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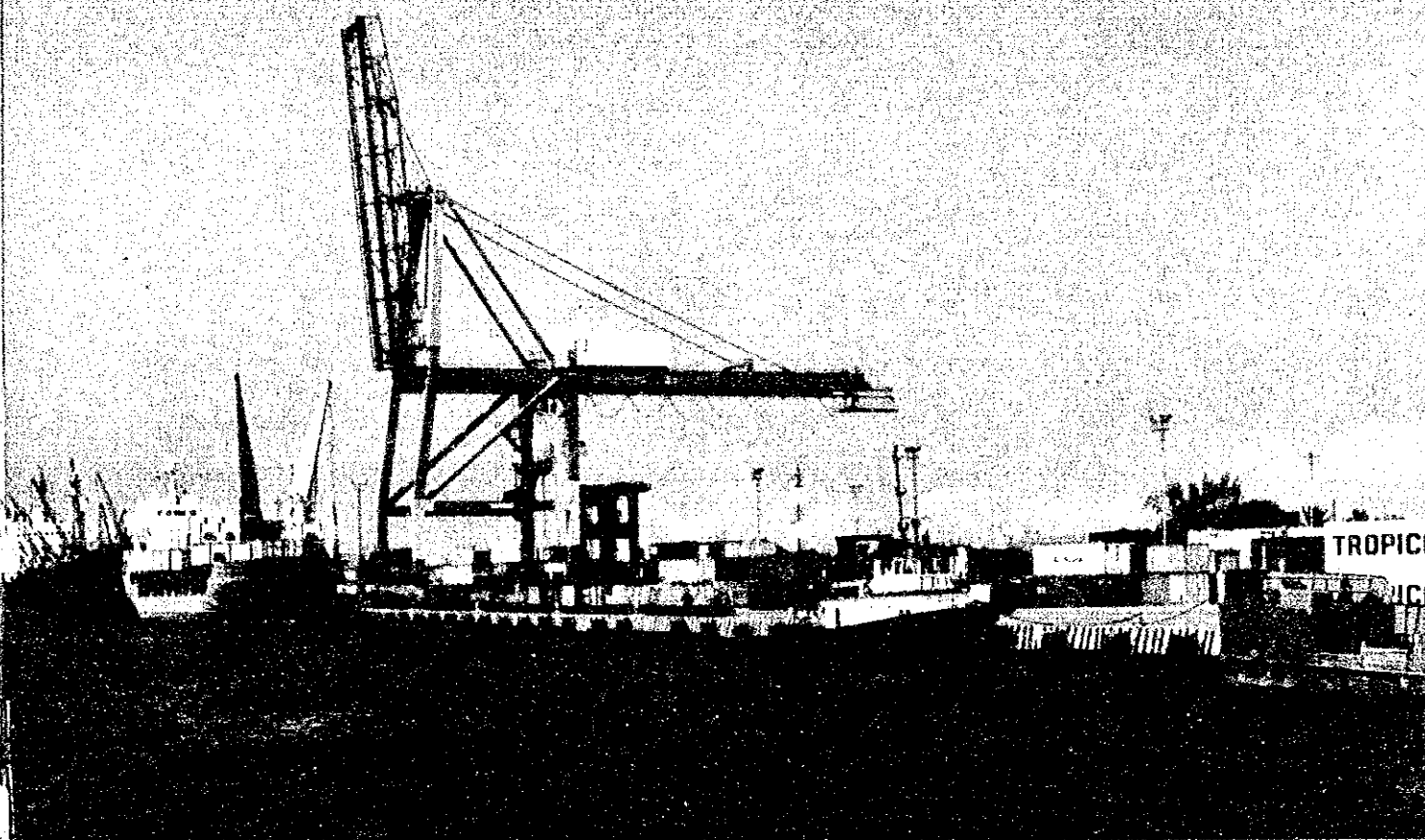
FINAL REPORT

THE STUDY ON THE IMPROVEMENT OF THE PORTS IN THE REPUBLIC OF HONDURAS

VOLUME I MAIN REPORT

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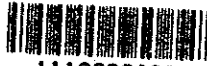
MARCH 1994

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**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
NATIONAL PORT ENTERPRISE**

FINAL REPORT

**THE STUDY ON
THE IMPROVEMENT OF THE PORTS IN
THE REPUBLIC OF HONDURAS**

VOLUME I MAIN REPORT

MARCH 1994

EXCHANGE RATE

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PREFACE

In response to a request from the Government of the Republic of Honduras, the Government of Japan decided to conduct a Study on the Improvement of the Ports in the Republic of Honduras and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Honduras a study team headed by Mr. Sagara Hideaki, Senior Executive Director of the Overseas Coastal Area Development Institute of Japan and composed of members from this institute and the company, Nippon Koei Co., Ltd, four times between January 1993 and March 1994.

The team held discussions with the officials concerned of the Government of Honduras, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Honduras for the close cooperation they extended to the team.

March 1994



Kensuke Yanagiya
President
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

March 1994

Mr. Kensuke Yanagiya
President
Japan International Cooperation Agency

Sir,

It is my great pleasure to submit the Final Report for the Study on the Improvement of Ports in the Republic of Honduras.

This report is the outcome of works between January 1993 and March 1994 including four field surveys during the period. The work was undertaken by the Overseas Coastal Area Development Institute of Japan (OCDI) and Nippon Koei Co., Ltd as per the contract with the Japan International Cooperation Agency (JICA).

Based on the findings of these surveys and utilizing data and information collected, and along the line of the scope of work which was agreed upon by the both governments, the report is formulated to cover following subjects;

- (1) the development and management strategy of Honduran port sector with a target year of 2010,
- (2) the urgent improvement,
- (3) the masterplan of the Port of Cortes with a target year of 2010,
- (4) the short term plan of the port with a target year of 2000, including a feasibility study and environmental assessment of the project.

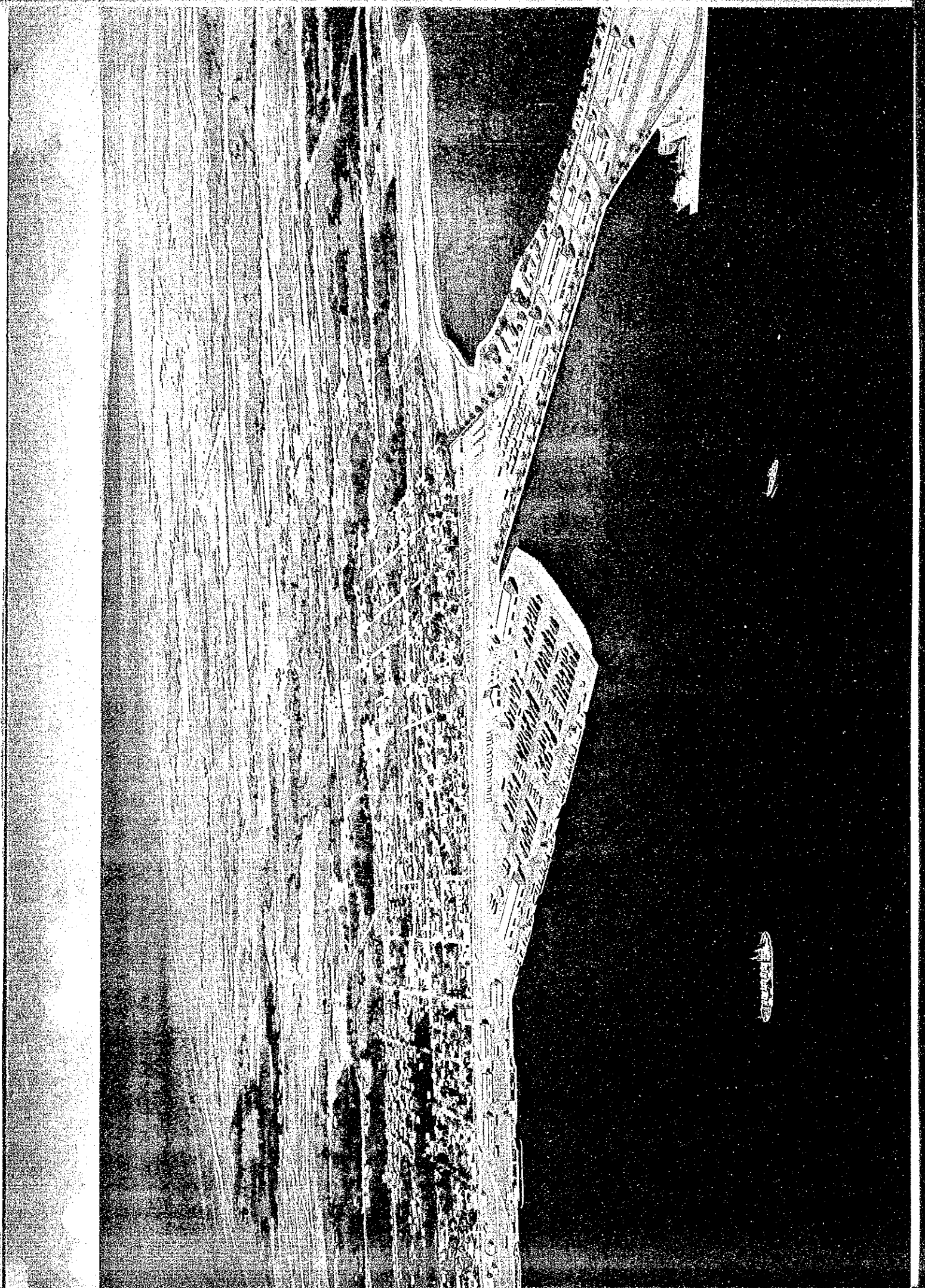
Since the study reveals that the development of Honduran port sector is vital for the success of the structural adjustment upon which Honduras is now embarking, and that the projects contained in the report is verified as feasible, I do hope that the projects, particularly those relating to container terminals will be implemented at early stage.

Now, I wish to stress that completion of the report is only possible with the cooperation and assistance by the personnel concerned from the government as well as the private sector. Our gratitude and appreciation should also be extended to the Japanese institutions which gave valuable advice and support for the study.

Yours faithfully,



Hideaki Sagara
Leader, Team for the Study
on the Improvement of the Ports
in the republic of Honduras



ABREVIATIONS

AHCORENA	Asociación Hondureña de Compañías y Representantes Navieras
AID	Agencia Internacional de Desarrollo
BANTRAL	Banco Central de Honduras
BID	Banco Interamericano de Desarrollo
CAP	Comisión Administradora del Petróleo
CE	Comunidad Europea
CFS	Container Freight Station
CIF	Cost, Insurance and Freight
CNSSP	Comisión Nacional Supervisora de los Servicios Públicos
COCATRAM	Comisión Centroamericana del Transporte Marítimo
COHEP	Consejo Hondureño de la Empresa Privada
CONAMA	Comisión Nacional del Medio Ambiente y Desarrollo
CY	Container Yard
DBT	Dry Bulk Terminal
DGPS	Dirección General de Planificación Sectorial
DIMUNDE	División Municipal de Desarrollo
DWT	Deadweight Tons
EIRR	Economic Internal Rate of Return
ENEE	Empresa Nacional de Energía Eléctrica
ENP	Empresa Nacional Portuaria
FAO	Food and Agriculture Organization
FCL	Full Container Load
FCN	Ferrocarril Nacional de Honduras
FHIS	Fondo Hondureño de Inversión Social
FIDE	Fundación para la Inversión y el Desarrollo de las Exportaciones
FIRR	Financial Internal Rate of Return
FIV	Fondo de Inversiones de Venezuela
FOB	Free on Board
HONDUTEL	Empresa Hondureña de Telecomunicaciones
IDA	International Development Association
IDB	International Development Bank
IHCAFE	Instituto Hondureño del Café
IHMA	Instituto Hondureño de Mercadeo
IHT	Instituto Hondureño de Turismo
INVA	Instituto Nacional de la Vivienda
JICA	Japan International Cooperation Agency
KL	Kilolitro
LEGISMAR	Legislación Marítima
LCL	Less than Container Load

LO-LO	Lift-on Lift-off
LOA	Length Overall
MY	Marsharing Yard
NMM	Nivel Medio del Mar
OCDI	The Overseas Coastal Area Development Institute of Japan
OECE	Overseas Economic Cooperation Fund
OPEC	Organization of Petroleum Export Countries
PIB	Producto Interno Bruto
RIT	Régimen de Importación Temporal
RO-RO	Roll-on Roll-off
SANAA	Servicio Nacional de Acueductos y Alcantarillados
SECOPT	Secretaría de Comunicaciones, Obras Públicas y Transporte
SECPLAN	Secretaría de Planificación, Coordinación y Presupuesto
SFC	Standard Fruit Company
SIECA	Secretaría de Integración Económica Centroamericana
TB	Tonelada Bruta
TBR	Tonelada Bruta Registrada
TCC	Terminal de Contenedores
TEU	Twenty-Foot Equivalent Unit
TRR	Tela Railroad Company
TM	Toneladas Métricas
UNAH	Universidad Nacional Autónoma de Honduras
UNCTAD	United Nations Conference on Trade and Development
ZIP	Zona Industrial de Procesamiento

The Study on the Improvement of the Ports in the Republic of Honduras

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INTRODUCTION

Introduction

1. This report is formulated for "the Study on the Improvement of the Ports in the Republic of Honduras", on the basis of a series of reports of the study, i.e. Inception Report, Progress Report, Interim Report I, Interim Report II and Draft Final Report which the study team submitted consecutively, and taking into consideration the views expressed by the counterparts of the study.

With the submission of this report, the study which has been carried out since January 1993 is completed.

2. The objectives of the study are;

- to formulate a nationwide port development and management strategy in Honduras,
- to formulate a master plan of a selected port for the period up to the year 2010,
- to conduct a feasibility study for the short-term development plan of the selected port for the period up to the year of 2000 within the framework of the master plan, and
- to formulate urgent improvement measures for the major ports.

The content of the report is along the line of the objectives, however, the order of items has been changed from the above objectives from above editorial points of view.

3. Honduran coastline stretches some 650 km along the Caribbean Sea and 65 km on the Pacific side. Since the rivers are only navigable for very small watercraft, port facilities are found along the coast. Ports with some facilities are as follows;
On Caribbean Sea-Puerto Cortes, Tela, La Ceiba, Trujillo, Castilla and Puerto Lempira
On the Bay Islands-Coxen Hall and some private ports
On the Gulf of Fonseca-San Lorenzo, Amapala

Among the above, the port of Cortes (Puerto Cortes) is the leading port with 77% of the total cargo throughput of the country, followed by Castilla. San Lorenzo is virtually the only port on the Pacific side, since Amapala is located on a remote island in the Gulf of Fonseca and seems not to play an important role in transport. Only these three namely Puerto Cortes, Castilla and San Lorenzo are furnished with modern facilities.

4. With the above observation in mind, the study team took up the following ports as the study ports for the nationwide development and management strategy;

Puerto Cortes, Tela, La Ceiba, Castilla, Puerto Lempira, San Lorenzo and Coxen Hole of the Roatan Island.

Puerto Cortes was selected as the study port in the master plan targeted for 2010 as well as in the short-term plan targeted for 2000 including feasibility analyses.

5. The study team began its work in January 1993 and finished in March 1994. During this period members of the team visited Honduras from February-April, June-July, September-October of 1993 and January of 1994, and they conducted interviews, site surveys and other data collection, as well as had discussions with the relevant personnel in Honduras concerning matters related to the study.

Their names and the responsibilities are listed below.

Name	Responsibility
Sagara Hideaki	Leader, Overall management and port policy
Fujita Ikuo	Acting leader, Port planning (2) and environment impact assessment
Amano Tomoo	Port planning (1) and port arrangement planning
Nagano Hiromichi	Demand forecast and economic analysis
Shimada Kenji	Management/operation and financial analysis
Aoyama Takahisa	Cargo handling system
Murai Noboru	Design of port facilities
Saigusa Fujio	Construction method and cost estimate
Suzuki Isamu	Natural condition (1)
Naito Katsumi	Natural condition (2)
Yamane Yuri	Interpreter
Kawamura Masayoshi	Interpreter

CONCLUSIONS AND RECOMMENDATIONS

Conclusion and Recommendations

During the study, the team made a number of observations in terms of construction, maintenance, operation and administration. While they are shown in detail in the main part of the report, substantive matters are briefly indicated in this part for the readers' convenience.

Conclusion

Port Development and Management Strategy

1. To bring the functions of Honduran port sector into full play, a wide range of investment is required in terms of the facilities and equipment of the ports of Cortes, Tela, La Ceiba, Castilla, Lempira, San Lorenzo and Coxen Hole (Roatan). The total amount of the investment required by year 2010 is between 800-1300 million Lps. Of this investment, a higher priority should be given to on-going or matured planning projects such as La Ceiba cabotage facilities, petroleum installations in San Lorenzo and Tela/Cortes and a pier in Coxen Hole.
2. For the management reform of port sector including inter alia, more private participation to the port operation, the Action Plan prepared by ENP Technical Working Group is a basis for future consideration on this matter. In this context, among the projects shown in paragraph 1 some of the investment will be more appropriate to be conducted by the private sector, or after the completion operation may be carried out with private participation.
3. In determining and implementing private participation in investment or operation, the 'human factor', which relates to the mindset of the people to be affected, and the impact of policy alteration on developing countries must be borne in mind to avoid backlash or negative consequences during the transition.

Subjects to Be Required for Urgent Improvement

4. Seventeen subjects inclusive of relocation of the road penetrating through No.5 berth and asphalt tank which is in the vicinity of the residential area are identified as needing urgent improvement without substantial change of operation. Fifteen of them involve facility and operation in the port of Cortes (two of them are implemented by ENP), while two others are common to all ports for reducing labor accidents and furnishing statistics of domestic trade. Of the 15 items subject to improvement at Cortes, road and yard pavement, replacement of handling equipment and change of road and parking place require considerable funds (more than 12 million Lps), while others are attainable by changing relevant rules or other measures at less cost. ENP recognizes these problems and is working out for resolving some of the problems, such as paving of container yard No.11, commodity wise assortment in Cortes warehouses and relocation

of asphalt handling.

The Port of Cortes Master Plan for 2010

5. Investment in the port of Cortes should be given special attention because the port is the largest in Honduras with some 80% of its total cargo throughput. With this in mind, a master plan of the port targeted for the year 2010 is formulated based upon the projected port demand and selected among the several alternatives. The main contents are as follows:

(1) To catch up with the rapid change both in terms of volume and technology of maritime transport and to establish efficient and orderly operations in the port, following new basic installations are required by the year 2010;

- Unit cargo berths three
- Dry bulk terminal one
- Cold storage terminal one
- Domestic cargo terminal .. to accommodate 25 vessels
- By-pass road approximately 1380 m.

(2) For the unit cargo berths, the unit quay length is 185m taken into account the idea that a continuous berth can accommodate vessels the length of which is longer than the single quay length. The number of gantry crane is one per berth, assuming that Ro/Ro vessels and relatively small size vessels have a considerable share among calling vessels. When larger vessel calling two gantry cranes can work together. With these steps, the amount of investment can be reduced.

(3) Above installations are accompanied by certain equipment, and the cost is estimated at 429 million Lps altogether. However, some of the installations including one cold storage terminal and the dry bulk terminal, as well as handling equipment in unit cargo terminals will be funded by the private sector.

(4) According to a stage plan which is prepared based on the comparison of assumed cargo volume and projected capacity, by the year 2000 at least two unit cargo terminals, by-pass road and the domestic terminal should be completed.

Short-term Plan for 2000 and its Feasibility

6. On the basis of the 2010 master plan, a short-term development plan for the year 2000 is formulated, as follows:

(1) Unit cargo terminal

Two berths of the unit cargo terminal are proposed on the reclamation area at the eastern most part of the existing port. The following are the major installations;

- i) two quays ...total length 370m, water depth -12m

- ii) container base (1,505 slots) and reefer base (178 slots)
- iii) container freight station ...5,000 sq.m
- iv) maintenance shop, office building, cleaning house ...1,000m each
- v) two gantry cranes ...lifting capacity 41 ton, with through rails, and
- vi) handling equipment (straddle carriers, tractor heads, chassis, etc.).

(2) Domestic cargo terminal and by-pass road

One domestic terminal is proposed at the eastern end of Cortes Free Zone. Also, a by-pass road which runs between the reclamation area and the domestic terminal is proposed. The proposed domestic cargo terminal is an L-shaped quay with 4.5 m depth and 200 m length. The by-pass road is 1,380 m with three lanes.

7. With construction of the container terminal, all containers are handled in this terminal, including those of banana company. With these steps, No.5 berth which is now working for both container and general cargo, can become used exclusively for general cargo. Also, container stuffing/unstuffing in No.3 and 4 warehouse is discontinued and moved to the new CFS. These steps will increase cargo handling capacity and efficiency in terms of general cargo too.

8. The aggregated amount of the construction cost of the proposed installations is 288.5 million Lps including engineering service and physical contingency.

9. Feasibility of the project is examined in terms of national economy and financial viability of implementing organ(s).

(1) Economic Internal Rate of Return (EIRR) is 22%, and according to the sensitivity analysis the worst case (10% less in benefit and 10% plus in cost) shows an EIRR of over 18%. Since these figures exceeds the ordinary level of a developing country's opportunity cost of capital, this project is regarded as feasible.

(2) Financial Internal Rate of Return (FIRR) is nearly 23%, and the worst case of the sensitivity analysis (10% less in revenue and 10% plus of investment cost) shows more than 18%. Assuming that a large part of the investment is funded by assistance from an international financial institution or donor country, these figures are well beyond the anticipated average of the project's interest rate. The expected profitability and the calculated financial soundness also exceed the level line. The project can thus be judged financially viable.

10. According to the team's careful examination on environmental problems which might occur during the construction work and in the operation stage of projected facilities, it is asserted with considerably high probability that in each stage serious damage to the environment, including in particular impact to the water quality, especially

turbidity in the work area will not be generated.

11. With these points described in paragraphs 9 and 10 above in mind, and bearing in mind the fact that port development and operation consistent with trade and economic growth may bring leverage for the prosperity of the nation and the region including creation of employment opportunity through port activities, this project is not only feasible in terms of the national economy, financial aspects of implementing organ(s) and environmental impact, but also ensures that the port sector will contribute to the development of the area and the country. Further, if the reformation steps in terms of management and institutional matters are implemented, which are shown in 'Recommendations' listed below, the investment in the modern installations will be rewarded through the creation of a competitive and lucrative port at Puerto Cortes.

Recommendations

Port Development and Management Strategy

1. As the guidepost to execute tellingly ENP's responsibility which is prescribed in the ENP Decree, to coordinate the development of port activities throughout the country, a national port plan should be formulated and its periodical review should be institutionalized.
2. With the big difference of cargo throughput and revenue between ports in mind, cross subsidy concept should be maintained. On the other hand, in view of fairness and equity which should be the general principle of pricing, it is recommended that the spread of tariff between banana and ordinary cargo is reduced.
3. There are several management issues to be improved, and these issues are dealt with in recommendations on the Port of Cortes management (paragraph 11 and after).
4. As far as port activities are concerned, although the environmental impact is not salient, preparations to tackle environmental problems should be embarked on by ENP, of which first step includes; i) strengthening of monitoring port and surrounding environment in particular water quality, ii) fostering personnel knowledgeable on environmental issues, and iii) establishing of a control system on environmental matters.
5. ENP should work toward decentralization and private participation in the construction of facilities and activities of ports, which are high on the agenda of port reformation. Besides issues of the port of Cortes, La Ceiba cabo-tage terminal, Castilla port operation, oil receiving facilities in several ports are the main candidates.
6. It is the responsibility of SECOPT to establish a long term plan for transport infrastructure within the context of a national development program. With a view to fostering the capability to meet this end by transferring required knowhow, it is advised that SECOPT retain a long term consultant or asks a donor country to provide long-term experts.
7. To fix and enforce fair and competitive tariff without undue political intervention, the competence of CNSSP should be strengthened and the power to promulgate the decision should be provided for CNSSP.
8. Followings are recommended to advance administrative and financial performances of ENP;
 - decision-making process should be expedited by delegating routine business to the Secretary General and by reducing the number of Board of Directors meetings, and
 - monetary discipline should be improved by appropriating the annual budget for three month terms and reporting the execution to the Board of Directors.

Development Plan of the Port of Cortes

9. Although the project in relation to the port of Cortes can be claimed useful for the development of the country and the region and has been proved to be feasible both in terms of the national economy and of the finance of the body, without the relevant institutions' efforts in raising the funds, the project cannot be realized. These efforts include, in particular:

- It is envisaged that the major part of the fund comes from a donor country or international financial institution, and the aid-managing ministry should make an effort to provide refinancing with as low interest as possible.
- Since ENP will bear a part of the cost, particularly in the infant stage of the project, ENP's financial position should be fostered by abolishing/decreasing of its unprescribed financial contribution to the central government and by ceasing over-reduction of specific commodities (see paragraph 2).

10. Although the impact to the environment of the project is judged minimal, it is advisable to further mitigate the influence by reducing the speed of dredging or by enclosing the reclaimed area with a sluice, where necessary.

Future Management and Operation of The Port of Cortes

11. Keeping pace with the master plan for port development and having in mind the port management strategy, a number of items in terms of port management and operation should be improved or upgraded. Also, the port reformation which is now studied and partly implemented within the relevant organizations of the Honduran government places a high priority on enhancing operation circumstances in the port. The major subjects proposed for this purpose are shown in below paragraphs.

12. The shift system with respect to port labor will have an effect in reducing labor accidents caused by lengthy work hours and thus in advancing work efficiency. ENP has already consulted with the labor union, and is investigating the timing of the introduction of the shift system. The team feels this is sensible and early implementation is desired.

13. Training and promotion of personnel is one of the central points of an organ's management, and these subjects should be studied from various angles for future advancement. Some of the points are listed below:

(1) The curriculum adopted in TRAINMAR is same for both office workers and operational workers. However, since the purpose of the training is different for these professional categories, the curriculum should be so modified as to meet their work type.

(2) A system in which personnel can more easily take part in the training course should be invented with a view to raising morale and ability of port staff. Making training results a prerequisite for of promotion might be an idea for encouraging trainees.

(3) It is important to establish a promotion scheme which is transparent to these concerned by using personnel evaluation sheets.

14. For better port service, more extensive use of computers is recommended. Electronic data processing is useful for such administrative matters as accounting, statistics, berth utilization plan and planning of maintenance. However, among others, the computerization and data exchange brings about higher performances of container operation through optimum yard usage, adequate allotment of handling equipment, search of container location and so on. It is advisable that ENP and entities pertaining to the operation of the port build a computer network particularly for the terminal operation.

15. Well-programed maintenance and repair work raises the efficiency by reducing trouble during the work. A systematic procurement of spare parts and a planned disposal/replacement scheme should be adopted for this purpose.

16. Following the prevailing practice in the global maritime circle, container terminal should be operated by a qualified private entity. It is advisable for ENP that a lease/concession scheme is preferred to BOT or BOO scheme. In view of the relatively short time available for the inauguration of container berths, the preparation work, in particular, selection of the lessee and persuasion activities should be commenced at an early stage.

17. After privatisation steps including paragraph 16. above have been taken, ENP will be transformed into a more planning and coordination-oriented organ. It should therefore take the following responsibilities:

- General coordination and supervision in terms of development and operation are in the hands of ENP. It should keep a good relation with terminal operator and other private enterprises working in the port, and provide a rule concerning orderly usage of port facilities.
- Function of training particularly of port labor is well-suited for ENP since it carries on TRAINMAR.
- ENP should take initiative in forming a machinery with relevant private parties to keep up with users' request and to work for active port sales.

PART I

Port Development and Management
Strategy

Chapter 1 Forecasting of Port Demand

1.1 Major Industrial Branches

1. Present economic activities in connection with port activities in recent 11 years are shown in Table 1-1-1 and Table 1-1-2. Fig.1-1-1 and Fig.1-1-2 show handled volume by commodity type. The major import and export cargoes in Honduras are summarized as below:

- (1) Export : Agriculture: banana, coffee, melon, timber, sugar
molasses, pineapple, palm-oil, others
Fishing: shrimps, lobster, shell, fish, others
Industry and mining : cement, bulk mineral, textile
Others
- (2) Import : petroleum, fertilizer, wheat, foodstuffs, iron & steel, chemicals
machinery & transportation equipment, others

1.1.1 Agricultural and Forest Products

(1) Banana

2. Banana has long been the most important product of Honduras. The production of banana is based in the northern part of the country and it is managed mainly by two main companies: Tela Railroad Company(TRR) and Standard Fruit Company(SFC).

3. According to Table 1-1-3, the volume of banana production from 1970 to 1992 has fluctuated between 800,000 MT and 1,100,000 MT except 1975. Production in the past 2 years has been stable at about 959,000 MT. The maximum volume was 1,189,000 MT, reached in 1971.

4. According to Table 1-1-4, cultivated area for banana production was around 22,000 ha in the early 1970's but in 1992 it decreased to 17,500 ha. Increase in production is not expected in future, because a quota on banana imports by EC recently came into effect and also fluctuations in the international market price has curbed production.

5. From Table 1-1-1 banana export peaked in 1987 at 940,000 MT, export volume has generally stayed in the range between 700,000 MT and 900,000 MT. Taking into consideration the above and based on interviews, it may be reasonable to expect the volume of banana export to range between about 700,000 - 1,000,000 MT/year in near future. Major export destinations are U.S.A and EC.

(2) Coffee

6. Coffee is also one of the most important product of Honduras, next to banana. Coffee is produced almost all over the country and the export volume is the second largest after banana.
7. According to Table 1-1-3, the volume of coffee production remarkably quadrupled from 1970 to 1992, from 33,700 MT to 128,500 MT. The peak volume of 128,500 MT was recorded in 1991.
8. According to Table 1-1-4, cultivated area was 94,600 ha in 1970, and it has gradually increased to 151,700 ha in 1992 with an annual increase rate of 2.2%. Since the government is supporting the production. Future production of coffee will possibly continue to expand for a certain period of time.
9. In Table 1-1-1, export volumes are shown from 1982 to 1992. In 1992 the volume of exported coffee peaked at 118,800 MT; increase rate of export is about 7.5%. Because of international market competition and price the increase will not continue for a long period. Major export destinations are U.S.A, Japan and Germany.

(3) Sugar and Molasses

10. From Table 1-1-3, it is noted that the volume of sugar cane production has increased from 1,374,500 MT in 1970 to 3,150,000 MT in 1983. Then the volume decreased to 2,500,000 MT in 1988 but has recovered in the last five years. In 1992 production was 3,016,200 MT. The overall average increase is 3.6%. In particularly the increase rate from 1976 to 1980 was a remarkably 14.9%. A peak volume of 3,150,000 MT was recorded in 1983.
11. According to Table 1-1-4, cultivated area for sugar cane was 25,200 ha in 1970 and it increased to 42,800 ha in 1992. The increase of cultivated area corresponds to that of sugar production.
12. According to Table 1-1-7 which lists the volume of sugar production from 1978 to 1991, production has risen from 113,000 MT to 174,000 MT. During this period, the peak volume 174,800 MT was recorded in 1991. Forecast for increase rate of production is 4% per year, but that will be influenced by the international market and domestic consumption.
13. According to the port statistics on export in Table 1-1-1, the volume of sugar xport was 87,000 MT in 1982, and peaked to 105,000 MT in 1985. However the export volume

has while steadily decreased, registering only 12,800 MT in 1992. The rate of decrease is very large when compared with production. The possible reasons are that the sugar export has been influenced by the international market, domestic consumption has remarkably increased along with the population growth as well as an improvement of living standards.

14. According to the statistics of molasses export, shown in Table 1-1-1, the volume of export steadily decreased to 12,300 MT in 1991 from 61,200 MT in 1982, however, in 1992 volume increased to 31,300 MT.

(4) Melon

15. According to Table 1-1-3, volume of melon production shows a surprisingly rapid growth, from 558 MT in 1970 to peak volume of 48,600 MT in 1989. This tendency will possibly continue for a while. The production of melon is found in the southern part of the country and the export volumes also shows rapid growth.

16. In Table 1-1-1 volume of melon export is listed. The melon export started in 1989 when the quantity was only 106 MT, however it recorded constant increases and 58,000 MT in 1992. Since the government is adopting policy to promote non-traditional agricultural commodities, growth of melon export can be considered to continue for a while.

(5) Pineapple

17. Production of pineapple also shows rapid growth. According to Table 1-1-3 production of pineapple grew to 215,200 MT in 1989 from 5,300 MT in 1970. Especially, the increase from 1979 to 1980 is surprising. The increase rate after 1980 was rather stable at 4.8% per year. In 1989 production volume peaked at 215,200 MT. This tendency may also continue for a while.

18. From Table 1-1-1 it is noted that up to 1988 export volume of pineapple was stable, however, after 1988 exports have been steadily increasing to 48,600 MT in 1992 from 25,700 MT in 1988. The annual increase rate of export volume counts about 17.3%. Increase of export may also continue while the rate of increase will be lower. Major export destinations are U.S.A and EC.

(6) African Palm

19. Table 1-1-3 shows production volume of African palm from 1970 to 1991. The volume increased from 32,800 MT in 1970 to 383,000 MT in 1992. The production volume has remarkably increased in the last 20 years by more than 10 times. The average rate of annual increase is 11.8%.

20. According to Table 1-1-4, cultivated area increased from 4,500 ha in 1970 to 29,100 ha in 1992. The increase in production volume, is not only attributed to the expanded cultivation area, but also to an improvement in productivity.

21. Table 1-1-1 lists export volume of export from 1982 to 1992. Export began in 1984 and the volume was 1,500 MT. The export volume continued to grow to 27,900 MT in 1987, however, after that figures declined. In 1990 and 1991, no export was recorded, but in 1992 export totalled 10,500 MT. The decrease in export despite the increase in production possibly indicates an increase in domestic consumption.

(7) Timber

22. Timber was one of the most important products of Honduras and its export volume was the second largest after banana until 1990, but now it has fallen to third place. The production sites of timber are mainly in eastern part of the country.

23. According to Table 1-1-3, production of timber decreased from 610,400 cu.m in 1977 to 302,600 cu.m in 1991. The annual rate of change is 5% per year. During this recorded period the maximum product was obtained in 1978 as 615,800 cu.m. Future volume of production will maintain the current level at best, because of the increased awareness of the need to protect the environment, and in particular of the need to curb further the deterioration of the forest zone.

24. From Table 1-1-1 it is noted that the volume of timber export declined to 94,807 MT in 1990 from its peak of 228,200 MT in 1982. After 1990, the volume shows small up-trend and the decrease rate of export for the period from 1982 to 1992 is about 6.8%. Major export destination are Caribbean countries, Europe, Japan, U.S.A. and Latin America.

1.1.2 Marine Products

25. There is only limited data available for marine products. Table 1-1-5 shows the volume of marine production from 1988 to 1991. The total volume varies from 5,060 MT to 8,800 MT and we find an increasing trend at a rate of 20.23% per year. The

maximum volume is 8,800 Mt in 1991. Production volume will increase for a while through modernization of fishing methods.

26. Table 1-1-6(b) shows the volume of shrimp export from the Port of Cortes from 1988 to 1992. The export volume shows considerable increase from 2,841 MT in 1989 to 6,823 MT in 1992, with an average increase rate of about 33.9%. There are considerable divergences of figures between the production statistics and ENP statistics (export). For example, in 1988, while production was 5,000 MT, export from Cortes recorded 6,100 MT. At any rate, however, it is reasonable to assume that the volume of export is at the level of several thousand to ten thousand MT.

1.1.3 Mining and Industry

(1) Mining

27. Major export cargo of bulk minerals are ore of zinc, lead and copper. According to Table 1-1-1, the volume of export grew from 66,800 MT in 1982 to 139,200 MT in 1985, but because of the bankruptcy of the mining company, the volume decreased to 38,000 MT in 1987. In 1987 a new company was established using U.S capital, then the volume of export recovered to the level of 80,000 MT. In 1992, the volume was 87,400 MT. During this recorded period, the maximum export volume was 139,200 MT in 1985. Domestic consumption is too small to consider.

(2) Cement

28. Cement recorded the second largest export volume in 1989 next to banana. According to Table 1-1-7 the production volume increased from 274,300 MT to 693,000 MT, with the rate of increase of 7.4%. During the period in the Table, the maximum production was 697,700 MT in 1990 and that volume has been maintained for the last three years. According to an interview with a cement company, the production will grow to 1,100,000 MT which is the production capacity of the sector.

29. According to Table 1-1-1, the volume of cement export recorded high levels in 1988, 1989 and 1990. In 1989 in particularly recorded the maximum volume of 210,600 MT. In 1992, however, it decreased to 29,200 MT. The reasons for this decrease are that the company was nationalized in 1991 and the domestic consumption increased in line with the population growth as well as the expansion of the economy. In future the volume of export will possibly increase. Because Honduras has excess capacity of cement production and the company which was privatized again in 1992, intends export their production.

(3) Iron and Steel

30. According to Table 1-1-2, the volume of iron and steel import fluctuates by two to three year cycles, however, long term trend indicates a general increase. In 1982 the import volume was 30,600 MT and it increased to 94,500 MT in 1992. The rate of increase is 11.9% per year. The import volume will continue to increase because the domestic consumption will increase according to the population and industry growth.

(4) Machine and Transportation Equipment

31. According to Table 1-1-2, it is noted that the import volume of machine and transportation equipment has fluctuated, however, long-term trend indicates increase. In 1982 the volume of import was 11,600 MT. Then the volume increased to 30,500 MT in 1992. The rate of increase is 10.1% per year. The above figure is justified by at the transport sector. The number of automobiles (shown in Table 1-1-12) has increased for the past five years, population per one car reached 31 persons in 1991 from 44 persons in 1986. The import volume will increase in conjunction with the growth of the transportation sector as well as industry.

(5) Chemicals

32. Chemicals are comprised of the following materials: paints, varnish/lacquers, soaps, perfume/cosmetics, tannery martials, refrigerated gases, caustic soda, aerosol. According to Table 1-1-2, the volume of import maintained a steady level, although there is a small fluctuation. The import volume will possibly increase according to the increase of domestic consumption which correlates to the population growth as well as growth of industry.

1.1.4 Energy Sector

(1) Petroleum Import

33. Petroleum may be the most important item for the port sector. It is imported by Texaco through the Port of Cortes and by Petro Tela through the Port of Tela. In near future Petro Sur will start importing petroleum through the Port of San Lorenzo. According to Table 1-1-2, the import volume has gradually increased. While in 1982 import volume was 518,300 MT, in 1992 it increased to 807,400 MT. During this period the maximum yearly import was 826,400 MT in 1989. The rate of increase over the period of 1982 and 1992 is 4.5% per year. The import volume will increase according to the growth of domestic consumption.

34. According to Table 1-1-8 and Fig.1-1-3, the consumption of petroleum has steadily increased. The consumption in 1985 was 673,800 KL and in 1989 reached 910,100 KL. Major proportion of consumption is: diesel oil 45%, gasoline 21%, fuel oil 17%, jet-oil 7%. Rate of increase of each fuel over the period of 1985 - 1989 is: fuel oil 88%, gasoline 42%, jet-oil 28%, diesel oil 27%. These increases are related to the increases of industry, car ownership, air transport and truck and trailer transport. In future based on interviews and according to the increase of transportation, petroleum import will increase substantially.

(2) Electricity and Fuel Consumption

35. Table 1-1-9 shows the statistics of electric consumption from 1978 to 1991. In 1982 720 million Kwh electricity was generated. In 1991 it increased to 2,317.7 million Kwh which is the maximum electric generation. The rate of increase is 9.4% per year. According to Table 1-1-10 which shows the capacity of power plant, the capacity was 243,142 Kw in 1983 and in 1992 it increased to 526,520 Kw.

36. According to Table 1-1-11, fuel consumption for the purpose of power generation dramatically decreased from 1983 to 1992. In 1983, fuel consumption was 119,967 KL, which dramatically decreased to 2,188 KL in 1991. During this period the maximum consumption was recorded in 1983. It should be borne in mind that the major volume of petroleum consumption is mainly by La Ceiba plant. From Table 1-1-10 total capacity of power plant was doubled in 1985 because of the start of operation at El Cajon plant.

1.1.5 Others

(1) Fertilizer

37. According to Table 1-1-2 which lists the volume of fertilizer import from 1982 to 1992, import volume was 49,900 MT in 1982, and it increased to 109,000 MT in 1992. The rate of increase is 8.1% per year. During this period, the maximum volume, 135,800 MT was recorded in 1991. We observe a big decrease between 1991 and 1992. The possible reasons of this decrease is reduced purchasing power because of change in the foreign exchange rate. The import volume will increase because farmers tend to use more and more fertilizer to obtain higher productivity.

(2) Wheat and Other Foodstuffs

38. According to Table 1-1-2, volume of wheat import was 84,400 MT in 1982 which increased to 106,500 MT in 1992, the maximum import volume was 160,600 MT in 1991. The rate of increase from 1982 to 1992 is 2.4% per year. In the meantime, the volume of flour product increased from 51,800 MT in 1978 to 81,600 MT in 1990, and rate of increase is 3.9% per year. The import volume of wheat will increase according to the increase of domestic consumption which depends on the population growth and improvement of people's living standard. From Table 1-1-2, it is noted that many kinds of other foodstuffs are imported. In 1982 the volume was 46,800 MT which increased to 108,000 MT in 1992. The maximum import volume was 219,700 MT in 1991. The rate of increase from 1982 to 1992 is 8.7% per year. Between 1991 and 1992, there is a big decrease, the reason of which is not clear. The import volume will increase according to the increase of domestic consumption which will accompany the population growth and improvement of people's living standard. Per capita consumption of foodstuffs is shown in Table 1-1-13 which was prepared in 1987. In the Table, there are considerable differences among region. This data will be utilized to estimate the future demand.

(3) Textile

39. As already stated in chapter 1.4, Part I there are several places running as Zonas Libres or similar zones. The major products from these places are textile. According to Table 1-1-14, the export volume of textile was 14,800 MT in 1991 and 26,600 MT in 1992. It is observed that there is a rapid increase. The export volume may contribute to be increase with some reduction in the growth rate according to the growth of industry in Zonas Libres and similar zones.

1.2 Available Socioeconomic Data

1.2.1 Population and its Distribution

40. There are several source of population statistics such as Banco Central, SECPLAN and so on. However, most of them have data only up to 1988. For the purpose of the population forecast, we selected data based on the following conditions.

- (1) The base year of this study is 1992.
- (2) The target year for the forecast is 2010.
- (3) Authorized data which includes the latest year will be preferable.
- (4) Data which covers a wide scope will be desirable.

41. After a careful check of the several sets of data we decided to use, mainly, the data which was published by Banco Central de Honduras, which describes total population, population by department and by each economic sector up to the year 2000. There is no substantial difference among data for 1988.

(1) Population

42. Population of Honduras is as shown in Table 1-2-1, which is based on data of Banco Central. Population for 1992 is estimated as follows:

	Population	Male	Female
In 1992	5,079,200	2,521,700	2,557,500
	Urban	Rural	Density
In 1992	2,119,200	2,960,000	45.3

43. Rate of increase from 1978 to 1992 is 3.32% per year. Proportion between urban and rural is 41.7% : 58.3%. Rate of increase of each area is 4.8% and 2.3% respectively, and this indicates a rapid growth in urban area.

(2) Population of Department and Cities (Table 1-2-2)

44. Population for each department and cities is given in Table 1-2-2. Above data were both based on data of Banco Central in 1992 as well as SECPLAN in 1988. According to Table 1-2-2, population of Francisco Morazan department, which is home to the capital is 1 million and then Cortes department follows with 0.7 million. The population of these two departments occupies 35% of the total population.

45. Population of El Distrito Central (Tegucigalpa and Comayaguera) in 1992 is the largest in Honduras, 0.7 million, and San Pedro Sula follows with 0.35 million. Each of La Ceiba, El Progreso and Choluteca has more than 50 thousand populations.

(3) Labor Force Distribution by Economic Sector

46. According to Table 1-2-3, total number of laborers force is 1.5 million in 1992. The labor force is growing every year and the increase rate is 4.1%. Agriculture sector employs 718 thousand, followed by service sector (331 thousand), industrial sector (187 thousand) and commercial sector (165 thousand). Increase rate of each sector for the past 10 years is: agriculture 2.18%, mining 0.2%, industry 4.17%, electric/gas/water 8.75%, construction 7.5%, commerce 5.5%, transport/warehouse 3.99%, bank/insurance 7.12%, service 6.59%.

1.2.2 Gross Domestic Product (G.D.P)

47. According to Table 1-2-4 (source: Banco Central), GDP in 1992 is given as 15,830 million lempiras at current price and GDP per capita is obtained as 3,117 lempiras. In constant price of 1978, GDP is 5,021 million lempiras. Refer to Table 1-2-5.

48. Comparison of GDPs of 1978 and 1992 indicates that GDP has expanded by annual rate of 2.75%, while the increase of population was larger than GDP. Consequently, GDP per capita declines in 1992.

	GDP	Rate	Per capita	Rate	Population	Rate
1978	3,433		1,068		3,214.2	
1992	5,021	2.75%	989	-0.5%	5,079.2	3.32%

1.3 Socioeconomic Frame

49. There is no authorized long term future plan in Honduras except estimation of population. Banco Central de Honduras estimated the total population at the rate of 3.32% per year as well as population of each economic sector up to 2000 which the study team used. After 2000 up to 2010, total population will be estimated by the increase rate of 2.50% because the birth rate will presumably decline with the progress of per capita income and the growing density within the country. Population of each economic sector is estimated by extrapolating the increase rate of the years between 1992 and 2000 to the year 2010, because a decline in birth rate will not influence labor force before 2010.

1.3.1 Total Population and its Distribution

(1) Total Population

50. Following the above mentioned calculations, Table 1-2-1 and Table 1-2-2 are obtained, as follows:

	In 1992	In 2000	In 2010
Population	5,079,200	6,597,100	8,444,800
Male	2,521,700	3,275,300	4,192,600
Female	2,557,500	3,321,800	4,252,200
Density	45.3	58.9	75.3
Urban	2,119,200	3,056,400	4,285,300
Rural	2,960,000	3,540,700	4,159,500

51. Proportion between urban and rural is 46.3% : 53.7% in 2000. Rate of increase of each figure is 4.7% and 2.3%, respectively. Proportion of urban and rural is 50.7% : 49.3% in 2010, their rates of increase are 3.4% and 1.6%. These trends are shown in Fig.1-3-1 and Fig.1-3-2.

(2) Population by Departments and Cities in 2000 and 2010

52. It is noted from Table 1-2-2 that in the year 2000 the population of Francisco Morazan department will be 1.35 million and population of Cortes department, where San Pedro Sula is located will be 1.06 million. These two departments will occupy 37% of total population. Concentration of population is foreseen.

53. Population of El Distrito Central in 2000 will be about 1.0 million and in San Pedro

Sula city, 0.50 million. The five cities of La Ceiba, El Progreso, Choluteca, Puerto Cortes and Danli will have a population of more than 50 thousands.

54. According to Table 1-2-2, population of Francisco Morazan department will reach about 1.82 million and population of Cortes department will be 1.41 million. These two departments will account for 39% for total population. Population concentration progress much more.

55. In 2010, the population of El Distrito Central is 1.57 million and San Pedro Sula city is 0.78 million. Six cities of La Ceiba, El Progreso, Choluteca will have a population of more than 100 thousand.

(3) Labor Force by Economic Sector

56. The size of the labor force will be 2,226.6 thousand in 2000. The Table is taken from Banco Central. The size of the labor force will be growing every year and the increase rate is 4.1%. Agriculture sector is 853 thousand and service sector 552 thousand, industrial sector 259 thousand and commercial sector 254 thousand. Increase rate of each sector in the past 10 years is: agriculture 2.18%, mining 0.2%, industrial 4.17%, electric/gas/water 8.75%, construction 7.50%, commercial 5.52%, transport/warehouse 3.99%, bank/insurance 7.12% and service 6.59%. These rates will be used for estimating of the size of the labor force in each economic sector in 2010.

57. According to Table 1-2-3, the total number of laborers in 2010 will be 3,525.2 thousand (estimated by The Study Team based on the above data). However, labor force will grow every year and the increase rate is 4.1%. Agriculture sector is 1,058 thousand, service 1,044 thousand, industrial 390 thousand and commercial 434 thousand. The same increase rate of each sector was adapted for this 10 year period.

1.3.2 GDP (Gross Domestic Product) Forecast for the Years 2000 and 2010

58. Since there exists no GDP forecast in this country, some estimation of GDP for the years 2000 and 2010 is inevitable for measuring future port demand. Available data are a series of population forecasts including those by departments, cities and labor force by economic sector, and GDP from 1978 to 1992 (1978 Value). Under the circumstances, it would not be appropriate to conduct a simple calculation, thus, the study team provides two separate GDP forecast, namely, scenario 1 (low scenario) and scenario 2 (high scenario).

59. First method for forecasting GDP follows the procedure below.

(1) Adjustment of labor force by GDP sector adapting labor force by economic sector.

- (2) Calculation of correlations between population of labor force and GDP of each sector.
- (3) Calculation of future GDP of each sector according to the future labor force by each sector.
- (4) Corrections and total GDP of each sectors.

The result of calculation is shown in Table 1-2-5, Fig1-3-3 and Fig.1-3-4.

60. According to Table 1-2-5, GDP in 2000 will be 6,377 million lempiras. Increase rate during 1992 and 2000 will be 3.03% which is less than increase rate of population, therefore, GDP per capita will be 967 lempiras. In 2010 GDP will be 9,154 million lempiras, increase rate during 2000 and 2010 will be 3.68% which is little larger than increase rate of population, therefore GDP per capita will be 1,084 lempiras. This growth of GDP is called scenario 1.

	GDP	yearly growth rate	GDP/capita	yearly growth rate	Population	yearly growth rate
1978	3,433		1,068		3,214	
1992	5,021	2.75%	989	-0.5%	5,079	3.32%
2000	6,377	3.03%	967	-0.2%	6,597	3.32%
2010	9,154	3.68%	1,084	1.1%	8,445	2.50%

61. These figures are pessimistic because in 2,000 per capita income is down 2.2 points from its current level and even in 2010 it only slightly exceeds its peak figure of the past. Nevertheless these figures could possibly be deemed the lowest considering the downward trend of recent per capita income.

62. Second method for forecasting GDP is as follows.

- (1) In the central or south American area, look for a country whose situation is similar to Honduras in 2010.
- (2) Adopt the per capita GDP of the country similar to Honduras in 2010.
- (3) Calculating GDP

63. Situation of Honduras in 2010 will be as follows.

Area (km ²)	Population(thousand)	density of population
112,088	8,444.8	75.3

In 1990 the situation of Guatemala was similar to that of Honduras.

Situation of Guatemala in 1990 ;

Area (km ²)	Population (thousand)	density of population
108,889	9,197.0	84.5

64. In 1990 Per capita GNP of Guatemala was US\$ 900, and Honduras was US\$ 590 base on the IDB data. In 1990, per capita GDP of Honduras was 982 lempiras. So Honduras' per capita GDP in 2010 is supposed as follows ; $982 \times 900 / 590 = 1,498$ -- 1,500. The per capita GDP of Honduras in 2010 was supposed 1,500 lempiras, therefore total GDP will be 12,667 million lempiras. This growth of GDP is herein after called scenario 2. The result of calculation is shown Table 1-3-1, Fig.1-3-5 and Fig.1-3-6 and summary is given below.

	GDP	yearly growth rate	GDP/capita	yearly growth rate	Population	yearly growth rate
1978	3,433		1,068		3,214.2	
1992	5,021	2.75%	989	-0.5%	5,079.2	3.32%
2000	7,850	5.75%	1,190	2.3%	6,597.1	3.32%
2010	12,667	4.90%	1,500	2.3%	8,444.8	2.50%

65. These figures are brighter and more encouraging because per capita income will substantially increase, however, it is highly debatable that the highest level of per capita income is attainable.

1.4 Methodology for Demand Forecast

66. There are two methods commonly used to forecast the future cargo volume. The first one is a macro forecast. Based on the assumption that the cargo volume handled at the port reflects the economic activity in the port's hinterland. The total cargo volume is estimated using the historical relation between cargo volume and macroeconomic indices such as GDP and population. The second method is a micro forecast, which estimates each commodity group individually based on related indices and the forecast demand and supply situation.

1.4.1 Correlation between Cargo Volume and Indices

(1) Macro Method

Total cargo volume : Total population, GDP
Total import cargo volume : Total population
Total export cargo volume : GDP

(2) Micro Method

1) Export cargo

Banana : Agriculture population, cultivated area, Domestic consumption, international market
Coffee : Agriculture population, cultivated area, Domestic consumption, international market
Melon : Agriculture population, cultivated area, Domestic consumption, international market
Pineapple: Agriculture population, cultivated area, Domestic consumption, international market
African : Agriculture population, cultivated area, palm Domestic consumption, international market
Timbers : Agriculture population, forestry area, Domestic consumption, international market
Shrimps : Fishing population, domestic consumption, international market
Cement : Industrial population, Domestic consumption, international market

2) Import cargo

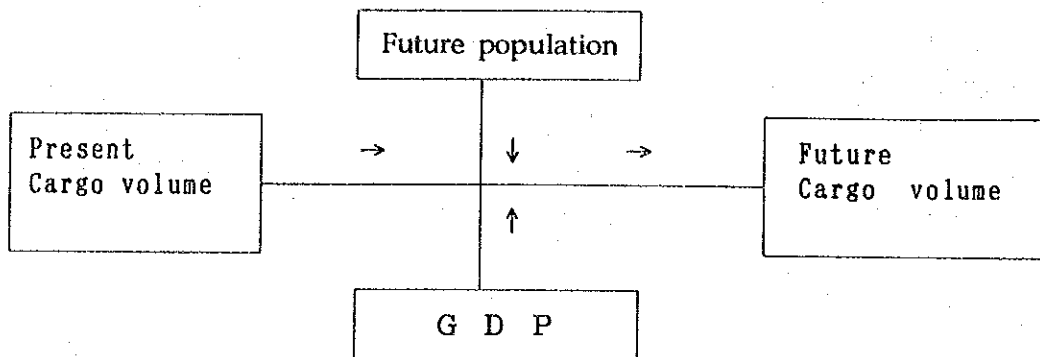
Petroleum : Population, GDP, Generation, Automobiles
Wheat : Population, Personal consumption, Product
Other foods : Population, Personal consumption, Product

- Fertilizer : Agriculture product, Unit consumption
- Iron, steel : GDP, Mining, Industry, Construction
- Transport : Progress of motorization, Industry Machine
- Chemicals : GDP, Industry, Population
- Others : Population, GDP

1.4.2 Macro Method

67. Total cargo volume, total export cargo volume, total import cargo volume will be estimated by macro method as mentioned below.

Macro method

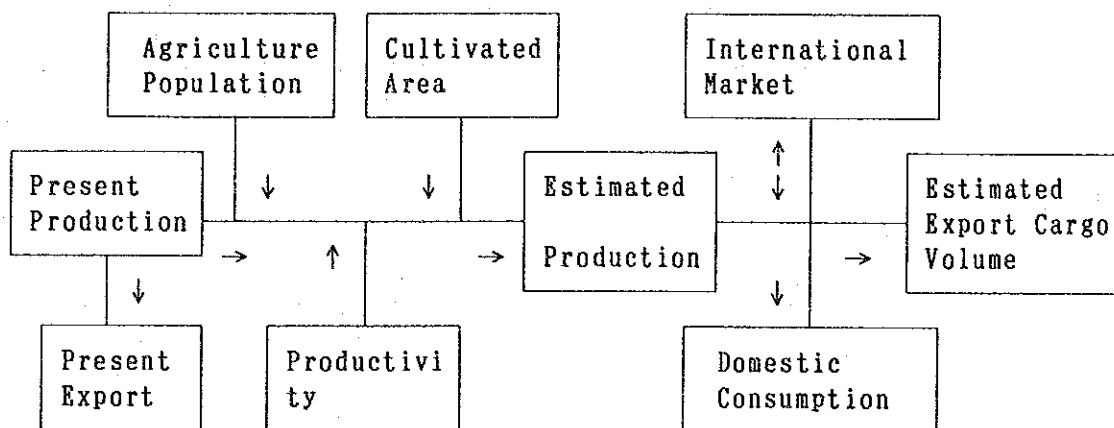


1.4.3 Micro Method

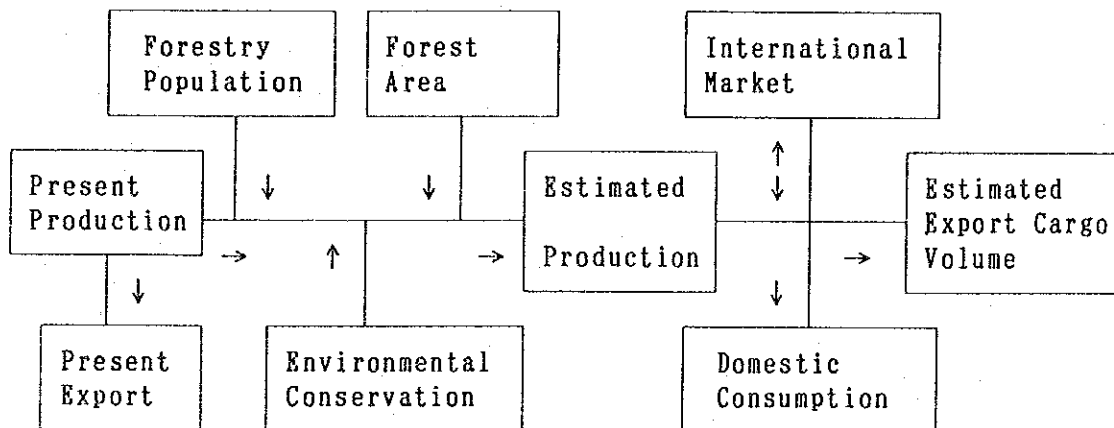
68. Each commodity will be estimated basically using following methods based on the above indies.

Micro method

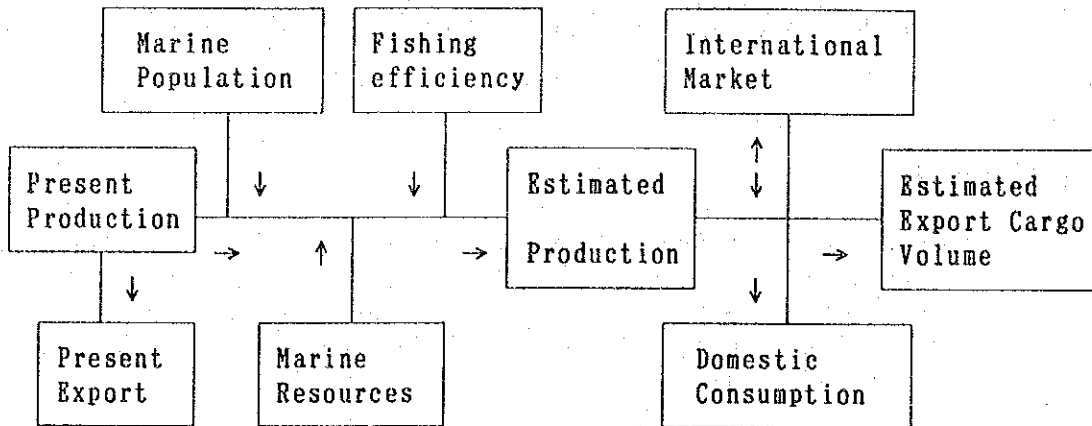
1) The export cargo volume of Banana, Coffee, Sugar, Melon, Pineapple, and African palm will be estimated by following micro method.



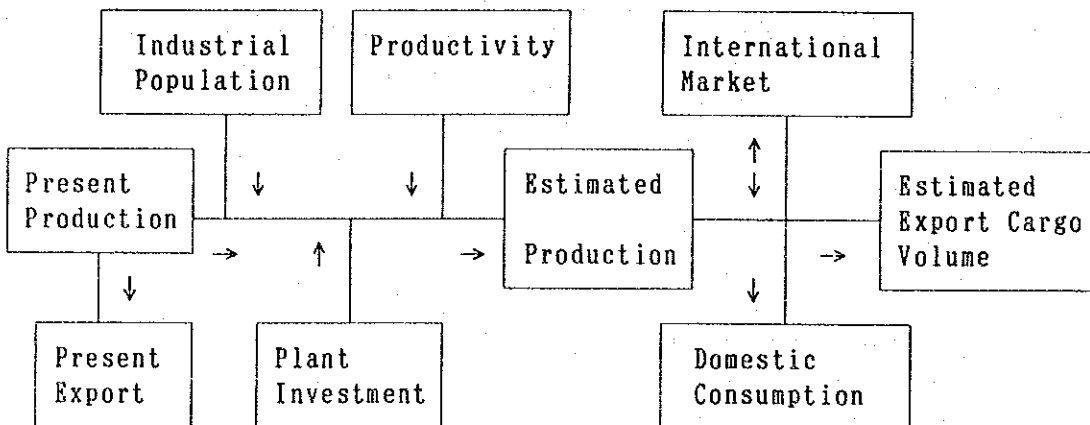
2) The export cargo volume of Timber will be estimated by following micro method.



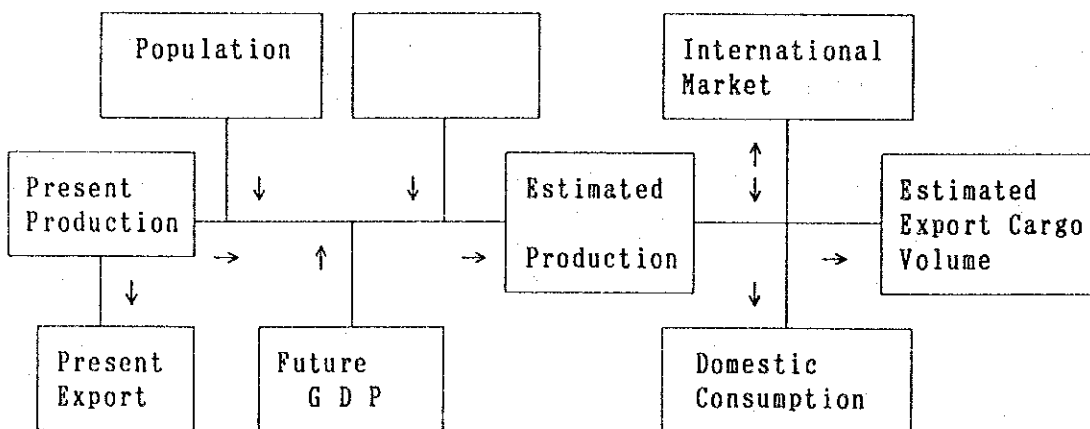
3) The export cargo volume of marine product will be estimated by following micro method.



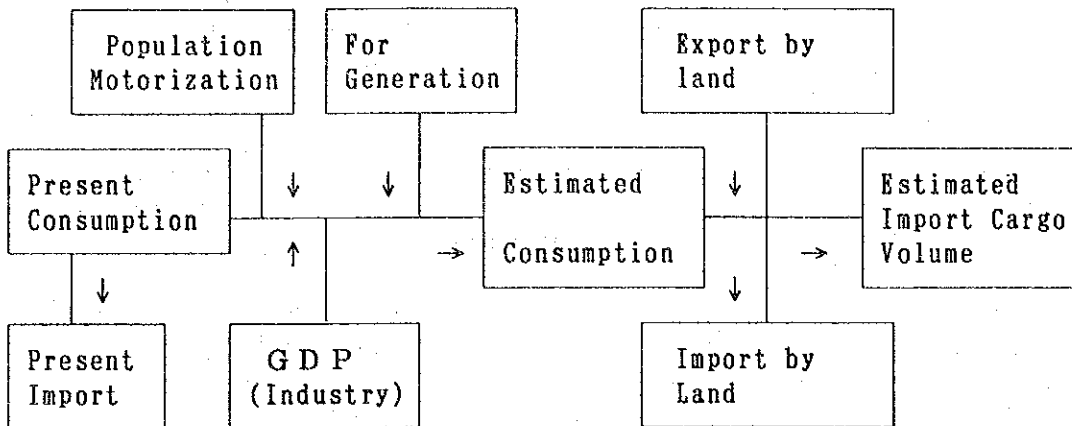
4) The export cargo volume of mining and industrial product will be estimated by following micro method.



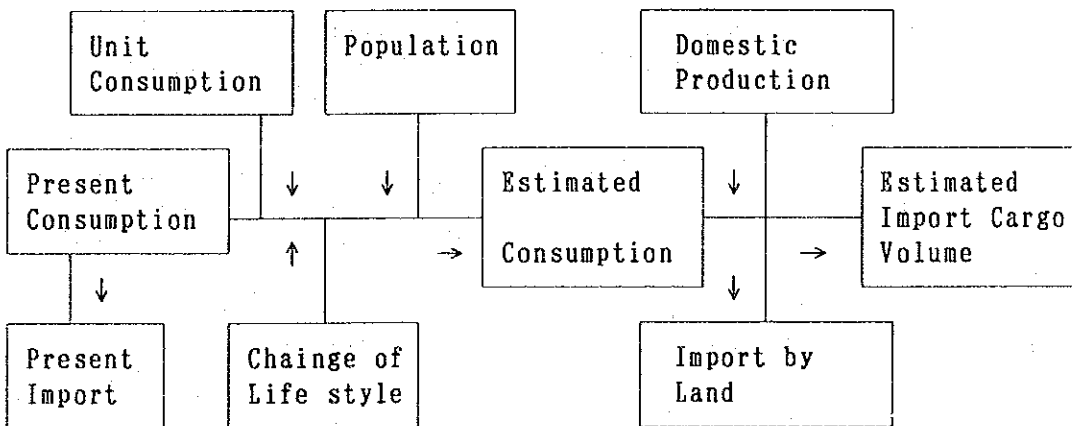
5) The export cargo volume of others will be estimated by following micro method.



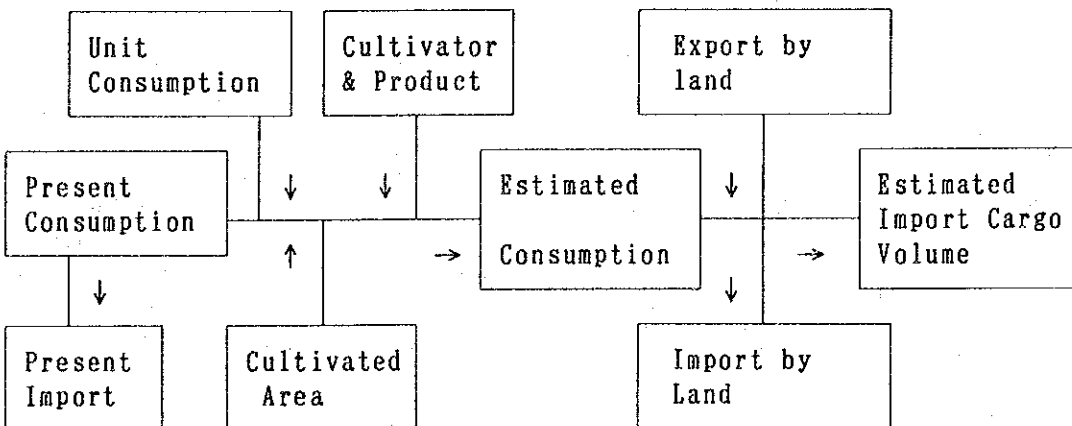
6) The import cargo volume of Petroleum will be estimated by following micro method.



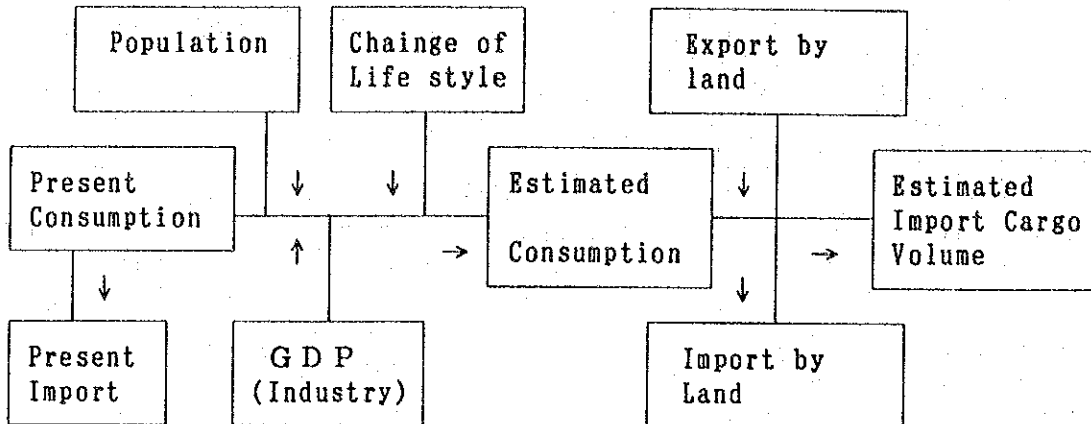
7) The import cargo volume of Wheat and other foods will be estimated by following micro method.



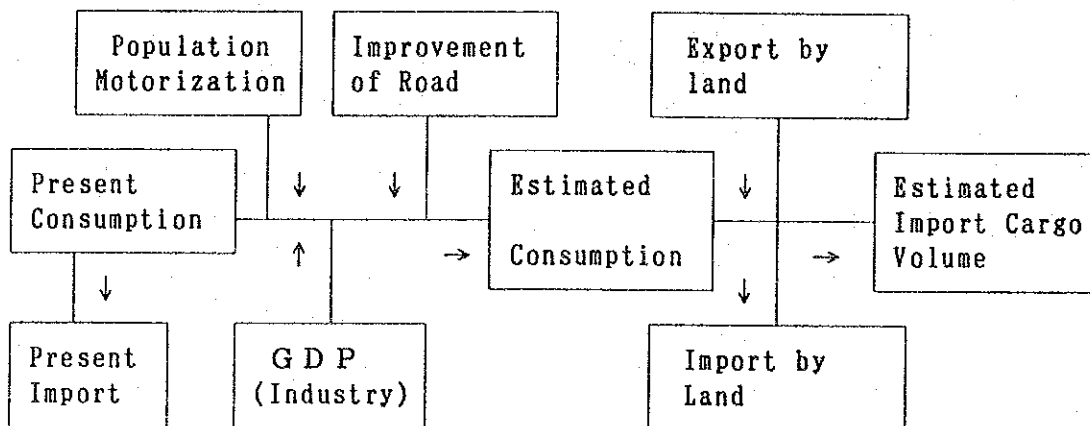
8) The import cargo volume of Fertilizer will be estimated by following micro method.



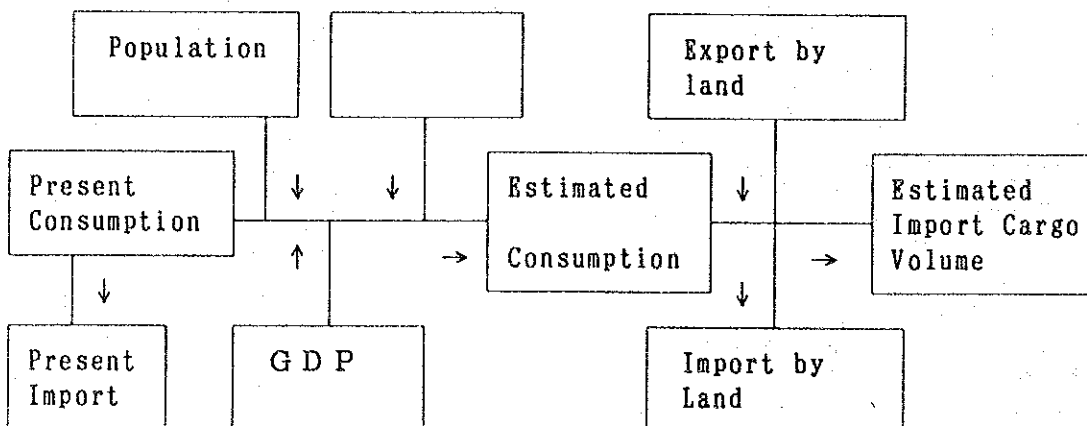
9) The import cargo volume of iron/steel, chemicals will be estimated by following micro method.



10) The import cargo volume of Machine and Transportation equipment will be estimated by following micro method.



11) The import cargo volume of others will be estimated by following micro method.



1.5 Hinterland of Each Port

1.5.1 Conceptual Frame of Hinterland

69. In order to forecast the future cargo volume for each port, hinterland should be defined. The hinterland of each port depends on various factors such as the proximity to consumption center/production center from the port, customary business practices and so on. The hinterland also varies from cargo to cargo. In this section, hinterland of each port is considered within the following frames.

70. As will be stated in Chapter 2, PART II, expected roles and functions of each port are outlined as follows;

- 1) The port of Cortes will remain as the leading port of Honduras. It functions as a major international port as well as domestic trade distribution center.
- 2) The ports of Castilla and San Lorenzo, together with the port of Cortes, will bear the role as the international sea gates of Honduras. The port of Castilla will enhance its importance as the gate for domestic trade.
- 3) The port of Tela has only limited significance as the gate for importing petroleum.
- 4) The port of La Ceiba will function as the only port for domestic trade, connecting to the Bay Islands.
- 5) The port of Roatan will have a significant role for the Bay Island in terms of domestic trade as well as limited scope of international trade.

71. Taking into account the roles and functions of each port, the premises used to define the hinterland are as follows.

- 1) Objective ports are ports of Cortes, Tela, La Ceiba, Castilla, San Lorenzo and Roatan.
- 2) The port of Tela, with the new pier which is now being planned, will be considered mainly for the purpose of petroleum import.
- 3) The port of La Ceiba will have a significant role in terms of domestic trade. The domestic cargo flow will be forecasted, instead of defining hinterland, based on the very limited data and interviews.
- 4) The port of San Lorenzo will operate as an oil import facility.
- 5) In Roatan, only domestic cargo flow will be forecasted. Cargo volume of international trade will be very roughly forecasted, however, it will be treated only as a reference number only.
- 6) Transportation network in the years of 2000 and 2010 are assumed as in Fig.1-5-1, Fig.1-5-2 and Fig.1-5-3. As shown in the figure, the road connection between the

port of Castilla and Juticalpa will be completed and the port of Castilla will have direct access to Tegucigalpa. The railroad will keep its roles and functions, however, the connection between the port of La Ceiba and Aguan Valley will not be rehabilitated.

7) Various industries as well as commercial functions will further concentrate in/around San Pedro Sula, however, some industrial new comers will be locate mainly in the north-central region.

72. The above premises may be modified in the course of the Study if the Team acquires additional data and information.

1.5.2 Hypothesis for the Transport Network

73. The model transportation networks are shown in Fig.1-5-1, Fig.1-5-2 and Fig.1-5-3. In the figures, distances between major locations will be given. It is assumed in the following analysis that the capacity of 4-lane roads will be the double the capacity of 2-lane road and the time taken between the locations is half of that by a 2-lanes road.

1.5.3 Definition of Hinterland for each port

74. We will define hinterlands for the ports of Cortes, Castilla and San Lorenzo, based on the above conditions. We will use a two-step approach to define the hinterland. First, we divide the whole country by department. Then, the distance from each one of these three ports is calculated and converted to time. Thus, the approximates of the ports are evaluated and whole country is divided into three hinterlands (the first approximation, called Geographical hinterland). The second step is to modify the said hinterland according to the present flow of each commodity (the second approximation).

75. According to the first approximation, the hinterland of the Port of Cortes comprises nine (9) departments; Cortes, Copan, Santa Barbara, Atlantida, Yoro, Ocotepeque, Lempira, Intibuca and Comayagua.

76. The hinterland of the Port of Castilla consists of the following three (3) departments; Colon, Olancho and Gracias A Dios.

77. The hinterland of San Lorenzo consists of the following five (5) departments; Valle, Choluteca, La Paz, El Paraiso and Francisco Morazan.

78. The remaining department, Islas de la Bahia, will not be directly included in any one of these hinterlands, however, it will relate to the ports of Cortes and Castilla through domestic shipping lines. The major part of Gracias A Dios will also be related

to these ports by domestic shipping lines.

79. In Fig.1-5-4 and Table 1-5-1, the first section summarizes the first approximation of hinterland. These models are not in conformity with the present situations in some aspects, especially import cargoes and some export cargoes. Then, we have modified the hinterland, as shown in the second approximation for each commodity.

80. In Chapter 2, Part I, the hinterland of each major commodity is already stated. The main features of the current trade is that the trade with the Gulf Coast region and the East Coast of the U.S., Caribbean countries and European countries are conducted through the port of Caribbean Coast of Honduras. On the contrary, the trade with the West Coast of the U.S. and Asian countries are conducted through the port on the Pacific side. In short, the main market of Honduras is U.S. Gulf, East Coast, Caribbean countries as well as Europe. In future, small amount of export to Pacific Rim countries, such as Australia and New Zealand, will be added to these main market. The main origins of imports are US Gulf, East Coast, Europe as well as Far East and this trend is expected to continue.

81. Taking into full consideration the above mentioned circumstances, we can get the modified hinterlands as shown in the middle section of Table 1-5-1. Some export cargoes such as fruits, shrimp and cement, with the main market in US Gulf, East Coast and Europe, flow through the port of Cortes. Some import cargoes including wheat, other foodstuff, chemicals, with the main origin in US Gulf, East Coast and Europe, enter through the port of Cortes. Other import cargoes are from the Far East and they use the port of San Lorenzo. Some part of these cargos which are used in fruits plantations will be handled at the port of Castilla.

82. As for the petroleum import, oil importers seem to have an agreement concerning their respective shares in Honduras. Petro Sur will import their oil from Alaska, and Texaco and Petro Tela are importing their oil from the Gulf or the Caribbean countries. This trend will not change in future. The volume of import at the port of San Lorenzo may increase because the company has a plan to distribute the imported oil to neighboring countries.

1.6 Macro Approach to Future Port Demand

83. Generally speaking, the cargo handling volume of ports has a close relation with the social and economic indices of the country. The available social and economic indices in Honduras are population and GDP. Therefore, future cargo volume is calculated by utilizing these two indices.

1.6.1 Macro Forecast of Import Cargo Volume at Ports

(1) Correlation with Population

84. Total import cargo volume handled at ports is forecasted by its correlation with population. The correlation between the cargo volume and population from 1974 to 1992 is expressed in the following equation.

$$Y = 0.443 X - 297 \quad (R = 0.931)$$

Where, Y : Total import cargo volume at ports (Thousand MT)
x : Population (Thousand)

(2) Correlation with GDP

85. Total import cargo volume handled at ports is forecasted by its relation with GDP. The correlation between the cargo volume and GDP from 1974 to 1992 is expressed in the following equation.

$$Y = 0.432 X - 218 \quad (R = 0.908)$$

Where, Y : Total import cargo volume at ports (Thousand MT)
x : GDP (Million lempiras)

(3) Estimation of Total Import Cargo Volume at Ports

86. The total import cargo volume at ports in the future is estimated using the above equation in relation to population, GDP of scenario 1 and GDP of scenario 2. The results are shown in Table 1-6-1 and Fig.1-6-1, a summary of which is given below. (Unit:Thousand MT)

	By Population	By scenario 1	By Scenario 2
In 1992	1,953	1,953	1,953
In 2000	2,626	2,582	3,176
In 2010	3,444	3,740	5,259

87. There is not a great difference between the estimation by population and by scenario 1, so the estimation by scenario 1 will be utilized for each port rather than estimation by population.

1.6.2 Macro Forecast of Import Petroleum Volume at Port

88. Petroleum is the single largest port cargo in Honduras and its handling practice is different from other port cargo. Therefore, even for rough planning, it is better to forecast the volume of petroleum separately. Based on interviews, petroleum import companies have plans to use the special ports for import petroleum. Total import petroleum volume handled at the ports is forecasted based on the correlation between the past handling cargo volume and GDP.

89. Total import petroleum volume handled at ports is forecasted by its relation with GDP. The correlation between the petroleum volume and GDP from 1982 to 1992 is expressed in the following equation.

$$Y = 0.212 X - 218 \text{ (R = 0.893)}$$

Where, Y : Total import petroleum volume at ports (Thousand MT)
 x : GDP (Million lempiras)

90. Estimation of total import petroleum volume at ports. The total import petroleum volume at ports in the future is estimated using the above equation in relation to GDP of scenario 1 and scenario 2. The results are shown in Table 1-6-2 and Fig.1-6-2, a summary of which is given below. (Unit:Thousand MT)

	By scenario 1	By scenario 2
In 1992	807	807
In 2000	1,153	1,444
In 2010	1,720	2,464

91. According to the interviews of the industry personnel, the shares of petroleum import ports are as follows. Texaco will import 50% of petroleum through the port of Cortes, Petro Tela will import 20% through the port of Tela and Petro Sur will import 30% through the port of San Lorenzo. Results are shown below (Unit:Thousand MT);

Scenario 1.

	Port of Cortes	Port of Tela	Port of San Lorenzo	Total
In 1992	596	203	9	807
In 2000	577	231	346	1,153
In 2010	860	344	516	1,720

Scenario 2.

	Port of Cortes	Port of Tela	Port of San Lorenzo	Total
In 1992	596	203	9	807
In 2000	722	289	433	1,444
In 2010	1,232	493	739	2,464

1.6.3 Macro Forecast of Export Cargo Volume at Port

92. The export volume is not linked with population or GDP in terms of theory or reality because the export of products, especially in the case of agriculture, forestry and fishery, is dictated more by the international market and destined nations' policy than by domestic socio-economic indicators; however, while no adequate index is found, the study team tentatively calculated future export. The result should carefully be looked into in the light of the cargo wise forecast which will be calculated in future.

(1) Correlation with Population

93. Total export cargo volume handled at ports is forecasted by its correlation with population. The correlation between the cargo volume and population from 1974 to 1992 is expressed in the following equation.

$$Y = 0.150 X + 1,064 \quad (R = 0.573)$$

Where, Y : Total export cargo volume at ports (Thousand MT)

x : Population (Thousand)

(2) Correlation with GDP

94. Total export cargo volume handled at ports is forecasted by its relation with GDP. The correlation between the cargo volume and GDP from 1974 to 1992 is expressed in the following equation.

$$Y = 0.176 X + 965 \text{ (} R = 0.673 \text{)}$$

Where, Y : Total export cargo volume at ports (Thousand MT)

x : GDP (Million lempiras)

(3) Estimation of Total Export Cargo Volume at Port

95. The total export cargo volume at ports in future is estimated using the above equation in relation to population, scenario 1 and scenario 2. The results are shown in Table 1-6-3 and Fig.1-6-3, a summary of which is given below. (Unit:Thousand MT)

	By Population	By scenario 1	By scenario 2
In 1992	1,754	1,754	1,754
In 2000	2,055	2,107	2,349
In 2010	2,322	2,580	3,199

96. There is not a great difference between the estimation by population and by scenario 1, so the estimation by scenario 1 will be utilized for each port rather than estimation by population.

1.7 Port Demand at Each Port

97. Total volume of future port cargoes is obtained for import and export, including volume of petroleum. Here, cargo volume at each port, by import and export, is forecast.

1.7.1 Premises for Calculation

98. Based on the interviews and the statistics of import and export cargo volume at ports from 1982 to 1992, following conditions are assumed.

- (1) There are some plans to assign certain ports for import petroleum, so that import petroleum volume of each port has already been estimated individually.
- (2) The port of Cortes will handle 73% of export cargo volume, 50% of import petroleum and 80% of other import cargo volume.
- (3) Fig.1-7-1 shows that at the ports of Tela and La Ceiba, export cargo volume has been decreasing, so these two ports will not handle export cargo in future.
- (4) The port of Tela will handle 20% of import petroleum.
- (5) Fig.1-7-2 shows that at the port of La Ceiba import cargo volume also has been decreasing, so import cargo will not be handled there. The port of La Ceiba will handle only domestic cargo.
- (6) Port of Castilla will handle 23% of export cargo and 15% of import cargo except petroleum.
- (7) Port of San Lorenzo will handle 4% of export cargo, 30% of import petroleum and 5% of other import cargo.

1.7.2 Import Cargo Volume of Each Port

99. Based on the above conditions, import cargo volume of each port is estimated as in Table 1-7-1 by scenario 1 and Table 1-7-2 by scenario 2, summaries of which are given below.

- (1) Estimated Import Cargo Volume of Each Port by Scenario 1.(Unit: Thousand MT)

	In 1992	In 2000	In 2010
Port of Cortes	1,530	1,720	2,476
Port of Tela	206	231	344
Port of La Ceiba	3	0	0
Port of Castilla	154	214	303
Port of San Lorenzo	60	417	617
Total	1,953	2,582	3,740

(2) Estimated import cargo volume of each port by scenario 2. (Unit: Thousand MT)

	In 1992	In 2000	In 2010
Port of Cortes	1,530	2,108	3,468
Port of Tela	206	289	493
Port of La Ceiba	3	0	0
Port of Castilla	154	260	419
Port of San Lorenzo	60	520	879
Total	1,953	3,176	5,259

1.7.3 Export Cargo Volume of Each Port

100. Based on the above conditions, export cargo volume of each port is estimated as in Table 1-7-3 by scenario 1 and as in Table 1-7-4 by scenario 2, summaries of which are shown below.

(1) Estimated export cargo volume of each port by scenario 1. (Unit: Thousand MT)

	In 1992	In 2000	In 2010
Port of Cortes	1,279	1,533	1,877
Port of Tela	16	0	0
Port of La Ceiba	3	0	0
Port of Castilla	386	487	596
Port of San Lorenzo	70	87	106
Total	1,754	2,107	2,580

(2) Estimated export cargo volume of each port by scenario 2. (Unit: Thousand MT)

	In 1992	In 2000	In 2010
Port of Cortes	1,279	1,710	2,328
Port of Tela	16	0	0
Port of La Ceiba	3	0	0
Port of Castilla	386	543	739
Port of San Lorenzo	70	97	132
Total	1,754	2,349	3,199

1.7.4 Estimation for Domestic Cargo Volume at Each Port

101. There is no authorized data on domestic cargo volume at each port, nor is there a forecasted cargo volume in Honduras for the years 2000 and 2010. Based on interviews with ENP, Marina Mercante National and on site investigations, following conditions are assumed in estimating domestic cargo volume at each port.

- (1) The number of ships involved in cabotage in Honduras up to this date is 33 for a total of 3,399.45 GT.
- (2) Based on interviews, the average GT per ship of cabotage at port of Cortes is about 120 GT.
- (3) From information of ENP, the average capacity of the domestic trade ships at port of La Ceiba is about 50 GT.
- (4) The average capacity of domestic trade ships at port of Castilla is about 80 GT.
- (5) Major domestic trade routes from port of Cortes are Roatan, Utila, Guanaja, Laceyba, Castilla and Lempira.
- (6) Major domestic trade routes from port of La Ceiba are Roatan, Utila, Guanaja, and Cortes
- (7) Major domestic trade routes from port of Castilla are Cortes and Lempira.
- (8) Based on the commencement operations at the new pier in Roatan, it is assumed that Ro-Ro ships between port of Cortes and Roatan will enter service.
- (9) New port of La Ceiba will start operations in 1994, and cargo volume will increase as a result. In the future Ro-Ro ships will start operation between Roatan, which will further increase cargo volume.
- (10) In future in conjunction with the development of the eastern part of the country and the introduction of Ro-Ro ships, domestic cargo volume at the port of Castilla will increase.

102. Total domestic cargo volume handled at the ports is forecasted based on the correlation between the past handling cargo volume and GDP. The total domestic cargo volume is the average of the estimated cargo volume by scenario 1 and scenario 2 because there is not a great influence on total cargo volume at each port. According to the above conditions, estimated total domestic cargo volume is distributed to each port, as shown in Table 1-7-5, a summary of which is given below.

Estimated total domestic cargo volume of each port (Unit: Thousand MT)

	Port of Cortes	Port of La Ceiba	Port of Castilla	Total
In 1992	48	30	16	94
In 2000	70	46	36	152
In 2010	110	54	67	231

1.7.5 Total Cargo Volume at Each Port

103. According to scenario 1, total cargo volume at each port which includes volume of import petroleum and domestic cargo volume is shown in Table 1-7-6, a summary of which is given below. (Unit: Thousand MT)

	Port of Cortes	Port of Castilla	Port of San Lorenzo
In 1992	2,857	557	130
In 2000	3,310	733	504
In 2010	4,463	967	723

104. According to scenario 2, total cargo volume at each port which includes volume of import petroleum and domestic cargo volume is shown in Table 1-7-7, a summary of which is given below. (Unit: Thousand MT)

	Port of Cortes	Port of Castilla	Port of San Lorenzo
In 1992	2,857	557	130
In 2000	3,887	839	617
In 2010	5,906	1,226	1,011

1.7.6 Macro Forecast Cargo Volume by Packing Type at Port

105. Above estimated cargo volume at port should be classified into packing type in order to estimate the berth length required in 2010. The cargo consists of liquid bulk cargo, dry bulk cargo, unit cargo and general cargo. Based on the statistics and interviews, very rough shares of major cargoes are assumed as follows.

- (1) Liquid bulk cargo consists of petroleum, molasses and african palm oil. The volume of petroleum has already been estimated. Molasses and african palm oil occupied about 5% of export cargo volume.
- (2) Dry bulk cargo consists of cement, bulk minerals, fertilizers, wheat and other cereals. It accounted for about 10% of export and 15% of import cargo volume.
- (3) Among general cargoes, cargoes unsuitable for unitization such as timber, some metal products and so on are omitted from the calculation of unit cargo volume.
- (4) Unit cargo means containerized cargo, Ro-Ro cargo and weight of containers. It is forecasted that the share of unit cargo will increase to approximately more than

80% in 2010 from 70% in 1992.

106. The result of the forecast for 2010 by scenario 1 is shown in Table 1-7-8, a summary of which is given below. (Unit: thousand MT)

	Port of Cortes	Port of Castilla	Port of San Lorenzo
General cargo	459	177	57
Liquid cargo	954	40	526
Dry bulk	750	60	20
Unit cargo	2,300	690	120
Total	4,463	967	723

107. The result of forecast for 2010 by scenario 2 is shown in Table 1-7-9, a summary of which is given below. (Unit: thousand MT)

	Port of Cortes	Port of Castilla	Port of San Lorenzo
General cargo	657	196	62
Liquid cargo	1,348	60	759
Dry bulk	1,000	80	30
Unit cargo	2,900	890	160
Total	5,906	1,226	1,011

108. As has been mentioned, forecast for main cargo will be carried out in the succeeding reports. The macro-forecast will be checked by the result of cargo wise calculation.