 250
Flour Mill and Food Processing	Flour 390 Bran 110	500		500	
Edible Oil (250,000 tons)	Soybean Oil 44 Oil cake 191	44 191		44 191	
Other Related Industries	Various Products 1,520	1,520		1,520	Raw Materials 1,900
Power Stations					Fuel Oil 1,537
Total	28,180	18,435	3,056	15,379	Fuel Oil 1,702 Others 2,150 Total 3,852

2) Transportation distance.

The calculation of inland transportation cost is based on the transportation distance between the Lagos or the East site and each CEA (Center of Economic Activity).

a. The inland destinations and origins of cargo through NOT are quire numerous and it is therefore difficult to calculate transport volume and cost for each.
b. Transportation volume and cost have therefore been calculated by positing certain points within each area as representative cargo origins and destinations.
c. This representative destinations or origins are the CEAs (Centers of Exonomic Activity), as proposed in the MIT Reports[1] (Fig. III-7-1). There are 23 CEAs including Federal Capital Territory (F.C.T.)/Ajaokuta Steel Mill (A.S.M.). The area represented by CEA is somewhat smaller than the existing 19 states. Most CEAs are state capitals.

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1) MIT Reports

- o Nigerian Ports Study, Traffic Studies and Projections, January 1979 (Phase I Report)
- o Nigerian Port Planning Economic and Financial Analysis, Phase II Reprot, October 1979

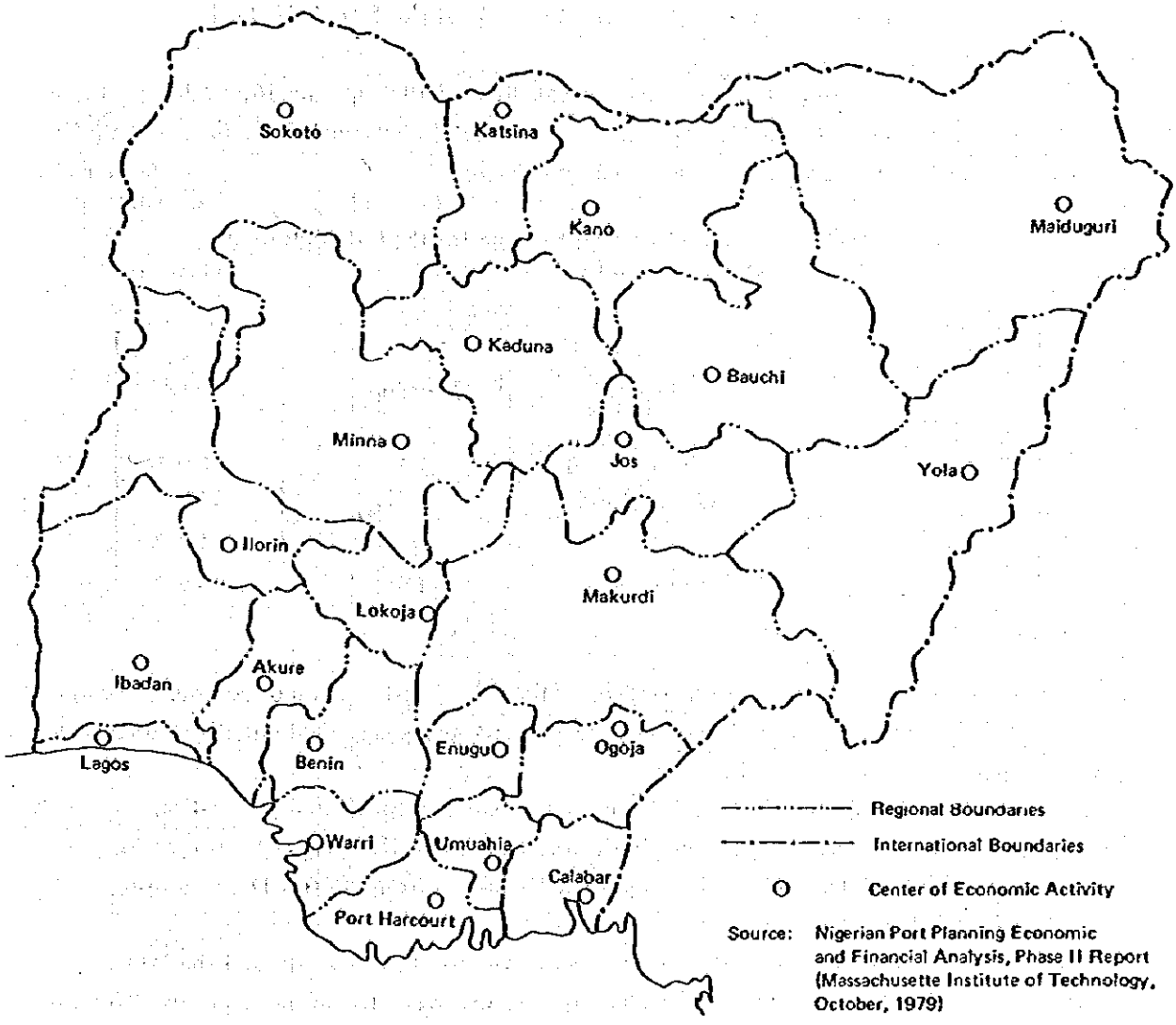


Fig. III-7-1 Centers of Economic Activity (CEA)

The calculation and comparison of transportation costs involve the following steps:

i Inland distribution of cargo
ii Cargo volume by transport mode
iii Estimate of freight rates
iv Comparison of transportation cost

(2) Inland Distribution of Cargo

1) Commercial cargo

The import and export cargo volumes for the calculation are 16,965,000 tons and 1,947,000 tons, respectively (Table III-7-2); their allocation computed on the basis of their compositional ratios for the year 2000 in the Phase II Report.

Table III-7-2 Commercial Cargo Volume for the Calculation of Transportation Cost

Cargo Composition	Cargo Volume ('000 tons)		
	Import	Export	Total
General Cargo			
Break Bulk	4,610 (540)	1,456	6,066
Containerized	11,313 (1,610)	491	11,804
Grain	1,042 (–)	–	1,042
Total	16,965 (2,150)	1,947	18,912

Note: ( ) indicates cargo volumes transported within NOT

Since no statistical information concerning the inland distribution of commercial cargo is available, in this study imports and exports were allocated using cargo volume distribution ratios by CEA as per the results of the MIT reports.

The inland distribution in the MIT Reports is based on projected population, especially urban population, and various economic indicators (see Table III-7-3). These projections cover the period up to 2000 A.D. and, in this study, distribution ratios in 2000 A.D. are adopted.

Classification of commercial cargo by item as treated in this study and the MIT Reports are corresponding indicated below. For distribution ratios, weighted averages are used for cases where items are notated in plural.

	This Study	MIT Reports
Imports	General Cargo	Consumer Goods
		Motor Vehicles and Parts
		Chemicals
		Iron and Steel
		Machinery
		Pulp and Paper Products
		Sugar
		Fertilizer
	Grain	Cereals
	Petroleum Products	Petroleum Products
Exports	Exports	Cocoa, Rubber
		Palm Oil and Grand Nut Oil
		Palm Kernel, Coal, Other

Table III-7-3 Basis for Inland Distribution (Commercial Cargo)

Commodity	Basis for inland distribution of imports and exports
Consumer Goods	Projected urban population distribution weighed by household income level
Motor Vehicles Paper Products Sugar	Projected urban population
Motor Vehicle Parts	Assembly plant locations
Cement	Construction sector indicator of regional product estimates in 1973
Chemicals	Average of employment and cost distributions of chemical industries, adjusted by respective urban demand growth of certain CEA and the proposed petrochemical complex in the Port Harcourt area
Iron and Steel	Location and size (by employment) of iron and steel manufacturing plants in 1975 and new local mills
Machinery	Agricultural and industrial sector indicator of regional product estimates in 1973, adjusted by regional agricultural development and new projects such as Federal Capital, the Ajaokuta and Warri Steel mills
Pulp	Paper mill locations
Cereals	Wheat: Projected urban population adjusted by the northern region production capacity Others: Projected rural population
Fertilizer	Actual distribution for 1973 and ADP (Agricultural Development Projects through 1990)
Petroleum Products	Projected urban population with regard to residual demand not met by local refineries
Exports	Actual origin for 1975

Source: Nigerian Ports Study, Traffic Studies and Projections, Massachusetts Institute of Technology, January 1979.

Destinations of imports are not limited only to certain areas but cover the entire Federation. This is in consideration of the prospect that the NOT commercial port serves a nationwide – rather than local – hinterland. Accordingly, the distribution ratio of each CEA for all cargo is the same for the Lagos site and the East site.

Tables III-7-4 and III-7-5 show the inland distribution of imports and exprots calculated under the conditions above. Of the 16,965,000 ton import total, 10,943,000 tons are for the western states compared to 6,022,000 tons for the eastern states, the resulting transport volume ratio being 64.5/35.5. Of the 1,947,000 ton export total, 1,317,000 tons are for the western states as opposed to 630,000 tons for the eastern states, the transport volume ratio being 67.6/32.4.

Table III-7-4 Inland Destinations of Imports in 2000

Center of Economic Acticity (CEA)	General Cargo				Grain		Total	
	Break Bulk		Containerized					
	'000 tons	%	'000 tons	%	'000 tons	%	'000 tons	%
IBADAN	629	13.6	1545	13.7	150	14.4	2324	13.7
AKURE	176	3.8	430	3.8	43	4.1	649	3.8
LAGOS	872	18.9	2140	18.9	90	8.6	3102	18.3
IROLIN	118	2.6	290	2.6	24	2.3	432	2.5
LOCOJA	41	0.9	101	0.9	20	1.9	162	1.0
SUBTOTAL	1836	39.8	4506	39.8	327	31.4	6669	39.3
SOKOTO	194	4.2	474	4.2	72	6.9	740	4.4
MINNA	82	1.8	202	1.8	24	2.3	308	1.8
KANO	276	6.0	676	6.0	88	8.4	1040	6.1
KADUNA	100	2.2	246	2.2	21	2.0	367	2.2
KATSINA	92	2.0	227	2.0	39	3.7	358	2.1
F.C.T./A.S.M.	412	8.9	1010	8.9	39	3.7	1461	8.6
SUBTOTAL	1156	25.1	2835	25.1	283	27.2	4274	25.2
WEST TOTAL	2992	64.9	7341	64.9	610	58.5	10943	64.5
MAKURUDI	150	3.3	368	3.3	42	4.0	560	3.3
CALABAR	144	3.1	354	3.1	46	4.4	544	3.2
OGOJA	71	1.5	174	1.5	26	2.5	271	1.6
ENUGU	177	3.8	435	3.8	50	4.8	662	3.9
UMUAHIA	142	3.1	347	3.1	50	4.8	539	3.2
P. HARCOURT	231	5.0	569	5.0	35	3.4	835	4.9
BENIN CITY	152	3.3	372	3.3	25	2.4	549	3.2
WARRI	201	4.4	495	4.4	18	1.7	714	4.2
SUBTOTAL	1268	27.5	3114	27.5	292	28.0	4674	27.6
MAIDUGURI	94	2.0	230	2.0	43	4.1	367	2.2
YOLA	67	1.5	164	1.4	37	3.6	268	1.6
BAUCHI	80	1.7	196	1.7	38	3.6	314	1.9
JOS	109	2.4	268	2.4	22	2.1	399	2.4
SUBTOTAL	350	7.6	858	7.6	140	13.4	1348	7.9
EAST TOTAL	1618	35.1	3972	35.1	432	41.5	6022	35.5
FED.TOTAL	4610	100.0	11313	100.0	1042	100.0	16965	100.0

Table III-7-5 Inland Origins of Exports in 2000

Center of Economic Activity (CEA)	Break Bulk		Containerized		Total	
	'000 tons	%	'000 tons	%	'000 tons	%
IBADAN	489	33.6	165	33.6	654	33.6
AKURE	216	14.8	73	14.9	289	14.8
LAGOS	54	3.7	18	3.7	72	3.7
IROLIN	13	0.9	4	0.8	17	0.9
LOCOJA	16	1.1	6	1.2	22	1.1
SUBTOTAL	788	54.1	266	54.2	1054	54.1
SOKOTO	25	1.7	9	1.8	34	1.7
MINNA	64	4.4	21	4.3	85	4.4
KANO	59	4.1	20	4.1	79	4.1
KADUNA	25	1.7	8	1.6	33	1.7
KATSINA	15	1.0	5	1.0	20	1.0
F.C.T./A.S.M.	9	0.6	3	0.6	12	0.6
SUBTOTAL	197	13.5	66	13.4	263	13.5
WEST TOTAL	985	67.7	332	67.6	1317	67.6
MAKURUDI	53	3.6	18	3.7	71	3.6
CALABAR	59	4.1	20	4.1	79	4.1
OGOJA	32	2.2	11	2.2	43	2.2
ENUGU	30	2.1	10	2.0	40	2.1
UMUAHIA	32	2.2	11	2.2	43	2.2
PORT HARCOURT	16	1.1	5	1.0	21	1.1
BENIN CITY	91	6.3	31	6.3	122	6.3
WARRI	43	3.0	14	2.9	57	2.9
SUBTOTAL	356	24.5	120	24.4	476	24.4
MAIDUGURI	21	1.4	7	1.4	28	1.4
YOLA	15	1.0	5	1.0	20	1.0
BAUCHI	21	1.4	7	1.4	28	1.4
JOS	58	4.0	20	4.1	78	4.0
SUBTOTAL	115	7.9	39	7.9	154	7.9
EAST TOTAL	471	32.3	159	32.4	630	32.4
FED. TOTAL	1456	100.0	491	100.0	1947	100.0

2) Industrial cargo

The industrial cargo volumes for the calculation are 7,595,000 tons and they are distributed using ratios in the MIT Reports as well as commercial cargo.

a. Basis for distribution

Inland distributions were calculated using indicator ratios for each CEA of either urban population, rural population, or fertilizer demand, according to the market conditions of industrial products.

① Urban population, because it reflects the extent of industrialization as well as the size of industrial products markets with great income elasticity, is taken as an indicator for the distribution of such items as steel, chemicals, motor vehicles, and soybean oil (Table III-7-6).

② Rural population, because it represents agricultural production activity, is taken as an indicator for the distribution of soybean oil cake used as animal feed or fertilizer.

Tabel III-7-6 Basis for Inland Distribution (Industrial Cargo)

	Indicator for Distribution		
	Urban Population	Rural Population	Proper Demand
Entire Federation	Steel Chemicals Motor Vehicles Other Products	Oil cake	Fertilizer
Some Parts of Federation	Flour Soybean Oil		

Note: Flour includes the associated product, bran.

b. Inland destinations

Industrial cargo, unlike commercial cargo, is divided into two groups: cargo for the entire Federation and cargo which are not distributed federation-wide.

Six items including steel, chemicals, motor vehicles, and fertilizer (see Table III-7-6) have destinations throughout the entire Federation. Because of their large production scale and the large proportion of their supply to the demand of the entire Nigeria, the market for these industrial products is not local but nation-wide. "Other products", however, constitute an exception, as this group is comprised of miscellaneous industrial products lumped together into one category, making it unfeasible to limit their destinations accurately to only certain specific parts of the Federation.

On the other hand, the destinations of flour and soybean oil, because flour milling and soybean oil processing are idnsutries oriented to local markets, are clearly limited to only certain specific parts of the Federation, varies from case to case:

c. Distribution ratios

The distribution ratio for each CEA of flour and soybean oil differs between the Lagos and East sites. These are local market-oriented industries and the main destinations are near to their plants. Therefore, all the cargoes of the Lagos site will be distributed to the south-western states (CEA: Ibadan, Akure, Lagos, Irolin, and Locoja). The north is not included in NOT's distribution area because it can be assumed that flour and soybean oil (or other vegetable oils) will be locally produced.

The East site products of flour and soybean oil will be distributed to the south-eastern states (CEA: Makurdi, Calabar, Ogoja, Enugu, Umahia, Port Harcourt, Benin City, and Warri). However, it would be unreasonable to assume a 100% distribution ratio for these cargoes because the hinterland market of the East site is smaller than that of the Lagos site. It may thus be assumed that the East site distribution ratio for the south-eastern states will be proportionate to the ratio of projected urban population in 2000 A.D. of the south-eastern states to south-western states, a distribution indicator for these products, as demonstrated below:

o Urban population in 2000 A.D. (Projected by MIT Report Phase 1)

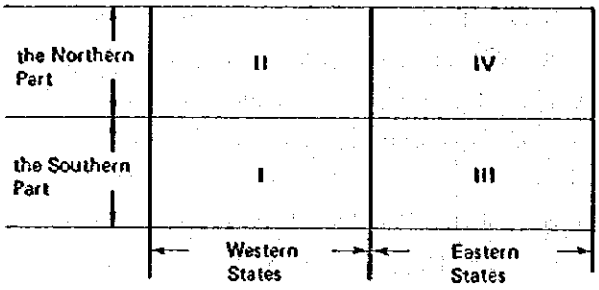
A: South-western states	26,990,700
B: South-eastern states	11,606,900

o Distribution ratio for both states:

South-eastern states	43.0% (B/A)
South-western states	57.0% (1 – B/A)

Therefore, these products are assumed to be 43% for the south-eastern states and 57% for the south-western states in the case of the East site. The north is not included in NOT's distribution area because of the same reason as the Lagos site.

Table III-7-7 shows the allocation of industrial cargo based on the above considerations. In the case of the Lagos site, 5,483,900 tons (72.2% of the total 7,595,000 tons) is allocated to the western states and 2,111,100 tons (28.8%) to the eastern states. In the case of the East site, about 5,250,000 tons (69.1%) is allocated to the western states and about 2,345,000 tons (30.9%) to the eastern states.



Centers of Economic Activity
I : Ibadan, Akure, Lagos, Ilorin, Lokoja,
II : Sokoto, Minna, Kano, Kaduna, Katsina, F.C.T./A.S.M.
III : Makurudi, Calabar, Ogoja, Enugu, Umuahia, Port Harcourt, Benin City, Warri
IV : Maiduguri, Yola, Bauchi, Jos

(2) Flour and Soybean Oil

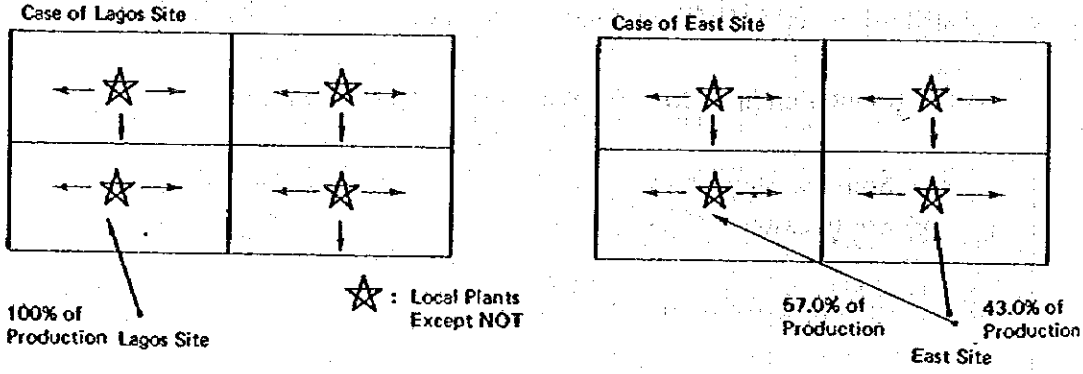


Fig. III-7-2 Physical Distribution of Local Market-Oriented Industries

Table III-7-7 Inland Destinations of Industrial Cargo in 2000 (1)

Center of Economic Activity (CEA)	Steel		Chemicals		Fertilizer		Motor Vehicles		Flour			
									Lagos site		East site	
	'000 tons	%	'000 tons	%	'000 tons	%	'000 tons	%	'000 tons	%	'000 tons	%
IBADAN	888.4	24.1	233.0	24.1	40.7	8.1	47.1	24.2	241.7	48.3	137.8	27.6
AKURE	190.2	5.2	49.9	5.2	17.7	3.5	10.1	5.2	51.8	10.4	29.5	5.9
LAGOS	602.4	16.4	158.0	16.4	0.6	0.1	31.9	16.4	163.9	32.8	93.4	18.7
IROLIN	129.4	3.5	33.9	3.5	12.8	2.6	6.9	3.5	35.2	7.0	20.1	4.0
LOCOJA	27.1	0.7	7.1	0.7	13.7	2.7	1.4	0.7	7.4	1.5	4.2	0.8
SUBTOTAL	1837.5	49.9	481.9	49.9	85.5	17.1	97.4	49.9	500.0	100.0	285.0	57.0
SOKOTO	210.9	5.7	55.3	5.7	42.0	8.4	11.2	5.7				
MINNA	60.3	1.6	15.8	1.6	31.5	6.3	3.2	1.6				
KANO	135.1	3.7	35.4	3.7	66.0	13.2	7.1	3.6				
KADUNA	67.6	1.8	17.7	1.8	28.7	5.7	3.6	1.8				
KATSINA	59.7	1.6	15.7	1.6	32.3	6.5	3.1	1.6				
F.C.T./A.S.M.	271.2	7.4	71.1	7.4			14.4	7.4				
SUBTOTAL	804.8	21.9	211.0	21.9	200.5	40.1	42.6	21.8				
WEST TOTAL	2642.3	71.8	692.9	71.8	286.0	57.2	140.0	71.8	500.0	100.0	285.0	57.0
MAKURUDI	92.0	2.5	24.1	2.5	50.8	10.2	4.9	2.5			25.0	5.0
CALABAR	76.2	2.1	20.0	2.1	6.6	1.3	4.0	2.1			20.7	4.1
OGOJA	55.7	1.5	14.6	1.5	8.5	1.7	2.9	1.5			15.2	3.0
ENUGU	167.3	4.5	43.9	4.5	11.7	2.3	8.9	4.6			45.5	9.1
UMUAHIA	80.2	2.2	21.0	2.2	11.0	2.2	4.3	2.2			21.8	4.4
PORT HARCOURT	191.4	5.2	50.2	5.2	0.1	0.0	10.1	5.2			52.1	10.4
BENIN CITY	78.8	2.1	20.7	2.1	8.8	1.8	4.2	2.2			21.5	4.3
WARRI	48.6	1.3	12.7	1.3	7.1	1.4	2.6	1.3			13.2	2.6
SUBTOTAL	790.2	21.5	207.2	21.5	104.6	20.9	41.9	21.5			215.0	43.0
MAIDUGURI	110.5	3.0	29.0	3.0	22.3	4.5	5.9	3.0				
YOLA	44.0	1.2	11.5	1.2	27.2	5.4	2.3	1.2				
BAUCHI	47.3	1.3	12.4	1.3	25.7	5.1	2.5	1.3				
JOS	45.7	1.2	12.0	1.2	34.2	6.8	2.4	1.2				
SUBTOTAL	247.5	6.7	64.9	6.7	109.4	21.9	13.1	6.7				
EAST TOTAL	1037.7	28.2	272.1	28.2	214.0	42.8	55.0	28.2			215.0	43.0
FED. TOTAL	3680.0	100.0	965.0	100.0	500.0	100.0	195.0	100.0	500.0	100.0	500.0	100.0

Table III-7-7 Inland Destinations of Industrial Cargo in 2000 (2)

Center of Economic Activity (CEA)	Soybean Oil				Oil cake		Other Products		Total			
	Lagos site		East site						Lagos site		East site	
	'000 tons	%	'000 tons	%	'000 tons	%	'000 tons	%	'000 tons	%	'000 tons	%
IBADAN	21.3	48.4	12.1	27.5	9.7	5.1	566.9	24.1	1848.8	24.3	1735.7	22.9
AKURE	4.5	10.2	2.6	5.9	6.0	3.1	78.6	5.2	408.8	5.4	384.6	5.1
LAGOS	14.4	32.7	8.2	18.6	1.3	0.7	248.8	16.4	1221.3	16.1	1144.6	15.1
IROLIN	3.1	7.0	1.8	4.1	2.1	1.1	53.5	3.5	276.9	3.6	260.5	3.4
LOCOJA	0.7	1.6	0.4	0.9	5.6	2.9	11.2	0.7	74.2	1.0	70.7	0.9
SUBTOTAL	44.0	100.0	25.1	57.0	24.7	12.9	759.0	49.9	3830.0	50.4	3596.1	47.3
SOKOTO					15.9	8.3	87.1	5.7	422.4	5.6	422.4	5.6
MINNA					5.3	2.8	24.9	1.6	141.0	1.9	141.0	1.9
KANO					25.1	13.1	55.8	3.7	324.5	4.3	324.5	4.3
KADUNA					5.2	2.7	27.9	1.8	150.7	2.0	150.7	2.0
KATSINA					11.1	5.8	24.7	1.6	146.6	1.9	146.6	1.9
F.C.T./A.S.M.							112.0	7.4	468.7	6.2	468.7	6.2
SUBTOTAL					62.6	32.8	332.4	21.9	1653.9	21.8	1653.9	21.8
WEST TOTAL	44.0	100.0	25.1	57.0	87.3	45.7	1091.4	71.8	5483.9	72.2	5250.0	69.1
MAKURUDI			2.2	5.0	10.7	5.6	38.0	2.5	220.5	2.9	247.7	3.3
CALABAR			1.8	4.1	13.0	6.8	31.5	2.1	151.3	2.0	173.8	2.3
OGOJA			1.3	3.0	6.5	3.4	25.0	1.5	111.2	1.5	127.7	1.7
ENUGU			4.0	9.1	10.1	5.3	69.1	4.5	311.0	4.1	360.5	4.7
UMUAHIA			1.9	4.3	14.4	7.5	33.1	2.2	164.0	2.2	187.7	2.5
PORT HARCOURT			4.6	10.5	2.5	1.3	79.1	5.2	333.4	4.4	390.1	5.1
BENIN CITY			1.9	4.3	4.7	2.5	32.6	2.1	149.8	2.0	173.2	2.3
WARRI			1.2	2.7	4.6	2.4	20.0	1.3	95.6	1.3	110.0	1.4
SUBTOTAL			18.9	43.0	66.5	34.8	326.4	21.5	1536.8	20.2	1770.7	23.3
MAIDUGURI					9.4	4.9	45.7	3.0	222.8	2.9	222.8	2.9
YOLA					11.1	5.8	18.1	1.2	114.2	1.5	114.2	1.5
BAUCHI					11.1	5.8	19.5	1.3	118.5	1.6	118.5	1.6
JOS					5.6	2.9	18.9	1.2	118.8	1.6	118.8	1.6
SUBTOTAL					37.2	19.5	102.2	6.7	574.3	7.6	574.3	7.6
EAST TOTAL			18.9	43.0	103.7	54.3	428.6	28.2	2111.1	27.8	2345.0	30.9
FED.TOTAL	44.0	100.0	44.0	100.0	191.0	100.0	1520.0	100.0	7595.0	100.0	7595.0	100.0

(3) Cargo Volume by Transport Mode

1) Selection of transport mode

In Nigeria the modes of domestic cargo transportation are coastal shipping, inland waterway, rail, and truck, so the selection of appropriate transportation modes is of prime importance in calculating transportation costs.

For the purpose of this study, transportation costs are calculated on the assumption that all commercial and industrial cargo will be transported by truck, inland waterway or rail. Transportation by inland waterway, however, is limited to the East site where access to the River Niger, a major trunk channel, is comparatively easy. This is based on the proposal made by the Nigerian Ports Authority that the Kwa Ibo River will be linked with the Niger via the Ougta Lake. As the transportation by coastal shipping is not wide spread, it is taken into consideration neither in this study nor in the MIT Reports."

2) Cargo volume by transport mode

As general factors in determining transport modes, the following may be noted:

- Transport distance and cost
- Transport lot, shape, character, and packing of cargo
- Conditions of such infrastructures as roads, railways, and ports
- Others: Security and time factor (degree of urgency)

In this study, preferred transport modes between NOT and CEA have been determined with consideration to transport distance, transport cost, and the conditions of infrastructures, the most fundamental and decisive of the above factors.

a. Lagos site

① Preferred mode for cargo transportation, for CEAs within about 600 km road transport of NOT:

By truck	100%
By rail	0%

② Road transport distance of over 600 km:

By truck	50%
By rail	50%

The decision to allocate to truck transport 100% of all cargo bound for destinations within a 600 km radius of NOT is based on a comparative analysis of truck and rail freight rates. Fig. III-7-3 shows the relation between transport distance and 1981 freight rates for 40-foot containers in Nigeria. The truck freight rate increases in a steep curve up to about 600 km but beyond 600 km, its increase is only slight and roughly levels off. Meanwhile, the rail freight rate increases considerably beyond 600 km, in sharp contrast to the truck freight rate. Accordingly, for shipping distances up to 600 km, the truck can compete quite adequately with railway.

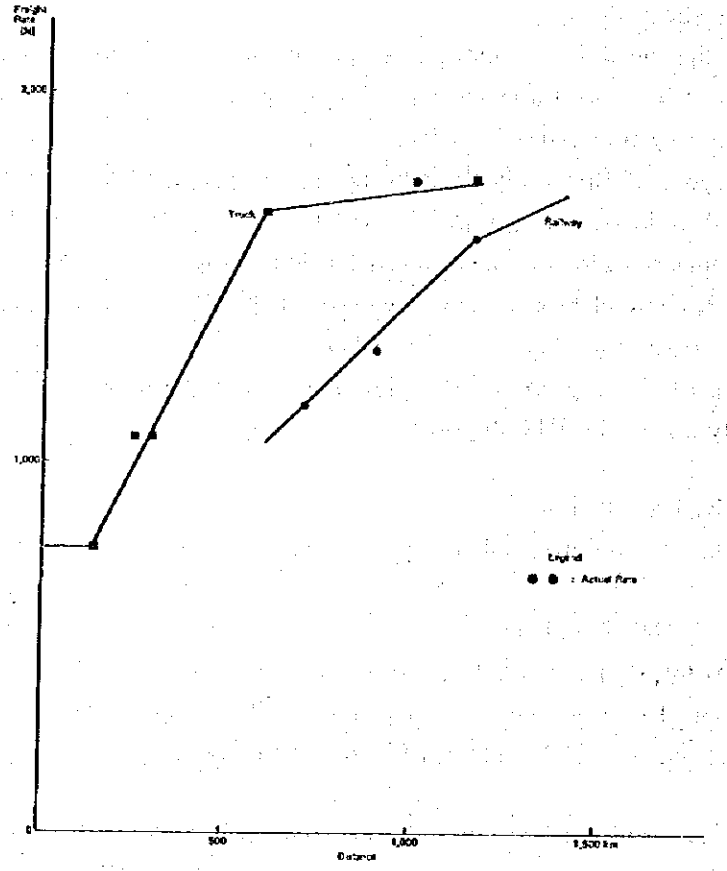


Fig. III-7-3 Railway and Truck Freight Rates for 40-Foot Container Transport in Nigeria : 1981

The following tentative computations were made regarding transportation over road distances exceeding 600 km:

Tentative computation of railway ratio in inland transportation of imported goods (based on the estimates of imports by MIT Report, Phase I)

i) Federation total of consumer goods imported in 1976 2,181,800 tons

ii) Distribution volume for CEAs more than about 600 km in road distance from Lagos Port (included in above total) 451,800 tons

iii) Rail transport ratio of above distribution volume

Case I $C_1 = 100\%$

Case II $C_2 = 50\%$

iv) Railway ratio in inland transportation of Federation total of imported consumer goods

Case I $451.8(B) \div 2,181.8(A) \times 1.00(C_1) \times 100 = 20.7(\%)$

Case II $B \div A \times 0.50(C_2) \times 100 = 10.35(\%)$

Table III-7-8 shows the actual inland transportation by rail and truck of imports routed through Lagos Port. The railway ratio was 26%–32% in the 1960s and 5%–22% in the 1970s. Comparison between the above values of tentative computation and these actual results indicates that 20.7% in Case I approximately agrees with 20.0% in 1969–70 and 10.35% in Case II is approximately, equal to 10.0% in 1972–73. Thus, the problem lies in the selection of either the Case I ratio or the Case II ratio. In this study, we attached importance to the more recent trend and the stabilized goods transportation, using 50% as the railway ratio in transportation over road distances exceeding 600 km.

Table III-7-8 Port Cargo Shipping by Mode of Inland Transportation (Lagos Port)

Year	Import					Export				
	Cargo Volume Handled 1000 tons	Railway		Road		Cargo Volume Handled 1000 tons	Railway		Road	
		'000 tons	%	'000 tons	%		'000 tons	%	'000 tons	%
1966–67	875	208	26	604	74	1,079	516	49	545	51
1967–68	1,020	299	32	646	68	1,409	604	44	783	56
1968–69	934	228	28	599	72	1,480	717	49	759	51
1969–70	1,190	229	22	806	78	1,283	510	40	762	60
1970–71	1,926	238	15	1,350	85	1,130	368	32	787	68
1971–72	2,308	260	11	1,956	89	806	118	15	661	85
1972–73	1,998	191	10	1,710	90	729	138	19	593	81
1973–74	2,091	228	11	1,938	85	808	120	17	600	83
1974–75	2,391	111	5	2,159	95	386	11	3	344	97
1975–76	2,970	204	8	2,465	92	382	10	3	292	97

Source: Statistics Division Development Department NPA.

b. East site

Transport modes of the East site include inland waterway in addition to truck and rail. In this study, it is assumed that inland waterway will be used for only certain CEAs situated along the Niger and Benue rivers, and those within about 100 km from a river port.

Transport by inland waterway can compete reasonably with truck and rail transport in these cases, even with the additional transshipment and inland transportation costs from the river ports to the CEAs.

It can not be assumed, however, except for exports, that the inland waterway transportation rate is 100%. This study has therefore assumed that 50% of imports and industrial cargo will be transported by inland waterway because of the assurance of stablized goods transportation.

It is assumed that the following cargoes will be transported by truck or by rail because they are not fit for inland waterway transport:

Commercial cargo: container
Industrial cargo : motor vehicle, flour, and bran

Accordingly commercial cargoes such as break bulk and grain, as well as steel, chemicals, fertilizer, soybean oil, oil cake, and other products will be transported by inland waterway.

Estimated transport ratios for truck and rail are based on the assumed same principles as those for the Lagos site. Below are the East site transport ratios of cargoes by mode.

① Prefered mode of cargo transportation for CEAs within about 600 km road transport of NOT:

I: Areas serviceable by inland waterway
By truck: : 50% (0% for exports)
By inland waterway : : 50% (100% for exports)

II: Other areas
By truck 100%

② Road transport distance of over about 600 km

I: Areas serviceable by inland waterway
By truck : 25% (0% for exports)
By inland waterway : 50% (100% for exports)
By rail : 25% (0% for exports)

Fig. III-7-4 shows transportation areas by truck, inland water way, and rail for the Lagos and East sites based on the above considerations.

Table III-7-9 shows the results of calculation of cargo volumes by transport mode. The transport ratios of truck and rail in the total cargo volume are 85.2% and 14.8%, respectively, for the Lagos site. The East site transport ratios of truck, inland waterway, and rail are 60.3%, 6.8%, 32.9%, respectively. In the case of the Lagos site, the ratio of truck transportation is high because the distribution volume in the western state, particularly the southern states to which Lagos and Ibadan are central is, as a whole, large. In the case of the East site, the ratio of rail transportation is high because the long-distance transportation volume is larger than in the case of the Lagos site. (Calculation results by cargo type and CEA are shown in Table III-7-10 to III-7-14)

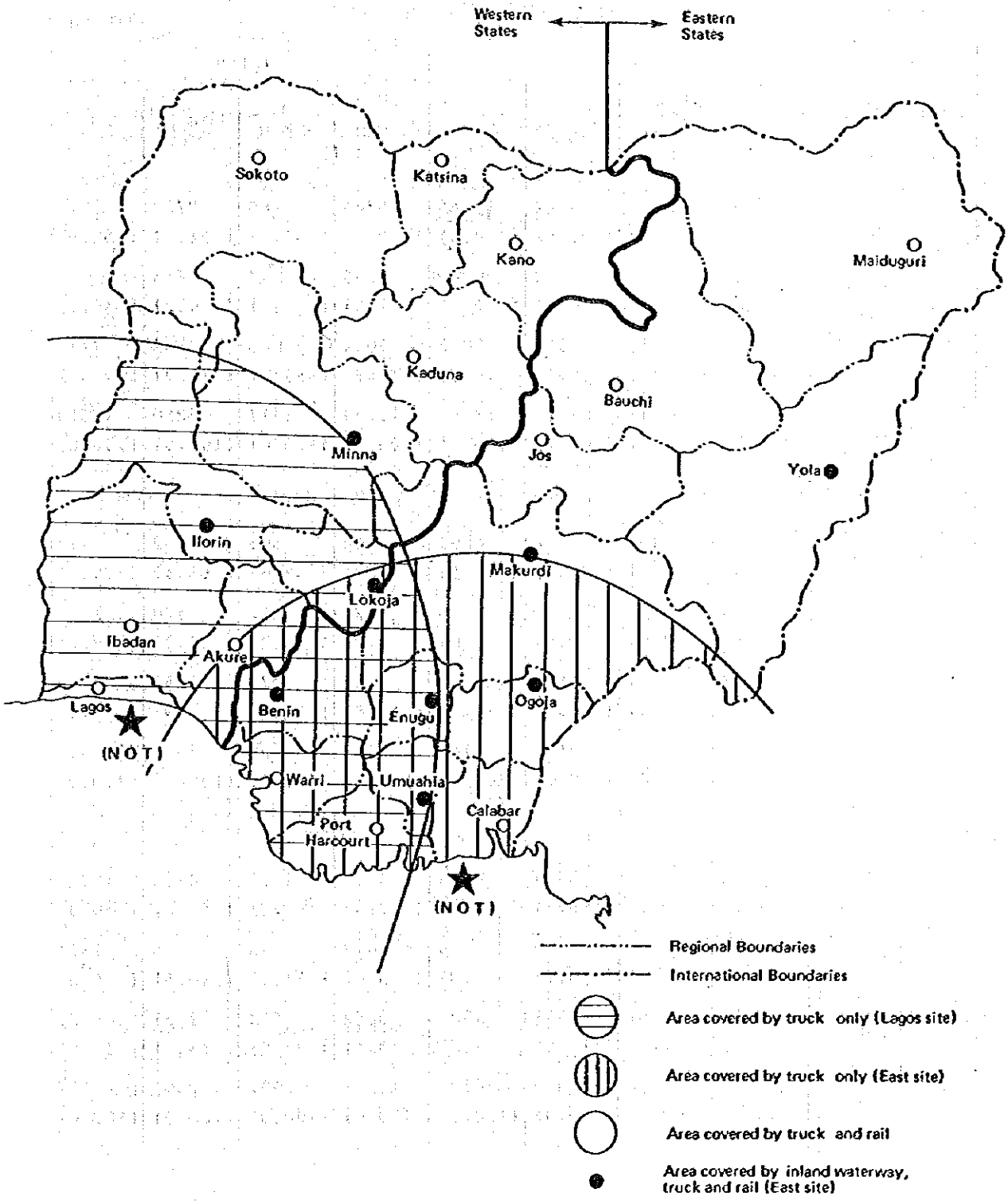


Fig. III-7-4 Transportation Areas by Truck and Rail (For calculation of transportation cost)

Table III-7-9 Cargo Volume by Transport Mode in 2000

('000 tons)

Destination or Origin	Transport Mode	Lagos site				East site			
		Commercial Cargo		Industrial Cargo	Total	Commercial Cargo		Industrial Cargo	Total
		Imports	Exports			Imports	Exports		
West	Truck	9691	1234	4962	15886	5785	760	2727	9271
		(88.6)	(93.7)	(90.5)	(89.5)	(52.9)	(57.7)	(51.9)	(52.9)
	Inland waterway	0	0	0	0	155	93	218	466
		(0.0)	(0.0)	(0.0)	(0.0)	(1.4)	(7.1)	(4.2)	(2.7)
	Rail	1253	83	522	1858	5004	465	2305	7773
		(11.4)	(6.3)	(9.5)	(10.5)	(45.7)	(35.3)	(43.9)	(44.4)
	Subtotal	10943	1317	5484	17744	10943	1317	5250	17510
		(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)
East	Truck	4661	457	1582	6699	4880	308	1532	6719
		(77.4)	(72.5)	(75.0)	(76.5)	(81.0)	(48.8)	(65.3)	(74.7)
	Inland waterway	0	0	0	0	495	253	580	1327
		(0.0)	(0.0)	(0.0)	(0.0)	(8.2)	(40.2)	(24.7)	(14.8)
	Rail	1362	174	529	2064	648	70	233	950
		(22.6)	(27.5)	(25.0)	(23.5)	(10.8)	(11.0)	(9.9)	(10.6)
	Subtotal	6022	630	2111	8763	6022	630	2345	8997
		(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)
Total	Truck	14351	1691	6544	22586	10664	1067	4260	15991
		(84.6)	(86.8)	(86.2)	(85.2)	(62.9)	(54.8)	(56.1)	(60.3)
	Inland waterway	0	0	0	0	649	346	798	1793
		(0.0)	(0.0)	(0.0)	(0.0)	(3.8)	(17.8)	(10.5)	(6.8)
	Rail	2614	257	1051	3921	5652	534	2537	8723
		(15.4)	(13.2)	(13.8)	(14.8)	(33.3)	(27.4)	(33.4)	(32.9)
	Subtotal	16965	1947	7595	26507	16965	1947	7595	26507
		(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

Table III-7-10 Cargo Volume by Transport Mode
1-1: Imports in 2000 (Lagos site)

('000 tons)

Center of Economic Activity (CEA)	General Cargo				Grain		Total	
	Break Bulk		Containerized					
	Truck	Rail	Truck	Rail	Truck	Rail	Truck	Rail
IBADAN	629.0		1545.0		150.0		2324.0	0.0
AKURE	176.0		430.0		43.0		649.0	0.0
LAGOS	872.0		2140.0		90.0		3102.0	0.0
IROLIN	118.0		290.0		24.0		432.0	0.0
LOCOJA	41.0		101.0		20.0		162.0	0.0
SUBTOTAL	1836.0		4506.0		327.0		6669.0	0.0
SOKOTO	97.0	97.0	237.0	237.0	36.0	36.0	370.0	370.0
MINNA	82.0		202.0		24.0		308.0	0.0
KANO	138.0	138.0	338.0	338.0	44.0	44.0	520.0	520.0
KADUNA	50.0	50.0	123.0	123.0	10.5	10.5	183.5	183.5
KATSINA	46.0	46.0	113.5	113.5	19.5	19.5	179.0	179.0
F.C.T./A.S.M.	412.0		1010.0		39.0		1461.0	0.0
SUBTOTAL	825.0	331.0	2023.5	811.5	173.0	110.0	3021.5	1252.5
WEST TOTAL	2661.0	331.0	6529.5	811.5	500.0	110.0	9690.5	1252.5
MAKURUDI	75.0	75.0	184.0	184.0	21.0	21.0	280.0	280.0
CALABAR	72.0	72.0	177.0	177.0	23.0	23.0	272.0	272.0
OGOJA	35.5	35.5	87.0	87.0	13.0	13.0	135.5	135.5
ENUGU	177.0		435.0		50.0		662.0	0.0
UMUAHIA	142.0		347.0		50.0		539.0	0.0
P. HARCOURT	231.0		569.0		35.0		835.0	0.0
BENIN CITY	152.0		372.0		25.0		549.0	0.0
WARRI	201.0		495.0		18.0		714.0	0.0
SUBTOTAL	1085.5	182.5	2666.0	448.0	235.0	57.0	3986.5	687.5
MAIDUGURI	47.0	47.0	115.0	115.0	21.5	21.5	183.5	183.5
YOLA	33.5	33.5	82.0	82.0	18.5	18.5	134.0	134.0
BAUCHI	40.0	40.0	98.0	98.0	19.0	19.0	157.0	157.0
JOS	54.5	54.5	134.0	134.0	11.0	11.0	199.5	199.5
SUBTOTAL	175.0	175.0	429.0	429.0	70.0	70.0	674.0	674.0
EAST TOTAL	1260.5	357.5	3095.0	877.0	305.0	127.0	4660.5	1361.5
FED. TOTAL	3921.5	688.5	9624.5	1688.5	805.0	237.0	14351.0	2614.0

Table III-7-11 Cargo Volume by Transport Mode
1-2: Imports in 2000 (East site)

(tons)

Center of Economic Activity (CEA)	General Cargo					Grain			Total			
	Break Bulk			Containerized								
	Truck	Inland waterway	Rail	Truck	Rail	Truck	Inland waterway	Inland-waterway	Truck	Inland waterway	Rail	Total
IBADAN	314500		314500	772500	772500	75000		75000	1162000	0	1162000	2324000
AKURE	176000			430000		43000			649000	0	0	649000
LAGOS	436000		436000	1070000	1070000	45000		45000	1551000	0	1551000	3102000
IROLIN	29500	59000	29500	145000	145000	6000	12000	6000	180500	71000	180500	432000
LOCOJA	20500	20500		101000		10000	10000		131500	30500	0	162000
SUBTOTAL	976500	79500	780000	2518500	1987500	179000	22000	126000	3674000	101500	2893500	6669000
SOKOTO	97000		97000	237000	237000	36000		36000	370000	0	370000	740000
MINNA	20500	41000	20500	101000	101000	6000	12000	6000	127500	53000	127500	308000
KANO	138000		138000	338000	338000	44000		44000	520000	0	520000	1040000
KADUNA	50000		50000	123000	123000	10500		10500	183500	0	183500	367000
KATSINA	46000		46000	113500	113500	19500		19500	179000	0	179000	358000
F.C.T./A.S.M.	206000		206000	505000	505000	19500		19500	730500	0	730500	1461000
SUBTOTAL	557500	41000	557500	1417500	1417500	135500	12000	135500	2110500	53000	2110500	4274000
WEST TOTAL	1534000	120500	1337500	3936000	3405000	314500	34000	261500	5784500	154500	5004000	10943000
MAKURUDI	75000	75000		368000		21000	21000		464000	96000	0	560000
CALABAR	144000			354000		46000			544000	0	0	544000
OGOJA	35500	35500		174000		13000	13000		222500	48500	0	271000
ENUGU	88500	88500		435000		25000	25000		548500	113500	0	662000
UMUAHIA	71000	71000		347000		25000	25000		443000	96000	0	539000
PORT HARCOURT	231000			569000		35000			335000	0	0	835000
BENIN CITY	76000	76000		372000		12500	12500		460500	88500	0	549000
WARRI	201000			495000		18000			714000	0	0	714000
SUBTOTAL	922000	346000		3114000		195500	96500		4231500	442500	0	4674000
MAIDUGURI	47000		47000	115000	115000	21500		21500	183500	0	183500	367000
YOLA	16750	33500	16750	82000	82000	9250	18500	9250	108000	52000	108000	268000
BAUCHI	40000		40000	98000	98000	19000		19000	157000	0	157000	314000
JOS	54500		54500	134000	134000	11000		11000	199500	0	199500	399000
SUBTOTAL	158250	33500	158250	429000	429000	60750	18500	60750	648000	52000	648000	1348000
EAST TOTAL	1080250	379500	158250	3543000	429000	256250	115000	60750	4879500	494500	648000	6022000
FED. TOTAL	2614250	500000	1495750	7479000	3834000	570750	149000	322250	10664000	649000	5652000	16965000

Table III-7-12 Cargo Volume by Transport Mode
2: Exports in 2000 (Lagos site and East site)

(tons)

Center of Economic Activity (CEA)	Lagos site				East site								Total
	Break Bulk		Containerized		Break Bulk			Containerized		Total			
	Truck	Rail	Truck	Rail	Truck	Inland waterway	Rail	Truck	Rail	Truck	Inland waterway	Rail	
IBADAN	489000		165000		244500		244500	82500	82500	327000	0	327000	654000
AKURE	216000		73000		216000			73000		289000	0	0	289000
LAGOS	54000		18000		27000		27000	9000	9000	36000	0	36000	72000
IROLIN	13000		4000			13000		2000	2000	2000	13000	2000	17000
LOCOJA	16000		6000			16000		6000		6000	16000	0	22000
SUBTOTAL	788000		266000		487500	29000	271500	172500	93500	660000	29000	365000	1054000
SOKOTO	12500	12500	4500	4500	12500		12500	4500	4500	17000	0	17000	34000
MINNA	64000		21000			64000		10500	10500	10500	64000	10500	85000
KANO	29500	29500	10000	10000	29500		29500	10000	10000	39500	0	39500	79000
KADUNA	12500	12500	4000	4000	12500		12500	4000	4000	16500	0	16500	33000
KATSINA	7500	7500	2500	2500	7500		7500	2500	2500	10000	0	10000	20000
F.C.T./A.S.M.	9000		3000		4500		4500	1500	1500	6000	0	6000	12000
SUBTOTAL	135000	62000	45000	21000	66500	64000	66500	33000	33000	99500	64000	99500	263000
WEST TOTAL	923000	62000	311000	21000	554000	93000	338000	205500	126500	759500	93000	464500	1317000
MAKURUDI	26500	26500	9000	9000		53000		18000		18000	53000	0	71000
CALABAR	29500	29500	10000	10000	59000			20000		79000	0	0	79000
OGOJA	16000	16000	5500	5500		32000		11000		11000	32000	0	43000
ENUGU	30000		10000			30000		10000		10000	30000	0	40000
UMUAHIA	32000		11000			32000		11000		11000	32000	0	43000
PORT HARCOURT	16000		5000		16000			5000		21000	0	0	21000
BENIN CITY	91000		31000			91000		31000		31000	91000	0	122000
WARRI	43000		14000		43000			14000		57000	0	0	57000
SUBTOTAL	284000	72000	95500	24500	118000	238000		120000		238000	238000	0	476000
MAIDUGURI	10500	10500	3500	3500	10500		10500	3500	3500	14000	0	14000	28000
YOLA	7500	7500	2500	2500		15000		2500	2500	2500	15000	2500	20000
BAUCHI	10500	10500	3500	3500	10500		10500	3500	3500	14000	0	14000	28000
JOS	29000	29000	10000	10000	29000		29000	10000	10000	39000	0	39000	78000
SUBTOTAL	57500	57500	19500	19500	50000	15000	50000	19500	19500	69500	15000	69500	154000
EAST TOTAL	341500	129500	115000	44000	168000	253000	50000	139500	19500	307500	253000	69500	630000
FED.TOTAL	1264500	191500	426000	65000	722000	346000	388000	345000	146000	1067000	346000	534000	1947000

Table III-7-13 Cargo Volume by Transport Mode

3--1: Industrial Cargo in 2000 (Lagos site)

(tons)

Center of Economic Activity (CEA)	Steel, Chemicals, Flour and Bran, Oil cake		Petroleum Products Fertilizer		Motor Vehicles, Soybean Oil, Other Products	
	Truck	Rail	Truck	Rail	Truck	Rail
IBADAN	1372800		40700		435300	
AKURE	297900		17700		93200	
LAGOS	925600		600		295100	
IROLIN	200600		12800		63500	
LOCOJA	47200		13700		13300	
SUBTOTAL	2844100		85500		900400	
SOKOTO	141050	141050	21000	21000	49150	49150
MINNA	81400		31500		28100	
KANO	97800	97800	33000	33000	31450	31450
KADUNA	45250	45250	14350	14350	15750	15750
KATSINA	43250	43250	16150	16150	13900	13900
F.C.T./A.S.M.	342300				126400	
SUBTOTAL	751050	327350	116000	84500	264750	110250
WEST TOTAL	3595150	327350	201500	84500	1165150	110250
MAKURUDI	63400	63400	25400	25400	21450	21450
CALABAR	54600	54600	3300	3300	17750	17750
OGOJA	38400	38400	4250	4250	12950	12950
ENUGU	221300		11700		78000	
UMUAHIA	115600		11000		37400	
PORT HARCOURT	244100		100		89200	
BENIN CITY	104200		8800		36800	
WARRI	65900		7100		22600	
SUBTOTAL	907500	156400	71650	32950	316150	52150
MAIDUGURI	74450	74450	11150	11150	25800	25800
YOLA	33300	33300	13600	13600	10200	10200
BAUCHI	35400	35400	12850	12850	11000	11000
JOS	31650	31650	17100	17100	10650	10650
SUBTOTAL	174800	174800	54700	54700	57650	57650
EAST TOTAL	1082300	331200	126350	87650	373800	109800
FED.TOTAL	4677450	658550	327850	172150	1538950	220050

Note: Industrial cargo is grouped according to rail tariff rate classifications.

Table III-7-14 Cargo Volume by Transport Mode
3–2: Industrial Cargo in 2000 (East site)

(tons)

Center of Economic Activity (CEA)	Steel, Chemicals, Flour and Bran, Oil cake			Fertilizer			Motor Vehicles, Soybean Oil, Other Products			Total			
	Truck	Inland waterway	Rail	Truck	Inland waterway	Rail	Truck	Inland waterway	Rail	Truck	Inland waterway	Rail	Total
IBADAN	634450		634450	20350		20350	213050		213050	867850	0	867850	1735700
AKURE	275600			17700			91300			384600	0	0	384600
LAGOS	427550		427550	300		300	144450		144450	572300	0	572300	1144600
IROLIN	51400	82700	51400	3200	6400	3200	17275	27650	17275	71875	116750	71875	260500
LOCOJA	24100	19900		6850	6850		7200	5800		38150	32550	0	70700
SUBTOTAL	1413100	102600	1113400	48400	13250	23850	473275	33450	374775	1934775	149300	1512025	3596100
SOKOTO	141050		141050	21000		21000	49150		49150	211200	0	211200	422400
MINNA	20350	40700	20350	7875	15750	7875	7825	12450	7825	36050	68900	36050	141000
KANO	97800		97800	33000		33000	31450		31450	162250	0	162250	324500
KADUNA	45250		45250	14350		14350	15750		15750	75350	0	75350	150700
KATSINA	43250		43250	16150		16150	13900		13900	73300	0	73300	146600
F.C.T./A.S.M.	171150		171150				63200		63200	234350	0	234350	468700
SUBTOTAL	518850	40700	518850	92375	15750	92375	181275	12450	181275	792500	68900	792500	1653900
WEST TOTAL	1931950	143300	1632250	140775	29000	116225	654550	45900	556050	2727275	218200	2304525	5250000
MAKURUDI	88400	63400		25400	25400		25000	20100		138800	108900	0	247700
CALABAR	129900			6600			37300			173800	0	0	173800
OGOJA	53600	38400		4250	4250		15050	12150		72900	54800	0	127700
ENUGU	156150	110650		5850	5850		45450	36550		207450	153050	0	360500
UMUAHIA	79600	57800		5500	5500		21800	17500		106900	80300	0	187700
PORT HARCOURT	296200			100			93800			590100	0	0	390100
BENIN CITY	73600	52100		4400	4400		21450	17250		99450	73750	0	173200
WARRI	79100			7100			23800			110000	0	0	110000
SUBTOTAL	956550	322350		59200	45400		283650	103550		1299400	471300	0	1770700
MAIDUGURI	37225	74450	37225	5575	11150	5575	14375	22850	14375	57175	108450	57175	222800
YOLA	33300		33300	13600		13600	10200		10200	57100	0	57100	114200
BAUCHI	35400		35400	12850		12850	11000		11000	59250	0	59250	118500
JOS	31650		31650	17100		17100	10650		10650	59400	0	59400	118800
SUBTOTAL	137575	74450	137575	49125	11150	49125	46225	22850	46225	232925	108450	232925	574300
EAST TOTAL	1094125	396800	137575	108325	56550	49125	329875	126400	46225	1532325	579750	232925	2345000
FED.TOTAL	3026075	540100	1769825	249100	85550	165350	984425	172300	602275	4259600	797950	2537450	7595000

(4) Estimation of Freight Rates

In calculating transportation cost, road, inland waterway, and rail transport distances between NOT and each CEA were measured and feight rates for these distances estimated.

1) Map measurements were taken of transport distances in accordance with existing and proposed networks of roads, inland waterways, and railways.

2) Freight rates by transport distance were estimated by the correlations between current (1981) freight rates for transportation between major cities and map-measured transporting distances. These freight rates were obtained from a private truck transport company and the Nigerian Railway Corporation. Inland waterway freight rates are estimated under the assumption of their successive diminution as transport distances increase, based on the fully owned by K2.8 ton.km, proposed freight rate of the Central Water Transport Company (the Federal Government).

3) The following were used as freight rates by cargo type:

a. Truck freight rates

Containerized cargoes: Freight rates for 40-foot containers.
Average per-container load of 26 tons was assumed based on Japanese figures.

Other cargo: Per-ton freight rates by 25-ton general cargo truck; data by commodity type not available.

b. Inland waterway freight rates.

Freight rates by cargo type are not available, so same rates have been assumed for all cargo types.

c. Rail freight rates

Containerized cargo: Freight rates for 40 foot containers
*As above, average load was set of 26 tons.

Other cargo: Freight rates were estimated by the three groups into which "other cargo" are divided, according to available data and by similarity of shape, character, etc. of cargo.

A group : Per-ton freight rates for electrical appliances and machinery. These rates are also used for the following cargo:
Commercial cargo (Break bulk)
Industrial cargo (Motor vehicles, soybean oil, and other products)

B group : Per-ton freight rates for rice, wheat, flour, iron and steel. Same rates are presently in use for such cargo in Nigeria and are also applied to the following:
Commercial cargo (Grain)
Industrial cargo (Steel, chemicals, flour and soybean oil cake)

C group : Fertilizer. Rates apply to.

Estimated freight rates based on the above for transportation between the Lagos or the East site and each CEA are shown in Table III-7-15 and III-7-16.

Table III-7-15 Transport Distance and Freight Rates (Lagos site)

Center of Eco. Activity	Distance (km)		Rates (₦/ton, container ₦/unit (26 tons))					
			Truck		Rail			
	Truck	Rail	General	Container	A group	B group	C group	Container
IBADAN	108		25	770				
AKURE	244		32	980				
LAGOS	50		25	770				
IROLIN	270		34	1030				
LOCOJA	475		48	1440				
SUBTOTAL								
SOKOTO	977	1568	64	1730	52	36	29	1805
MINNA	647		59	1685				
KANO	1072	1359	66	1740	47	33	26	1700
KADUNA	811	1089	62	1705	40	28	22	1530
KATSINA	1245	1521	69	1760	51	35	26	1780
F.C.T./A.S.M.	649		59	1685				
SUBTOTAL								
WEST TOTAL								
MAKURUDI		801	60	1695	33	24	18	1240
CALABAR		1130	60	1695	41	29	23	1570
OGOJA	726	883	60	1695	36	26	20	1465
ENUGU	507		51	1490				
UMUAHIA	517		52	1520				
PORT HARCOURT	524		52	1540				
BENIN CITY	260		33	1010				
WARRI	350		40	1190				
SUBTOTAL								
MAIDUGURI	1555	1741	74	1800	57	39	31	1885
YOLA	1263	1250	68	1765	44	31	25	1645
BAUCHI	1060	1298	70	1735	46	32	25	1670
JOS	938	1160	65	1725	42	29	23	1600
SUBTOTAL								
EAST TOTAL								
FED. TOTAL								

Note: Railway freight rates
A group: Commercial cargo (Break Bulk), Industrial cargo (Motor vehicles, Soybean oil and other products)
B group: Commercial cargo (Grain), Industrial cargo (Steel, Chemicals, flour and oil cake of soybean)
C group: Fertilizer, Petroleum products

Table III-7-16 Transport Distance and Freight Rates (East site)

Center of Economic Activity (CEA)	Distance (km)			Rate (₦/ton, container ₦/unit (26 tons))						
	Truck	Inland waterway	Rail	Truck		Inland waterway	Rail			
				General	Container		A group	B group	C group	Container
IBADAN	675		907	59	1690		36	26	20	1345
AKURE	557			55	1600					
LAGOS	707		1137	60	1695		42	29	23	1575
IROLIN	746	875	1092	60	1700	19	40	28	22	1530
LOCOJA	553	550		54	1590	14				
SUBTOTAL										
SOKOTO	1383		1423	71	1770		49	34	27	1730
MINNA	852	650	887	62	1710	16	36	26	20	1465
KANO	1158		1214	67	1750		44	30	24	1630
KADUNA	897		944	63	1710		37	27	21	1385
KATSINA	1331		1376	70	1770		48	33	26	1710
F.C.T./A.S.M.	727		798	60	1695		33	24	18	1240
SUBTOTAL										
WEST TOTAL										
MAKURUDI	536	775		53	1550	17				
CALABAR	185			28	855					
OGOJA	439	300		46	1370	9				
ENUGU	270	345		34	1030	10				
UMUAHIA	145	170		25	780	6				
PORT HARCOURT	123			25	770					
BENIN CITY	387	345		43	1065	10				
WARRI	297			36	1070					
SUBTOTAL										
MAIDUGURI	1220		1454	68	1755		50	35	28	1750
YOLA	961	1325	963	54	1725	25	37	27	21	1405
BAUCHI	994		1011	64	1730		38	27	21	1450
JOS	872		873	62	1715		35	25	19	1315
SUBTOTAL										
EAST TOTAL										
FED. TOTAL										

(5) Comparison of Transportation Cost

Table III-7-17 shows the results of cost calculation for the Lagos and East sites based on the above assumptions and considerations. (Results by cargo type and by CEA are shown in Tables III-7-18 to III-7-23).

1) Lagos site costs

Total annual transportation cost is approximately ₦1,087 million, breaking down to about ₦895 million (82.3%) by truck and about ₦192 million (17.7%) by rail. The average per-ton freight rate is ₦41.0 total; ₦39.6 for truck and ₦49.0 for rail.

2) East site costs

Total annual transportation cost is approximately ₦1,274 million, breaking down to about ₦854 million (67.1%) by truck about ₦22 million (1.7%) by inland water way, and about ₦398 million (31.2%) by rail. The average per-ton freight rate is ₦48.1, total; ₦53.4 for truck, ₦12.2 for inland waterway, and ₦45.6 for rail.

3) Cost comparison between sites

The annual total transportation cost is about ₦187 million (17.2%) higher and the average per-ton freight rate is ₦7.1 higher for the East site than for the Lagos site. This result reflects the following factors affecting transportation cost:

a. Regional composition of distribution volume

The cargo distribution volume to the western states is large, reflecting the scale of economic activity of these states, and even in the case of the East site represent 66.1% of the total. (see Table III-7-9)

Percent of total volume distributed to western states	East site	66.6%
	Lagos site	66.9%

b. Comparatively large volume in long-distance transport

Due to the above factor and the site position, the long-distance transport volume of the East site is larger than that of the Lagos site. Higher transportation costs may be attributed largely to this factor.

c. Relation between rail and truck freight rates and the detour of rail transportation.

The total rail transport volume for the East site is about 8.7 million tons, or about 2.2 times the 3.9 million ton figure for the Lagos site, because of the proportionately high long-distance transport volume.

The East site truck transportation cost is about ₦41 million less than that of the Lagos site while the rail transportation cost is about ₦206 million more than that of the Lagos site. As a result, total transportation cost for the East site is higher by ₦187 million including inland waterway transportation cost. This cost increase is due in part to the higher rail volume, but is also affected by the detouring involved in rail transportation.

Table III-7-17 Inland Transportation Cost for All Cargoes

Type of Cargo	Transport Mode	A: Lagos site			B: East site			Cost Balance (B – A) (N '000)
		(a) Cargo Volume (tons)	(b) Cost (N '000)	b/a (N)	(a) Cargo Volume (tons)	(b) Cost (N '000)	b/a (N)	
Commercial cargo (Imports)	Truck	14351000	571902	39.9	10664000	572035	53.6	133
		(84.6)	(79.8)		(62.9)	(65.9)		
	Inland waterway	0	0	0.0	649000	8589	13.2	8589
		(0.0)	(0.0)		(3.8)	(1.0)		
	Rail	2614000	144430	55.3	5652000	287417	50.9	142987
		(15.4)	(20.2)		(33.3)	(33.1)		
	Subtotal	16965000	716332	42.2	16965000	868041	51.2	151709
		(100.0)	(100.0)		(100.0)	(100.0)		
Commercial cargo (Exports)	Truck	1690500	64900	38.4	1067000	58625	54.9	-6275
		(86.8)	(84.2)		(54.8)	(68.3)		
	Inland waterway	0	0	0.0	346000	4461	12.9	4461
		(0.0)	(0.0)		(17.8)	(5.2)		
	Rail	256500	12178	47.5	534000	22725	42.6	10547
		(13.2)	(15.8)		(27.4)	(26.5)		
	Subtotal	1947000	77078	39.6	1947000	85811	44.1	8733
		(100.0)	(100.0)		(100.0)	(100.0)		
Industrial Cargo	Truck	6544250	257859	39.4	4259525	223414	52.5	-34445
		(86.2)	(87.9)		(56.1)	(69.8)		
	Inland waterway	0	0	0.0	797950	8874	11.1	8874
		(0.0)	(0.0)		(10.5)	(2.8)		
	Rail	1050750	35545	33.8	2537375	87617	34.5	52072
		(13.8)	(12.1)		(33.4)	(27.4)		
	Subtotal	7595000	293404	38.6	7595000	319905	42.1	26501
		(100.0)	(100.0)		(100.0)	(100.0)		
Total	Truck	22585750	894661	39.6	15990525	854074	53.4	-40587
		(85.2)	(82.3)		(60.3)	(67.1)		
	Inland waterway	0	0	0.0	1793100	21924	12.2	21924
		(0.0)	(0.0)		(6.8)	(1.7)		
	Rail	3921250	192153	49.0	8723375	397759	45.6	205606
		(14.8)	(17.7)		(32.9)	(31.2)		
	Subtotal	26507000	1086814	41.0	26507000	1273757	48.1	186943
		(100.0)	(100.0)		(100.0)	(100.0)		

Rail rates are lower than truck rates over similar distances, but under the present Nigerian system, the gap between rail rates and truck rates narrows with increasing transporting distances. The following are examples of sections where railway and truck transporting distances are nearly the same (see Table III-7-16).

Per-ton freight rates for general cargo

		A: Rail	B: Truck	A/B
East site ——► Jos	Distance (km)	873	872	–
	Rate (₦)	35	62	56.5 (%)
East site ——► Yola	Distance (km)	963	961	–
	Rate (₦)	37	64	57.8 (%)
East site ——► Katsina	Distance (km)	1,376	1,331	–
	Rate (₦)	48	70	68.6 (%)

d. Per-ton freight rates for general cargo

Were it not for the declining economic advantage of the railway to the truck with increasing transporting distances, transportation costs for the East site would not have exceeded those of the Lagos site so dramatically.

The detours involved in rail transportation constitute another factor in the relative increase of transportation cost. Since railway transportation must move from station to station, transport distance by rail between the same two points is often longer than transport distance by truck. The section between the East site and Ibadan, for example is fully 907 km by rail – 232 km longer than the 675 km figure by truck. The longer transporting distance due to this detour results in the relative increase of railway freight rate. This contributes somewhat to the higher transportation costs of the East site, which has 2.2 times the rail transport volume of the Lagos site.

The most significant contributing factor in the higher transportation costs of NOT-east is the great volume of long-distance shipping demanded by the concentration of Nigeria's economic activity in the western states – particularly the southern states to which Lagos and Ibadan are central. As known from the result of transportation cost calculation, the cost difference between the Lagos and East sites cannot be reconciled, even with extensive use of comparatively economical transport mode such as rail and inland waterways. The higher transportation cost which averages ₦7.1 per cargo/ton, will probably be offset, mainly by rises in commodity prices or decreases in value added, but consitutes at any rate a loss from the stand point of national economy.

Table III-7-18 Inland Transportation Cost for Imports (Lagos site)

Center of Economic Activity (CEA)	Cargo Volume						Transportation Cost					
	Truck		Rail		Total		Truck		Rail		Total	
	tons	%	tons	%	tons	%	N'000	%	N'000	%	N'000	%
IBADAN	2324000	16.2	0	0.0	2324000	13.7	65231	11.4	0	0.0	65231	9.1
AKURE	649000	4.5	0	0.0	649000	3.8	23216	4.1	0	0.0	23216	3.2
LAGOS	3102000	21.6	0	0.0	3102000	18.3	87427	15.3	0	0.0	87427	12.2
IROLIN	432000	3.0	0	0.0	432000	2.5	16316	2.9	0	0.0	16316	2.3
LOCOJA	162000	1.1	0	0.0	162000	1.0	8522	1.5	0	0.0	8522	1.2
SUBTOTAL	6669000	46.5	0	0.0	6669000	39.3	122012	21.3	0	0.0	122012	17.0
SOKOTO	370000	2.6	370000	14.2	740000	4.4	24282	4.2	22793	15.8	47075	6.6
MINNA	308000	2.1	0	0.0	308000	1.8	19345	3.4	0	0.0	19345	2.7
KANO	520000	3.6	520000	19.9	1040000	6.1	34632	6.1	30038	20.8	64670	9.0
KADUNA	183500	1.3	183500	7.0	367000	2.2	11817	2.1	9532	6.6	21349	3.0
KATSINA	179000	1.2	179000	6.8	358000	2.1	12203	2.1	10799	7.5	23002	3.2
F.C.T./A.S.M.	1461000	10.2	0	0.0	1461000	8.6	92065	16.1	0	0.0	92065	12.9
SUBTOTAL	3021500	21.1	1252500	47.9	4274000	25.2	194344	34.0	73162	50.7	267506	37.3
WEST TOTAL	9690500	67.5	1252500	47.9	10943000	64.5	316356	55.3	73162	50.7	389518	54.4
MAKURUODI	280000	2.0	280000	10.7	560000	3.3	17755	3.1	11754	8.1	29509	4.1
CALABAR	272000	1.9	272000	10.4	544000	3.2	17239	3.0	14307	9.9	31546	4.4
OGOJA	135500	0.9	135500	5.2	271000	1.6	8582	1.5	6518	4.5	15100	2.1
ENUGU	662000	4.6	0	0.0	662000	3.9	36506	6.4	0	0.0	36506	5.1
UMUAHIA	539000	3.8	0	0.0	539000	3.2	30270	5.3	0	0.0	30270	4.2
PORT HARCOURT	835000	5.8	0	0.0	835000	4.9	47534	8.3	0	0.0	47534	6.6
BENIN CITY	549000	3.8	0	0.0	549000	3.2	20292	3.5	0	0.0	20292	2.8
WARRI	714000	5.0	0	0.0	714000	4.2	31416	5.5	0	0.0	31416	4.4
SUBTOTAL	3986500	27.8	687500	26.3	4674000	27.6	209594	36.6	32579	22.6	242173	33.8
MAIDUGURI	183500	1.3	183500	7.0	367000	2.2	13031	2.3	11856	8.2	24887	3.5
YOLA	134000	0.9	134000	5.1	268000	1.6	9103	1.6	7236	5.0	16339	2.3
BAUCHI	157000	1.1	157000	6.0	314000	1.9	10670	1.9	8743	6.1	19413	2.7
JOS	199500	1.4	199500	7.6	399000	2.4	13148	2.3	10854	7.5	24002	3.4
SUBTOTAL	674000	4.7	674000	25.8	1348000	7.9	45952	8.0	38689	26.8	84641	11.8
EAST TOTAL	4660500	32.5	1361500	52.1	6022000	35.5	255546	44.7	71268	49.3	326814	45.6
FED. TOTAL	14351000	100.0	2614000	100.0	16965000	100.0	571902	100.0	144430	100.0	716332	100.0

Table III-7-19 Inland Transportation Cost for Imports (East site)

	Cargo Volume								Transportation Cost							
	Truck		Inland waterway		Rail		Total		Truck		Inland waterway		Rail		Toal	
	tons	%	tons	%	tons	%	tons	%	N'000	%	N'000	%	N'000	%	N'000	%
IBADAN	1162000	10.9			1162000	20.6	2324000	13.7	73194	12.8			53234	18.5	126428	14.6
AKURE	649000	6.1					649000	3.8	38507	6.7					38507	4.4
LAGOS	1551000	14.5			1551000	27.4	3102000	18.3	98616	17.2			84434	29.4	183050	21.1
IROLIN	180500	1.7	71000	10.9	180500	3.2	432000	2.5	11611	2.0	1349	15.7	9881	3.4	22841	2.6
LOCOJA	131500	1.2	30500	4.7			162000	1.0	7824	1.4	427	5.0			8251	1.0
SUBTOTAL	3674000	34.5	101500	15.6	2893500	51.2	6669000	39.3	229752	40.2	1776	20.7	147549	51.5	379077	43.7
SOKOTO	370000	3.5			370000	6.5	740000	4.4	25577	4.5			21747	7.6	47324	5.5
MINNA	127500	1.2	53000	8.2	127500	2.3	303000	1.8	8286	1.4	848	9.9	6585	2.3	15719	1.8
KANO	520000	4.9			520000	9.2	1040000	6.1	34944	6.1			28582	9.9	63526	7.3
KADUNA	183500	1.7			183500	3.2	367000	2.2	11902	2.1			8686	3.0	20588	2.4
KATSINA	179000	1.7			179000	3.2	358000	2.1	12312	2.2			10317	3.6	22629	2.6
F.C.T./A.S.M.	730500	6.9			730500	12.9	1461000	8.6	46452	8.1			31351	10.9	77803	9.0
SUBTOTAL	2110500	19.8	53000	8.2	2110500	37.3	4274000	25.2	139473	24.4	848	9.9	107268	37.3	247589	28.5
WEST TOTAL	5784500	54.2	154500	23.8	5004000	88.5	10943000	64.5	369225	64.5	2624	30.6	254817	88.7	626666	72.2
MAKURUDI	464000	4.4	96000	14.8			560000	3.3	27026	4.7	1632	19.0			28658	3.3
CALABAR	544000	5.1					544000	3.2	16961	3.0					16961	2.0
OGOJA	222500	2.1	48500	7.5			271000	1.6	11399	2.0	437	5.1			11836	1.4
ENUGU	548500	5.1	113500	17.5			662000	3.9	21092	3.7	1135	13.2			22227	2.6
UMUAHIA	443000	4.2	96000	14.8			539000	3.2	12810	2.2	576	6.7			13386	1.5
PORT HARCOURT	835000	7.8					835000	4.9	23501	4.1					23501	2.7
BENIN CITY	460500	4.3	88500	13.6			549000	3.2	19044	3.3	885	10.3			19929	2.3
WARRI	714000	6.7					714000	4.2	28255	4.9					28255	3.3
SUBTOTAL	4231500	39.7	442500	68.2			4674000	27.6	160088	28.0	4665	54.3			164753	19.0
MAIDUGURI	183500	1.7			183500	3.2	367000	2.2	12421	2.2			10343	3.8	23264	2.7
YOLA	108000	1.0	52000	8.0	108000	1.9	268000	1.6	7104	1.2	1300	15.1	5300	1.8	13704	1.6
BAUCHI	157000	1.5			157000	2.8	314000	1.9	10297	1.8			7498	2.6	17795	2.1
JOS	199500	1.9			199500	3.5	399000	2.4	12900	2.3			8959	3.1	21859	2.5
SUBTOTAL	648000	6.1	52000	8.0	648000	11.5	1348000	7.9	42722	7.5	1300	15.1	32600	11.3	76622	8.8
EAST TOTAL	4879500	45.8	494500	76.2	648000	11.5	6022000	35.5	202810	35.5	5965	69.4	32600	11.3	241375	27.8
FED. TOTAL	10664000	100.0	649000	100.0	5652000	100.0	16965000	100.0	572035	100.0	8589	100.0	287417	100.0	868041	100.0

Table III-7-20 Inland Transportation Cost for Exports (Lagos site)

	Cargo Volume						Transportation Cost					
	Truck		Rail		Total		Truck		Rail		Total	
	tons	%	tons	%	tons	%	N'000	%	N'000	%	N'000	%
IBADAN	654000	38.7	0	0.0	654000	33.6	17112	26.4	0	0.0	17112	22.2
AKURE	289000	17.1	0	0.0	289000	14.8	9664	14.9	0	0.0	9664	12.5
LAGOS	72000	4.3	0	0.0	72000	3.7	1883	2.9	0	0.0	1883	2.4
IROLIN	17000	1.0	0	0.0	17000	0.9	600	0.9	0	0.0	600	0.8
LOKOJA	22000	1.3	0	0.0	22000	1.1	1100	1.7	0	0.0	1100	1.4
SUBTOTAL	1054000	62.3	0	0.0	1054000	54.1	30359	46.8	0	0.0	30359	39.4
SOKOTO	17000	1.0	17000	6.6	34000	1.7	1099	1.7	962	7.9	2061	2.7
MINNA	85000	5.0	0	0.0	85000	4.4	5137	7.9	0	0.0	5137	6.7
KANO	39500	2.3	39500	15.4	79000	4.1	2616	4.0	2041	16.8	4657	6.0
KADUNA	16500	1.0	16500	6.4	33000	1.7	1037	1.6	735	6.0	1772	2.3
KATSINA	10000	0.6	10000	3.9	20000	1.0	687	1.1	554	4.5	1241	1.6
F.C.T./A.S.M.	12000	0.7	0	0.0	12000	0.6	725	1.1	0	0.0	725	0.9
SUBTOTAL	180000	10.6	83000	32.4	263000	13.5	11301	17.4	4292	35.2	15593	20.2
WEST TOTAL	1234000	73.0	83000	32.4	1317000	67.6	41660	64.2	4292	35.2	45952	59.6
MAKURUDI	35500	2.1	35500	13.8	71000	3.6	2177	3.4	1304	10.7	3481	4.5
CALABAR	39500	2.3	39500	15.4	79000	4.1	2422	3.7	1814	14.9	4236	5.5
OGOJA	21500	1.3	21500	8.4	43000	2.2	1319	2.0	886	7.3	2205	2.9
ENUGU	40000	2.4	0	0.0	40000	2.1	2103	3.2	0	0.0	2103	2.7
UMUAHIA	43000	2.5	0	0.0	43000	2.2	2307	3.6	0	0.0	2307	3.0
PORT HARCOURT	21000	1.2	0	0.0	21000	1.1	1128	1.7	0	0.0	1128	1.5
BENIN CITY	122000	7.2	0	0.0	122000	6.3	4207	6.5	0	0.0	4207	5.5
WARRI	57000	3.4	0	0.0	57000	2.9	2361	3.6	0	0.0	2361	3.1
SUBTOTAL	379500	22.4	96500	37.6	476000	24.4	18024	27.8	4004	32.9	22028	28.6
MAIDUGURI	14000	0.8	14000	5.5	28000	1.4	1019	1.6	853	7.0	1872	2.4
YOLA	10000	0.6	10000	3.9	20000	1.0	680	1.0	488	4.0	1168	1.5
BAUCHI	14000	0.8	14000	5.5	28000	1.4	969	1.5	708	5.8	1677	2.2
JOS	39000	2.3	39000	15.2	78000	4.0	2548	3.9	1833	15.1	4381	5.7
SUBTOTAL	77000	4.6	77000	30.0	154000	7.9	5216	8.0	3882	31.9	9098	11.8
EAST TOTAL	456500	27.0	173500	67.6	630000	32.4	23240	35.8	7886	64.8	31126	40.4
FED. TOTAL	1690500	100.0	256500	100.0	1947000	100.0	64900	100.0	12178	100.0	77078	100.0

Table III-7-21 Inland Transportation Cost for Exports (East site)

	Cargo Volume								Transportation Cost							
	Truck		Inland waterway		Rail		Total		Truck		Inland waterway		Rail		Total	
	tons	%	tons	%	tons	%	tons	%	N'000	%	N'000	%	N'000	%	N'000	%
IBADAN	327000	30.6			327000	61.2	654000	33.6	19789	33.8			13070	57.5	32859	38.3
AKURE	289000	27.1					289000	14.8	16372	27.9					16372	19.1
LAGOS	36000	3.4			36000	6.7	72000	3.7	2207	3.8			1679	7.4	3886	4.5
IROLIN	2000	0.2	13000	3.8	2000	0.4	17000	0.9	131	0.2	247	5.5	118	0.5	496	0.6
LOCOJA	6000	0.6	16000	4.6			22000	1.1	367	0.6	224	5.0			591	0.7
SUBTOTAL	660000	61.9	29000	8.4	365000	68.4	1054000	54.1	38866	66.3	471	10.6	14867	65.4	54204	63.2
SOKOTO	17000	1.6			17000	3.2	34000	1.7	1194	2.0			911	4.0	2105	2.5
MINNA	10500	1.0	64000	18.5	10500	2.0	85000	4.4	691	1.2	1024	23.0	592	2.6	2307	2.7
KANO	39500	3.7			39500	7.4	79000	4.1	2650	4.5			1925	8.5	4575	5.3
KADUNA	16500	1.5			16500	3.1	33000	1.7	1051	1.8			675	3.0	1726	2.0
KATSINA	10000	0.9			10000	1.9	20000	1.0	695	1.2			524	2.3	1219	1.4
F.C.T./A.S.M.	6000	0.6			6000	1.1	12000	0.6	368	0.6			220	1.0	588	0.7
SUBTOTAL	99500	9.3	64000	18.5	99500	18.6	263000	13.5	6649	11.3	1024	23.0	4847	21.3	12520	14.6
WEST TOTAL	759500	71.2	93000	26.9	464500	87.0	1317000	67.6	45515	77.6	1495	33.5	19714	86.8	66724	77.8
MAKURUDI	18000	1.7	53000	15.3			71000	3.6	1073	1.8	901	20.2			1974	2.3
CALABAR	79000	7.4					79000	4.1	2310	3.9					2310	2.7
OGOJA	11000	1.0	32000	9.2			43000	2.2	580	1.0	288	6.5			868	1.0
ENUGU	10000	0.9	30000	8.7			40000	2.1	396	0.7	300	6.7			696	0.8
UMUAHIA	11000	1.0	32000	9.2			43000	2.2	330	0.6	192	4.3			522	0.6
PORT HARCOURT	21000	2.0					21000	1.1	548	0.9					548	0.6
BENIN CITY	31000	2.9	91000	26.3			122000	6.3	1270	2.2	910	20.4			2180	2.5
WARRI	57000	5.3					57000	2.9	2124	3.6					2124	2.5
SUBTOTAL	238000	22.3	238000	68.8			476000	24.4	8631	14.7	2591	58.1			11222	13.1
MAIDUGURI	14000	1.3			14000	2.6	28000	1.4	950	1.6			761	3.3	1711	2.0
YOLA	2500	0.2	15000	4.3	2500	0.5	20000	1.0	166	0.3	375	8.4	135	0.6	676	0.8
BAUCHI	14000	1.3			14000	2.6	28000	1.4	905	1.5			594	2.6	1499	1.7
JOS	39000	3.7			39000	7.3	78000	4.0	2458	4.2			1521	6.7	3979	4.6
SUBTOTAL	69500	6.5	15000	4.3	69500	13.0	154000	7.9	4479	7.6	375	8.4	3011	13.2	7865	9.2
EAST TOTAL	307500	28.8	253000	73.1	69500	13.0	630000	32.4	13110	22.4	2966	66.5	3011	13.2	19087	22.2
FED. TOTAL	1067000	100.0	346000	100.0	534000	100.0	1947000	100.0	58625	100.0	4461	100.0	22725	100.0	85811	100.0

Table III-7-22 Inland Transportation Cost for Industrial Cargo (Lagos site)

	Cargo Volume						Transportation Cost					
	Truck		Rail		Total		Truck		Rail		Toal	
	tons	%	tons	%	tons	%	N'000	%	N'000	%	N'000	%
IBADAN	1848800	28.3	0	0.0	1848800	24.3	46220	17.9	0	0.0	46220	15.8
AKURE	408800	6.2	0	0.0	408800	5.4	13082	5.1	0	0.0	13082	4.5
LAGOS	1221300	18.7	0	0.0	1221300	16.1	30533	11.8	0	0.0	30535	10.4
IROLIN	276900	4.2	0	0.0	276900	3.6	9415	3.7	0	0.0	9415	3.2
LOCOJA	74200	1.1	0	0.0	74200	1.0	3562	1.4	0	0.0	3562	1.2
SUBTOTAL	3830000	58.5	0	0.0	3830000	50.4	102812	39.9	0	0.0	102812	35.0
SOKOTO	211200	3.2	211200	20.1	422400	5.6	13517	5.2	8243	23.2	21760	7.4
MINNA	141000	2.2	0	0.0	141000	1.9	8319	3.2	0	0.0	8319	2.8
KANO	162250	2.5	162250	15.4	324500	4.3	10709	4.2	5563	15.7	16272	5.5
KADUNA	75350	1.2	75350	7.2	150700	2.0	4672	1.8	2213	6.2	6885	2.3
KATSINA	73300	1.1	73300	7.0	146600	1.9	5058	2.0	2643	7.4	7701	2.6
F.C.T./A.S.M.	468700	7.2	0	0.0	468700	6.2	27653	10.7	0	0.0	27653	9.4
SUBTOTAL	1131800	17.3	522100	49.7	1653900	21.8	69928	27.1	18662	52.5	88590	30.2
WEST TOTAL	4961800	75.8	522100	49.7	5483900	72.2	172740	67.0	18662	52.5	191402	65.2
MAKURUDI	110250	1.7	110250	10.5	220500	2.9	6615	2.6	2687	7.6	9302	3.2
CALABAR	75650	1.2	75650	7.2	151300	2.0	4539	1.8	2387	6.7	6926	2.4
OGOJA	55600	0.8	55600	5.3	111200	1.5	3336	1.3	1549	4.4	4885	1.7
ENUGU	311000	4.8	0	0.0	311000	4.1	15861	6.2	0	0.0	15861	5.4
UMUAHIA	164000	2.5	0	0.0	164000	2.2	8528	3.3	0	0.0	8528	2.9
PORT HARCOURT	333400	5.1	0	0.0	333400	4.4	17337	6.7	0	0.0	17337	5.9
BENIN CITY	149800	2.3	0	0.0	149800	2.0	4943	1.9	0	0.0	4943	1.7
WARRI	95600	1.5	0	0.0	95600	1.3	3824	1.5	0	0.0	3824	1.3
SUBTOTAL	1295300	19.8	241500	23.0	1536800	20.2	64983	25.2	6623	18.6	71606	24.4
MAIDUGURI	111400	1.7	111400	10.6	222800	2.9	8244	3.2	4721	13.3	12965	4.4
YOLA	57100	0.9	57100	5.4	114200	1.5	3883	1.5	1821	5.1	5704	1.9
BAUCHI	59250	0.9	59250	5.6	118500	1.6	4148	1.6	1960	5.5	6108	2.1
JOS	59400	0.9	59400	5.7	118800	1.6	3861	1.5	1758	4.9	5619	1.9
SUBTOTAL	287150	4.4	287150	27.3	574300	7.6	20136	7.8	10260	28.9	30396	10.4
EAST TOTAL	1582450	24.2	528650	50.3	2111100	27.8	85119	33.0	16883	47.5	102002	34.8
FED. TOTAL	6544250	100.0	1050750	100.0	7595000	100.0	257859	100.0	35545	100.0	293404	100.0

III-7-23 Inland Transportation Cost for Industrial Cargo (East site)

	Cargo Volume								Transportation Cost							
	Truck		Inland waterway		Rail		Total		Truck		Inland waterway		Rail		Total	
	tons	%	tons	%	tons	%	tons	%	N'000	%	N'000	%	N'000	%	N'000	%
IBADAN	867850	20.4			867850	34.2	1735700	22.9	51203	22.9			27630	31.5	78833	24.6
AKURE	384600	9.0					384600	5.1	21153	9.5					21153	6.6
LAGOS	572300	13.4			572300	22.6	1144600	15.1	34338	15.4			21288	24.3	55626	17.4
IROLIN	71875	1.7	116750	14.6	71875	2.8	260500	3.4	4313	1.9	2218	25.0	2526	2.9	9057	2.8
LOCOJA	38150	0.9	32550	4.1			70700	0.9	2060	0.9	456	5.1			2516	0.8
SUBTOTAL	1934775	45.4	149300	18.7	1512025	59.6	3596100	47.3	113067	50.6	2674	30.1	51444	58.7	167185	52.3
SOKOTO	211200	5.0			211200	8.3	422400	5.6	14995	6.7			8952	10.2	23947	7.5
MINNA	36050	0.8	68900	8.6	36050	1.4	141000	1.9	2235	1.0	1102	12.4	1094	1.2	4431	1.4
KANO	162250	3.8			162250	6.4	324500	4.3	10871	4.9			6048	6.9	16919	5.3
KADUNA	75350	1.8			75350	3.0	150700	2.0	4747	2.1			2392	2.7	7139	2.2
KATSINA	73300	1.7			73300	2.9	146600	1.9	5131	2.3			2970	3.4	8101	2.5
F.C.T./A.S.M.	234350	5.5			234350	9.2	468700	6.2	14061	6.3			6785	7.7	20846	6.5
SUBTOTAL	792500	18.6	68900	8.6	792500	31.2	1653900	21.8	52040	23.3	1102	12.4	28241	32.2	81383	25.4
WEST TOTAL	2727275	64.0	218200	27.4	2304525	90.8	5250000	69.1	165107	73.9	3776	42.6	79685	90.9	248568	77.7
MAKURUDI	138800	3.3	108900	13.7			247700	3.3	7356	3.3	1851	20.9			9207	2.9
CALABAR	173800	4.1					173800	2.3	4866	2.2					4866	1.5
OGOJA	72900	1.7	54800	6.9			127700	1.7	3353	1.5	493	5.6			3846	1.2
ENUGU	207450	4.9	153050	19.2			360500	4.7	7053	3.2	1531	17.3			8584	2.7
UMUAHIA	106900	2.5	80800	10.1			187700	2.5	2673	1.2	485	5.5			3158	1.0
PORT HARCOURT	390100	9.2					390100	5.1	9753	4.4					9753	3.0
BENIN CITY	99450	2.3	73750	9.2			173200	2.3	4276	1.9	738	8.3			5014	1.6
WARRI	110000	2.6					110000	1.4	3960	1.8					3960	1.2
SUBTOTAL	1299400	30.5	471300	59.1			1770700	23.3	43290	19.4	5098	57.4			48388	15.1
MAIDUGURI	57175	1.3	108450	13.6	57175	2.3	222800	2.9	3888	1.7			2459	2.8	6347	2.0
YOLA	57100	1.3			57100	2.3	114200	1.5	3654	1.6			1813	2.1	5467	1.7
BAUCHI	59250	1.4			59250	2.3	118500	1.6	3792	1.7			1923	2.2	5715	1.8
JOS	59400	1.4			59400	2.3	118800	1.6	3683	1.6			1737	2.0	5420	1.7
SUBTOTAL	232925	5.5	108450	13.6	232925	9.2	574300	7.6	15017	6.7			7932	9.1	22949	7.2
EAST TOTAL	1532325	36.0	579750	72.7	232925	9.2	2345000	30.9	58307	26.1	5098	57.4	7932	9.1	71337	22.3
FED. TOTAL	4259600	100.0	797950	100.0	2537450	100.0	7595000	100.0	223414	100.0	8874	100.0	87617	100.0	319905	100.0

III-7-2 Development Benefits

(1) General Development Benefits

First, general development benefits to be derived from the construction of the New Ocean Terminal at either site will be illustrated.

Fig. III-7-5 shows the classifications of general development benefits to be gained from the construction of NOT.

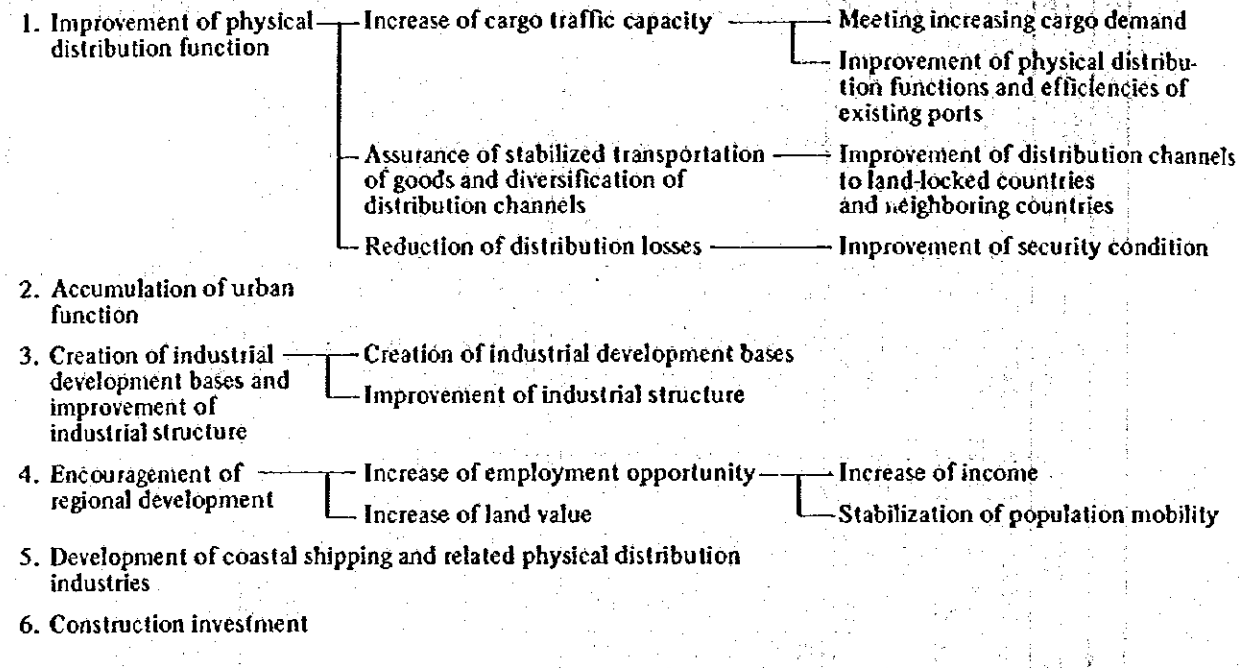


Fig. III-7-5 General Development Benefits of the New Ocean Terminal

1) Improvement of physical distribution function

a. Increased capacity

The major development purpose of NOT is to increase cargo traffic capacity. This increase will further accelerate the improvement and strengthening of the present physical distribution function. The increase of the cargo traffic capacity through the construction of NOT will meet the Nigerian cargo demand expected to increase greatly in the future.

When the cargo throughput presently being handled at Lagos Port and other existing ports in Nigeria is transferred in part to NOT, the existing ports will finally be enabled to operate as they should. The distribution functions of the existing ports will be improved and their efficiency increased. Congestion, for example, which is particularly severe at Lagos Port, will be alleviated.

Physical distribution in the ports will as a result be speeded and this in turn will produce an extremely high value added for Nigeria, where there is a great deal of highly time-sensitive cargo traffic.

b. Stabilization of transportation and diversification of distribution channels.

The increase of cargo traffic capacity through the development of NOT will enable the terminal to serve as the cargo distribution center needed by such land-locked countries as Niger, Chad, etc. NOT can also serve as a transit port for the neighboring countries in the West and Central African Region by receiving modern large container ships. Thus, the merits of NOT as a large port can be enjoyed not only by Nigeria but also by its neighbors. When this becomes possible, the development of NOT will greatly contribute to the rise of Nigeria's international position in Africa.

When the NOT-related infrastructures are constructed and a goods distribution network is completed to enable NOT to function smoothly, stabilized transportation of goods will be assured and the channels of distribution will be diversified. As a result, more channels than ever will be available for the transportation of goods from the inland of Nigeria and the transportation of imports into the inland areas, accelerating the development of industry. This means that the construction of NOT will encourage prosperity in the inland areas which are still underdeveloped, and eventually contribute to one of the basic policies of the Nigerian Government – the development of the inland areas and the balanced development of the country.

c. Reduction of distribution losses

Increase in distribution capacity and reduction of distribution time are linked to reduction of distribution loss. Cargo damage generally increases with the time cargo waits in the hold of a ship or in the port zone; pilferage increases when the port zone is overloaded with cargo due to inadequate facilities. This constitutes a loss to the national economy which can be minimized by the construction of NOT and the subsequent enabling of the existing Nigerian ports to operate at proper capacity. This will have the further favorable effect of boosting international confidence in Nigeria.

2) Accumulation of urban function

The existence of a large port gives rise to the growth and development of city and related industries and accelerates the urbanization of the surrounding area as well. In the process of forming and developing the city, rational utilization of city space integrated with the port is important. Here, the effective use of resources and land is possible with NOT, a rationally planned port, and city space can be made available all the more for this reason. The NOT plan is designed in this way to integrate urban and port functions and to develop both in a rational and systematic fashion. Consequently, urban funcitons integrated with port functions can be accumulated systematically and rationally.

3) Creation of industrial development bases and improvement of industrial structure

When commercial port and urban functions are properly organized and developed and a physical distribution network is provided by constructing port-related infrastructures, the area around the port becomes a central location for port-related and other industries. A base for industrial development particularly favorable to the development of port-oriented industries grows thanks to the central distribution of materials and products through the port. Industries dependent on the external economy resulting from the accumulation of port and urban functions

and the preparation of the physical distribution network also find their bases in the port area. In this way, the construction of NOT as planned – a large-scale port which combines commercial port and industrial port functions – will provide Nigeria with a major base for the nation's industrial development.

Export industries and basic industries have already been planned around the industrial development base to be created through the construction of NOT; the improvement of the Nigerian industrial structure and the realization of a balanced economic structure will be accelerated by the development of these industries.

4) Encouragement of regional development

a. Employment

As port functions, urban functions, and industries are formed and accumulated through the construction of NOT, opportunities for local employment will increase greatly and income levels will improve accordingly. Although population movement may accompany the courses of urbanization and industrial growth (as a result of the shift in emphasis from primary to secondary industries), the development of port-related industries planned under the NOT project will, while helping to smooth the progress of social mobilization, induce the stabilization of population mobility.

b. Property values

The enrichment of "social capital" such as roads and urban facilities is another benefit expected to stem naturally from the development of NOT. Regional living standards and convenience will improve enormously, and as the accumulation of port and urban functions and industries bolster the external economy of the surrounding area, the prospects of regional development will become more viable than ever. The development potential of the entire area will swell, and accordingly the land in the NOT area will boast increasingly high utility value.

5) Development of coastal shipping and related physical distribution industries

Nigerian coastal shipping is at present specialized to the transport of refined oil from the Delta Port complex to Lagos Port. The transportation of general cargo by coastal shipping, however, is as yet underdeveloped, due in part to problems concerning cargo lots, etc.

With the development of NOT and the resulting socio-economic progress of the nation, however, the movement of cargo will become more active and the feasibility of mass cargo transport will increase greatly. Coastal shipping and related physical distribution industries may be expected to mature because these transport methods are so profitable where sufficient volume is available.

6) Construction investment

The various effects discussed above constitute in part the outcome of the scope of activities surrounding the construction of NOT. These effects can be characterized as long-term and continuing.

Another economic effect to be considered is the direct effect of the construction investment. The construction of NOT requires long-term investment of a large scale. Moreover,

the construction of NOT with its ports, industrial bases, urban facilities, and various other projects will, with the task of supplying construction materials, create many employment opportunities and bring a wide range of economic benefits to the entire country.

(2) Contrast of Development Benefits

Basic NOT development benefits, by site, are as follows:

1) NOT-east: The impact of NOT's development on the economic and social progress of the eastern states is great because of its location in an area where urbanization and industry are markedly undeveloped. NOT-east will stimulate the development of the eastern states where less favorable socio-economic conditions still prevail – it will contribute greatly to the balancing of Nigeria's development. On the other hand, however, because of the present paucity of urbanization and industry, NOT-east calls for considerable investment to stimulate the development of the urban and other functions necessary for its own maintenance.
2) NOT-Lagos: Since the development of NOT could be supported by existing accumulation of urban functions and industries, the economy and society with a close correlation of industrial structure, namely, highly circular and roundabout production will develop. From this point of view, the NOT-Lagos plan could be the more productive for the national economy.

Table III-7-24 contrasts the main development benefits for each NOT site. Note that the characters and the degrees of the development benefits differ in accordance with the socio-economic conditions of each site. The table contrasts as much as possible the relative weights of the socio-economic effects of NOT on the eastern and western states.

Table III-7-24 Contrast of Development Benefits by NOT Site

1. Improvement of physical distribution function

NOT-east	NOT-Lagos
1. The increase in cargo traffic capacity will have the following effects: (1) Meeting future increases in cargo demand. (2) Improving the physical distribution functions of existing ports and increase of their efficiency. (3) Effective functioning as cargo distribution terminal to land-locked countries and as a transit port (container base) for neighboring countries in the West and Central African region. Raising of Nigeria's international position through these functions. (4) Contributing to the industrial and economic development of the inland areas through the assurance of stabilized goods transportation and the diversification of distribution channels. This, in turn, contributes to regional development and the balanced development of the country.	1. Same as NOT-east with respect to the effects of the increase of cargo traffic capacity and the reduction of distribution loss, except that improvement of physical distribution function incorporating that of the existing Lagos Port is possible because of its proximity to NOT. Because of the geographical position of NOT-Lagos, if it is used as a transit port for containers, about a day can be saved in transportation to the neighboring countries in the West and Central African region.
2. Reduction of distribution loss through the increase of cargo traffic capacity and the saving of distribution time.	
3. Transportation costs of NOT-east for commercial and industrial cargo total 1,273.8 million naira. This represents a ₦7.1/ton increase over NOT-Lagos and must be seen as a loss to the nation's economy.	2. Transportation costs of NOT-Lagos for commercial and industrial cargo total 1,086.8 million naira. NOT-Lagos affords about 17.2% economical advantage.
4. Inasmuch as the area surrounding the NOT-east site lacks the socio-economic conditions to support the NOT functions, a certain amount of social and economic investment will be required to provide adequate levels of port-related and public facilities, transportation and communication services, etc.	

2. Accumulation of urban function

NOT-east	NOT-Lagos
1. Planned rational urbanization is possible.	1. Planned rational urbanization is possible.
2. The formation of a city with approximately the same population (200,000) as the population (192,700) of Calabar in the year 2000 will have immense impact on the regional economy and society of the eastern states.	2. Since port operation incorporating the existing Lagos Port is possible, the existing Lagos Port will be maintained more properly than ever in conjunction with port facilities. This will make the re-development of the vicinities of the existing Lagos Port possible and have the same effect as the creation of new urban space.

3. Creation of industrial development bases and improvement of industrial structure

NOT-east	NOT-Lagos
1. A base for industrial development favorable to the development of port-related industries can be created by accumulating commercial port function and urban function and preparing an efficient physical distribution network through the construction of port-related infra structures.	1. Same as NOT-east with respect to the creation of industrial development bases and the improvement of the industrial structure.
2. The industrial structure will be improved since the development of export industries and basic industries has already been planned in connection with the development of NOT.	2. The existing urban and industrial accumulations will be further increased and expanded by the development of NOT. As new industries are developed with the purpose of using the economic advantages of these accumulations, related industries as well will be stimulated. In this sense, the development of NOT-Lagos is likely to contribute more efficiently to the development of economy and society.
3. NOT's desired stimulatory effects on inter-industry relations and urbanization may be thwarted by the fact the surrounding area is at present relatively underdeveloped, and the assumed industrial production scale may attain an economically rational scale due to the high transportation costs. It is therefore to be desired that Nigeria's government would implement radical industrial encouragement policies to bridge the gap until development takes hold and the situation improves.	3. The socio-economic disparity between the eastern and the western states could be intensified by NOT-Lagos, rendering its construction incompatible with national policies aimed at balanced development.
4. The development of NOT-east will enable the eastern states, which lag behind the western states in industrialization and other socio-economic conditions, to recover from their industrialization lag, bridging gaps with the west in various aspects. In this sense, NOT-east will contribute more directly to the Government's basic targets of national development: balanced development of the country and correction of imbalances between economic sectors and between districts.	
5. Effects of NOT development on the value added of manufacturing industries: 1) Value added of eastern states in 1978: ₦257 million * (A) 2) Value added of NOT-related industries: ₦1,070 million (B) 3) Ratio of NOT value added to value added of eastern states (B/A): 4.16 * Value added in 1978 was obtained by multiplying value added in 1975 by inflation ratio.	4. Effects of NOT development on value added of manufacturing industries: 1) Value added of western states in 1978: ₦1,731 million * (A) 2) Value added of NOT-related industries: ₦1,070 million (B) 3) Ratio of NOT value added to value added of western states (B/A): 0.63

4. Encouragement of regional development

NOT-east	NOT-Lagos
1. NOT-east will contribute to local employment opportunities, bring about income increases, and stabilize population. There will, however, be difficulties in culling a qualified labor force from the NOT-east area due to the present scarcity of industrial development there.	1. Same as NOT-east with respect to employment, income, the stabilization of population, and the increase of land value.
2. Effects of NOT development on increase of population and employees: 1) Population a. Population of Calabar (1980): 116,900 (A) b. Population of new NOT city: 200,000 (B) c. Ratio of population of new NOT city to population of Calabar (B/A): 1.71 2) Employees a. Employees in Cross River State (1975): 23,521 (A) b. Employees of NOT-related manufacturing and processing industries: 30,000 (B) c. Ratio of NOT-related employees to employees in Cross River State (B/A): 1.28	2. Effects of NOT development on increase of population and employees: 1) Population a. Population of Lagos city (1980): 1,100,000 (estimation) (A) b. Population of new NOT city: 200,000 (B) c. Ratio of population of new NOT city to population of Lagos (B/A): 0.18 2) Employees a. Employees in Lagos state (1975): 105,086 (A) b. Employees of NOT-related manufacturing and processing industries: 30,000 (B) c. Ratio of NOT-related employees to employees in Lagos state (B/A): 0.29
3. Local land values will increase through the improvements in regional living standards gained by the enrichment of social capital and the realization of regional development potential.	3. Crime and other social problems will increase due to the excessive concentration of population in metropolitan Lagos, which will continue into the future. (The population density in 2000 will be 1,444 persons/km^2 for Lagos as compared with the national average of 152 persons/km^2.) However, as NOT is constructed at some distance from the city of Lagos and a suitable portion of the concentrated population is absorbed by the NOT-related area, NOT will help Lagos cope with the ills of overpopulation and contribute to the welfare of the local inhabitants.
4. The above effects will have great impact on the regional society and economy of the eastern states which have lagged behind the western states in socio-economic conditions. Further, NOT development will greatly contribute to the correction of imbalances with the western states.	4. NOT-Lagos will have no direct effect on the amelioration of conditions in the eastern states, and therefore would contribute very little to the correction of imbalanced development.

5. Development of coastal shipping and related physical distribution industries.

NOT-east	NOT-Lagos
1. Because of the economic advantage of transportation by coastal shipping, coastal shipping and related physical distribution industries are expected to develop. Coastal shipping is most likely to be used for the transportation of goods to Lagos, center of the nation's economy and industry, and major consumption area.	1. Coastal shipping and related distribution industries are expected to develop, as in the case of NOT-east, but this development will be less marked, due to the lesser demand for such transport methods caused by generally shorter transport distances to major centers of consumption.

6. Construction investment.

NOT-east	NOT-Lagos
1. Construction of NOT will increase employment opportunities and have extensive economic effects through the procurement of construction materials and the performance of work.	1. Same as NOT-east.
2. The cost of construction of NOT-east is 3,284 million naira (1981 price basis). Construction costs therefore exceed those of NOT-Lagos by about 18%.	2. The cost of construction of NOT-Lagos is 2,789 million naira 1981 price basis).

7. Development of Inland Waterways and Related Distribution Industries.

NOT-east	NOT-Lagos
1. The eastern states have many rivers including the two large rivers of Niger and Benue and many creeks in the Niger Delta. The possibility of mass transportation of cargo will increase as the result of NOT development and the development of economy and society, and consequently, inland waterways in the eastern states may well be utilized more than ever due to these geographical conditions of the eastern states and the economic advantage of transportation by inland waterways. Thus, inland waterways and related distribution industries will develop and this development will contribute to the economic and industrial development of the region.	1. With the increase of goods transportation through NOT development, the use of Niger River inland waterways may be stepped up, particularly in the northern part of the western states. Thus, inland waterways and related distribution industries are expected to develop, but the scale of the development will be much smaller than in the case of NOT-east.

8. National Security

NOT-east	NOT-Lagos
1. NOT-east is at a distance of more than about 600 km from Lagos, key city to the Nigerian economy and her industry. The development of NOT-east will not only help to cut the excessive concentration of socio-economic activities in metropolitan Lagos but will contribute as well to socio-economic development in the eastern states. The development of NOT-east will bring about a "twin port system" with the existing Lagos Ports Complex. Under this twin port system, the effects on socio-economic activities of a natural calamity or disaster occurring at one of the ports can be minimized by the functioning of the other. The realization of the twin port system through the development of NOT-east can thus be highly appreciated as being in the interest of the Nigerian national security.	1. Since NOT-Lagos is located only 50 km from Lagos city, it can be said from the standpoint of national geography that NOT lies within the general sphere of metropolitan Lagos. The socio-economic activities thus concentrated in metropolitan Lagos by the development of NOT will be directly affected by a natural calamity or a major disaster occurring in the metropolitan area. The paralysis of NOT and other functions in metropolitan Lagos could profoundly affect the socio-economic activities throughout Nigeria having a most damaging effect on the national economy.