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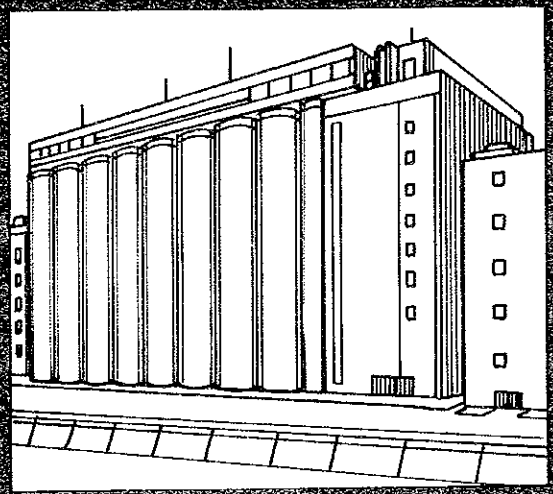
No. M

FINAL REPORT
THE FEASIBILITY STUDY ON THE DEVELOPMENT OF NEW PORT TERMINALS AT MONTEVIDEO PORT IN THE ORIENTAL REPUBLIC OF URUGUAY (SUMMARY)



JAPAN INTERNATIONAL COOPERATION AGENCY

FINAL REPORT
THE FEASIBILITY STUDY ON THE DEVELOPMENT OF NEW PORT TERMINALS AT MONTEVIDEO PORT IN THE ORIENTAL REPUBLIC OF URUGUAY (SUMMARY)

FEBURUARY 1993

PREFACE

In response to a request from the Government of the Oriental Republic of Uruguay, the Government of Japan decided to conduct a feasibility study on the Development of New Port Terminals at the Montevideo Port and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Uruguay a study team headed by Mr. Jiro Kano, Advisor of the Overseas Coastal Area Development Institute of Japan, three times between February 1992 and November 1992.

The team held discussions with the officials concerned of the Government of Uruguay, 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 Oriental Republic of Uruguay for their close cooperation extended to the team.

February 1993

Kensuke Yanagiya

Kensuke Yanagiya
President
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

February 1993

Mr. Kensuke Yanagiya
President
Japan International Cooperation Agency

Dear Mr. Yanagiya

It is my great pleasure to submit herewith the Final Report for the Feasibility Study on the Development of New Port Terminals at Montevideo Port in the Oriental Republic of Uruguay.

The report is the result of studies carried out by the Overseas Coastal Area Development Institute of Japan (OCDI) and Nippon Tetrapod Co., Ltd. as per the contract with the Japan International Cooperation Agency (JICA). The study team conducted three field surveys between February 1992 and November 1992.

Based on the findings of these surveys and on data and information collected and analyzed in Japan, the short term development plan of main port facilities was formulated with a target year of 1998, including a feasibility study.

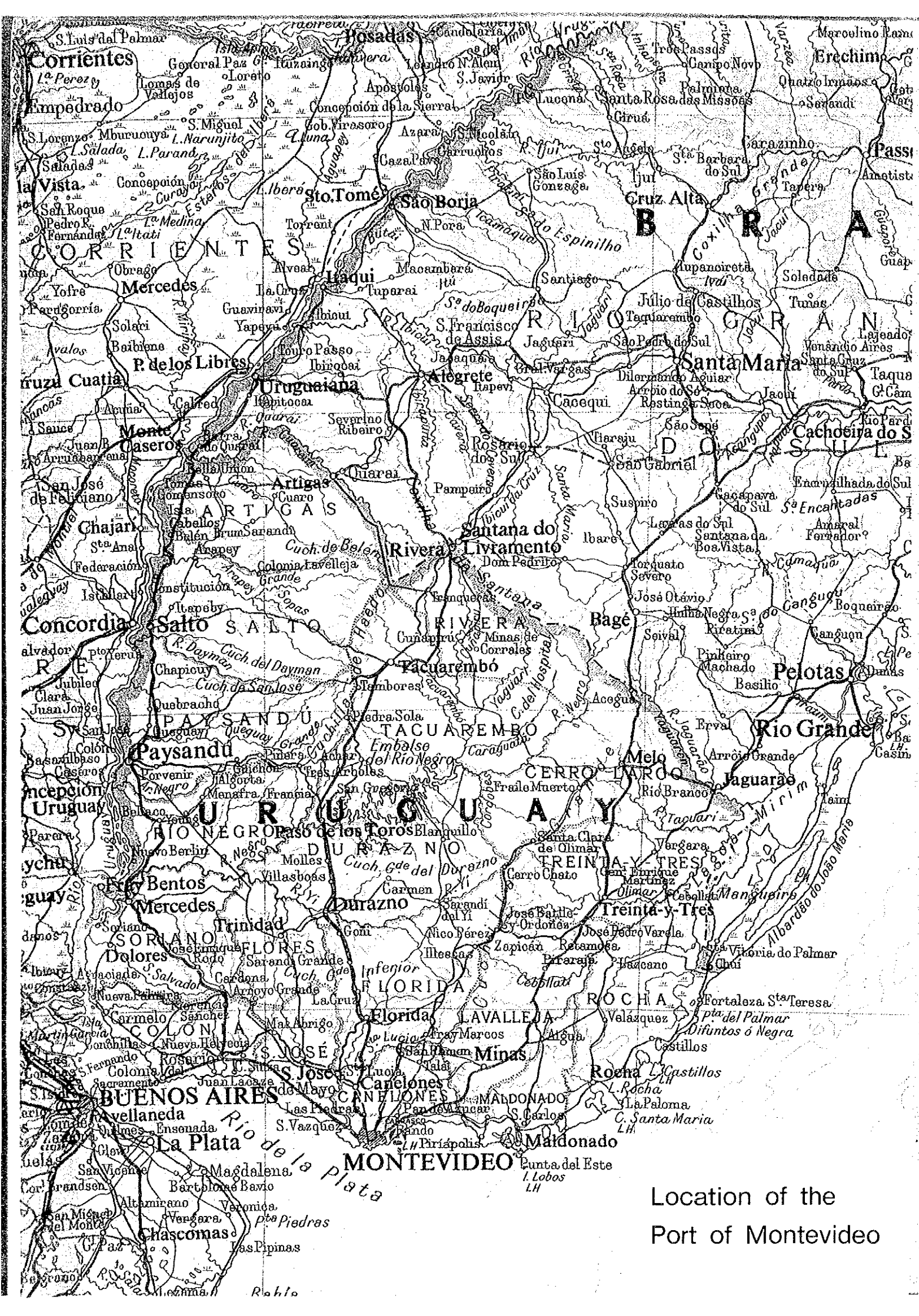
The study shows that the development of main port facilities at Montevideo Port is important. I earnestly hope that measures will be taken to implement this project.

On behalf of the study team, let me express my heartfelt thanks for the generous cooperation, assistance and warm hospitality extended to the study team during their stay in Uruguay.

Our thanks are also due to the Japan International Cooperation Agency, the Ministry of Foreign Affairs, the Ministry of Transport and the Japanese Embassy in Uruguay for their valuable advice and support during the field survey and preparation of this report.

Yours Faithfully,

Jiro Kano
Leader
Japanese Study Team for the Feasibility Study on the Development of New Port Terminals at Montevideo Port in the Oriental Republic of Uruguay (Adviser, the Overseas Coastal Area Development Institute of Japan)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Empedrado
Santa Rosa
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Passo Fundo
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São Borja
Caxias do Sul
Mercedes
Itaqui
Santiago
Soledade
Júlio de Castilhos
Tuparendi
Taquarembó
Santa Maria
Cachoeira do Sul
Uruguaiana
Alegrete
Cacequi
Rosário do Sul
São Gabriel
Monte Caseros
Artigas
Quaraí
Santana do Livramento
Rivera
Chajarí
Concordia
Salto
Bagé
Tacuarembó
Pelotas
Rio Grande
Paysandú
Melo
Jaguarão
Uruguay
Paso de los Toros
Durazno
Treinta-y-Tres
Fray Bentos
Mercedes
Trinidad
Florida
Dolores
Minas
Rocha
Colonia
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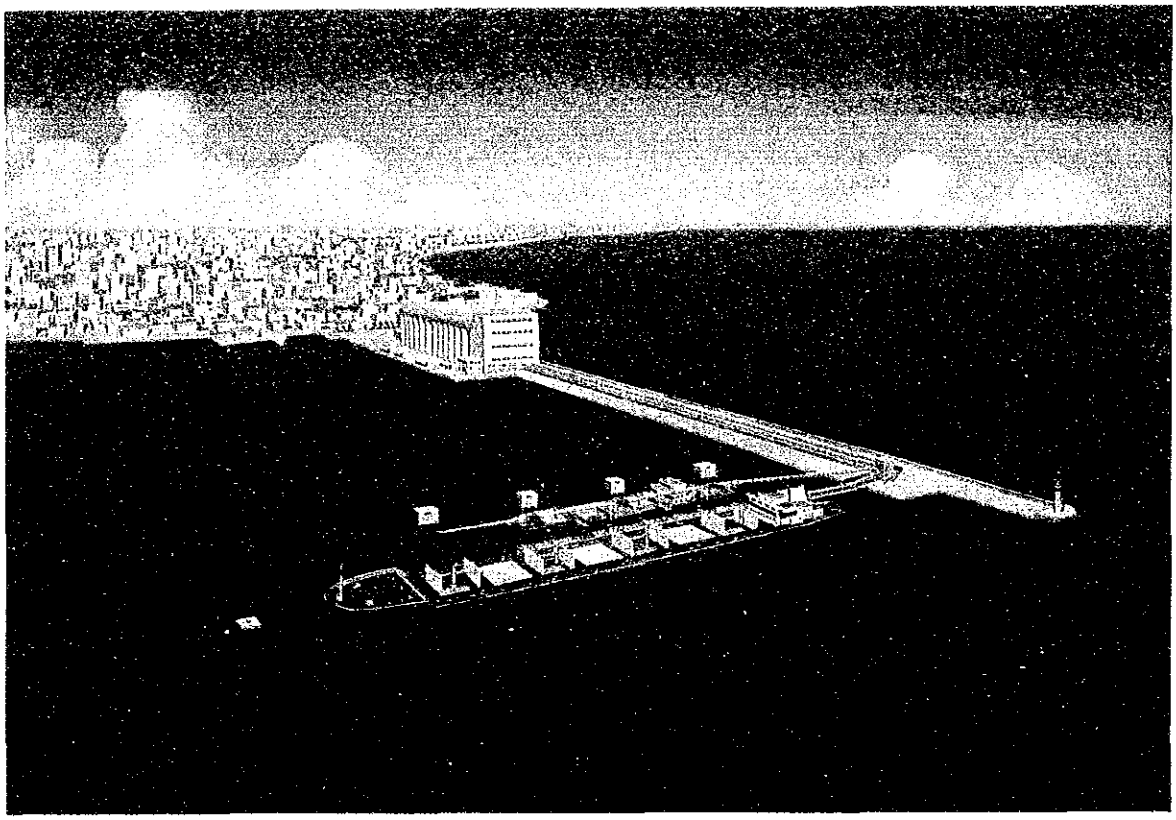
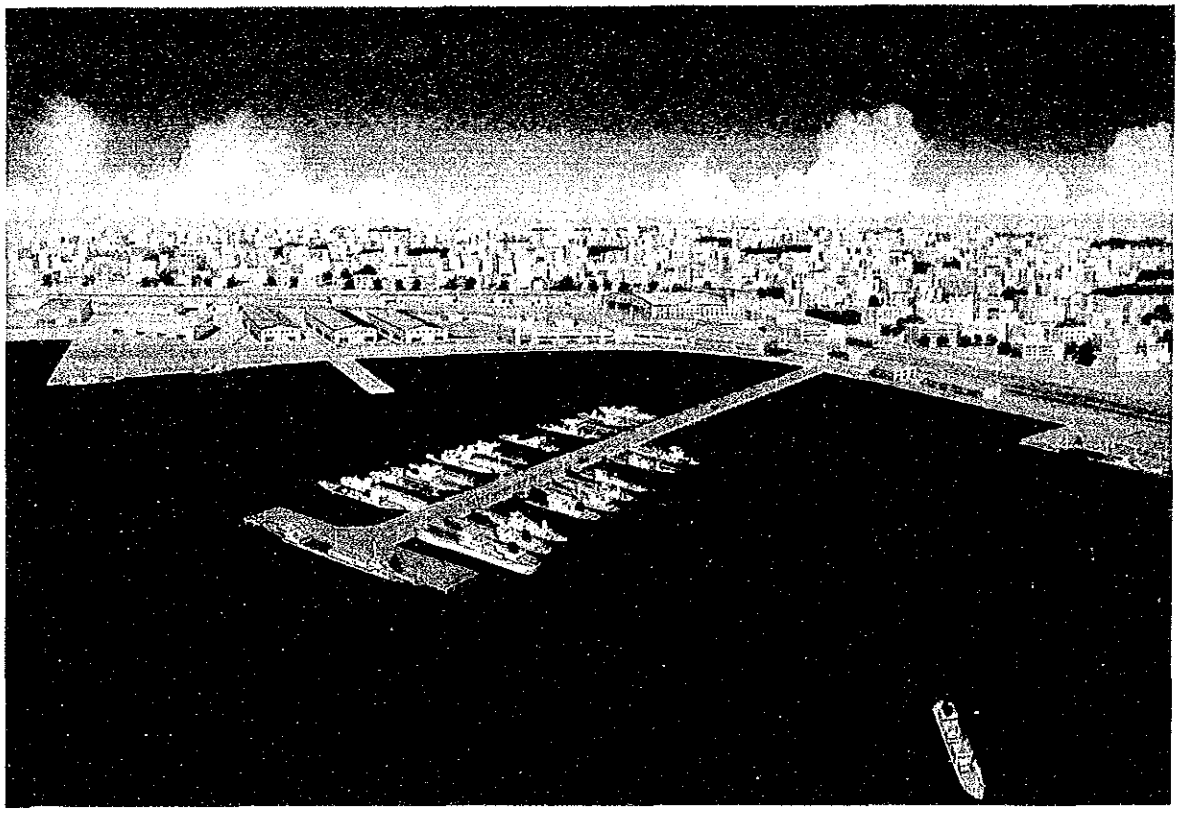
La Plata
Montevideo
Punta del Este
Chascomus
Río de la Plata
Location of the
Port of Montevideo



Grain Terminal



Foreign Fishing Terminal

ABBREVIATIONS

ACA	Asociacion de Cooperativas Argentinas
AFE	Administracion de Ferrocarriles del Estado
ANCAP	Administracion Nacional de Combustibles, Aicohol y Portland
ANNP	Administracion Nacional de Navegacion y Puertos(Paraguay)
ANP	Administracion Nacional de Puertos
ANSE	Administracion Nacional de Servicios de Estiba
CATIDU	Camara Autotransporte Terrestre Internacional del Uruguay
C.D. Este	Cuidad del Este
CDL	Chart Datum Level
DGEC	Direccion General de Estadistica y Censos
DIEA	Direccion de Investigaciones Economicas Agropecuarias
DIGRA	Direccion de Granos
DNH	Direccion Nacional de Hidrografia
DNT	Direccion Nacional de Transporte
DNV	Direccion Nacional de Vialidad
FACA	Federacion Argentina de Cooperativas Agrarias
INAC	Instituto Nacional de Carnes
INAPE	Instituto Nacional de Pesca
JNG	Junta Nacional de Granos
MERCOSUR	Mercado Comun del Sur
MGAP	Ministerio de Granaderia, Agricultura y Pesca
MTOP	Ministerio de Transporte y Obras Publicas
NADE	Nomenclatura Arancelaria de Exportaciones
NADI	Nomenclatura Arancelaria de Importaciones
NRT	Net Registered Tonnage
ZTE	Zona de Transbordo Esta
ADB	Asian Development Bank
ALADI	Latin American Association of Integration
BOT	Build Operate Transfer
CIF	Cost Insurance and Freight
DWT	Dead Weight Tonnage
EIRR	Economic Internal Rate of Return
FAO	Food and Agriculture Organization of The United Nations
FIRR	Financial Internal Rate of Return

FOB	Freight on Board
GDP	Gross Domestic Product
GRT	Gross Registered Tonnage
HP	Horse Power
IBRD	International Bank for Reconstruction and Development
IVA	Value added tax
LOA	Length Over All
MHWL	Mean Height Water Level
MLWL	Mean Low Water Level
MWL	Mean water Level
OCC	Opportunity Cost of Capital
PIANC	Permanent International Association of Navigation Congresses
TEU	Twenty Equivalent Unit
USAID	United States Agency for International Development

CURRENCY EXCHANGE RATE

1 US Dollar = 2667 Uruguayan Peso = 130 Japanese Yen

CONTENTS

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

1. Meaning of the development of the Port of Montevideo

At present, the Port of Montevideo is beginning to undergo a change in its regional trade movement as the result of the treaty concluded by the four countries of Brazil, Argentina, Paraguay and Uruguay on March 26 of 1991. The common market to be established under this treaty provides not only for the free transfer of properties, service and products by the abolition of tariffs and non-tariff barriers, but also the establishment of a common tariff, adoption of policy for macro and sector economy. Great progress in trading activities in this region is expected by these measures.

The river basin, which is comprised of the Parana River and Paraguay River is a great granary from where a large amount of grain is exported worldwide. Ships are used for transportation because they are the most economical for bulk and cargoes with large volumes such as grain. However, since there is limited water depth in both rivers, transshipment from a small vessel to a larger one at the mouth of La Plata River is inevitable for exportation of grain to importing countries such as in Europe. Therefore, the Port of Montevideo, which is located at the mouth of La Plata river, comes before the footlights because of its advantageous location in the region. The Port of Montevideo is able to provide a more economical route for international grain transportation.

However, one big drawback of the Port of Montevideo should be noted. That is the necessity of about a 30 km long channel which is required for the entrance of large vessel to the Port, since the Port is located within the river despite its advantageous location. Substantial funds are necessary to construct and maintain the long channel.

Despite the drawback described above, it is very important to develop the Port of Montevideo as a transportation base for grain in the big surge of trade promotion around La Plata river basin.

Many foreign fishing vessels visit the Port of Montevideo at present. After conducting fishing activities in the South Atlantic Ocean, which reportedly has a plentiful fish resources, they visit the Port not only to transship fishcatch, but also to load water, fuel oil, daily commodities and to exchange the vessel crew. Unfortunately, since there is not a designated facility available for these services in the Port, they encounter difficulties such as being forced to change berths several times. It would be unwise to risk losing these foreign fishing vessels to

other ports by leaving the situation as it is, considering the great profit generated by them.

In this sense, the construction of a foreign fishing terminal is very important.

2. Short term development plan of main port facilities

The plans of the grain terminal and foreign fishing terminal are formulated for the target year of 1998.

(1) Contents of plans

1) Grain terminal

The minimum grain cargo volume at the year of 1998 is estimated at 1.812 million tons of transshipment, 189 thousand tons of export and 12 thousand tons of import. Then, scales of facilities are determined based on the grain cargo volume of 2 million tons. It is assumed that transshipment cargo is transported from/to production area by ship as the cheapest transportation means while export/import cargo is transported from/to domestic production area by truck. The Port of Montevideo provides not only the same transshipment function as that of Alpha zone, 50 Km off the shore of Montevideo port, but also provides storage, taking advantage of its available land area. Objective vessel size for export is assumed to be the panamax type which is popularly used at present, and a new transportation system in which a panamax size vessel can enter the Port and be fully loaded with grain is planned. Grain cargo to be loaded on the panamax-type vessel at the Port of Montevideo is conveyed by 15,000 DWT shuttle-vessels from up-river ports to Montevideo port. A dolphin type loading berth (length 270m, depth -12m), the same type unloading berth (length 170m, depth -9.5m) and a silo (capacity 93,000 tons) are constructed at the transshipment base. Dredging of both basins in front of these dolphins and the long approach channel will be carried out.

The construction site is selected from among 4 candidate sites, existing wharf(A wharf), the inner side of the west breakwater, the north side of the Cintura breakwater and the north side of the Sarandi breakwater(the east side of the port mouth) which were chosen through considering the master plan study and the opinion of Adminstracion Nacional de Puertos(hereinafter referred to as 'ANP'). The site of the north side of Sarandi breakwater was selected from the economic and technical points of view such as construction cost, future development potential and coordinative condition with other plans.

2) Foreign fishing terminal

The number of foreign fishing vessels arriving in 1998 is estimated at 500. Although this value represents a slightly larger number than in 1991, the number of fishing vessels is not likely increase much because the fishing area in the South Atlantic Ocean is already fairly exploited and a further increase in fish catch is not expected. These foreign fishing vessels call at the Port to obtain fuel and water, prepare for the next fish catch, exchange or rest crew and to effect ship repairs rather than merely the transshipment of fish catch. As transshipment of fish catch does not necessarily need quaywall, a mooring facility for other activities is planned. Stern mooring is applied for this case. In case of a vessel whose size is more than 1,000 GRT, a part of the general cargo berth is available for its berthing. The objective vessel size is assumed at less than 1,000 GRT. And one berth for alongside mooring is planned additionally. A mooring facility in the shape of the letter "T" composed of a pier of 330 m long and a tip pier of 85m long is planned. The construction site is planned to be located between the second basin and domestic fishing terminal.

(2) Construction cost and period

The construction cost is estimated after the formulation of construction plan and preliminary design based on natural condition data such as geophysical condition and utilization condition. Since the development of grain terminal contains many kinds of construction works, not only construction of berthing facility, but also reclamation and dredging, it takes 4 years for completion. On the other hand, it takes 2 years for construction work of the foreign fishing terminal. Total construction cost is US$ 94.82 million for grain terminal (Foreign portion of it is US$ 40.05 million, 42.2% of total.), US$ 7.56 million for foreign fishing terminal (Foreign portion of it is US$ 2.89 million, 38.2% of total.). Of the cost of the grain terminal, since expansion of the container terminal is also planned in parallel with it, the cost for dredging of approach channel and common basin to -11m is assumed to be borne by the container terminal.

(3) Management and operation program

There are three alternatives for the construction and management body of grain terminal, (i)ANP itself, (ii)private sector, and (iii)combination of ANP for construction of basic port activities and private sector for construction of equipment and operation. A continuous effort to collect customers and an efficient operation are required for the grain terminal. It is necessary to collect various information related to grain, and a professional know-how to analyze these data is

also required.

Therefore, it is desirable for the private sector, which has much experience in grain handling, to operate the terminal, and the ANP is requested to secure its administrative right without interrupting the activity of the private sector.

The service to be provided at the foreign fishing terminal has been offered by the ANP. Since a large increase in the demand for this service is not expected, the ANP should continue to provide the same service as before.

(4) Evaluation

Comprehensive evaluation is carried out through an economic analysis in which implementation of the project is evaluated from the national economic point of view and through financial analysis in which profitability of the project itself is evaluated.

In an economic analysis, evaluation is carried out by the internal rate of return(EIRR) calculated through a cost benefit analysis. On the other hand, in the financial analysis, we calculated the financial internal rate of return(FIRR) by the discount cash flow method.

1) Grain terminal

The objective of the development of the grain terminal is to make the present grain transportation system in the La Plata river basin more economical. Concerning transportation cargo, the savings in transportation cost and construction cost of transshipment facility for the increase of transshipment cargo volume are assumed to be the benefits. On the other hand, the construction cost, replacement investment cost, maintenance cost, personnel cost and other operation cost are assumed as the cost. As already described, the cost of dredging the approach channel and common basin is assumed as the cost for the part deeper than -11m. The economic internal rate of return is calculated at 11.3 % under the condition that the project life is 30 years. Therefore, it is judged that this project is marginally feasible.

On the other hand, in the financial analysis, the revenue mainly from handling and storing charge is compared with the expenditure composed of construction cost and operation cost. The rate of handling and storing charge of the new terminal is assumed at the level in which the cargo handling at the new terminal is competitive with the transhipment activity conducted in the Alpha zone, analyzing required total transportation cost through the Alpha zone. Based on these conditions, the financial rate of return is calculated at 8.5%. Judging from the fact that the estimated average procurement interest rate is 8.0%, the project

is evaluated at the edge of feasibility. However, considering the possibility of raising the handling and storing charge since the new terminal is located in a fairly advantageous land area (in contrast with the existing transshipment spot, Alpha zone, which is located on the sea), it is judged that the project is fairly profitable.

2) Foreign fishing terminal

The foreign fishing terminal is constructed to improve the situation of foreign fishing vessels which enter the Port of Montevideo. The benefit, which is assumed to be composed both of savings of berth transference of ship and waiting cost and the net product increase of port service industries, is compared with the cost of construction and operation. The economic interest rate of return is calculated at 15.9%, and it is judged that the project is very significant from the national economic point of view. On the other hand, the project preserves profitability with the financial interest rate of return of 8.0% only when the port charge is raised by four times its current level. Since the benefit to the foreign fishing vessels by the project is large, they can pay the increased charges. An alternative, however, to raising the charges by four times would be to revise the port entrance charge and wharfage fee etc.

Recommendations

1. Grain terminal

Although the construction of the grain terminal is judged very significant, it is not an easy project from economic and financial points of view. Thorough preparation and consideration of the following matters are necessary for implementation of the project

(1) The grain terminal is constructed mainly for transshipment of grain which is produced in other countries, and these cargoes do not necessarily need to use this terminal. Therefore, it is imperative to make various efforts to collect a large volume of cargoes and it should be recommended that the commencement of the project is contingent on the solid prospects of attracting cargoes.

(2) Considering ship size trend, it can be said that ,in the case of grain transportation, the panamax type vessel conveys a large amount of cargo, and that therefore, it is imperative to provide sufficient facilities for accommodating that

type of vessel. However, since the cost of initial and maintenance dredging of channel and basin is tremendous, the amount of the dredging cost paid by the terminal might debilitate the grain handling business. As the approach channel and common basin are used by container vessels and conventional vessels besides grain carriers, the major portion of the cost above should be paid by facilities other than the grain terminal.

(3) Above all, the know-how acquired through long experience is fundamentally necessary for the business of grain handling. Participation of the private sector which has great experience in this field should be sought by all means. However, since the activity is conducted in the port area, the minimum effort should be made to secure public interest.

(4) Handling of grain cargo, especially loading, is always accompanied by small flying grain particles. At present it is impossible to eliminate this completely. Upon completion of the construction work, the observation of flying particles should be conducted and the countermeasures such as control of handling based on climate condition and planting of trees will be considered, if necessary.

2. Foreign fishing terminal

The foreign fishing terminal project is requested urgently by foreign fishing vessel operators concerned and the construction of it is very significant. The project should be implemented as soon as possible, taking the following into account.

Although the project is highly feasible from the national economic point of view, it is necessary to raise the tariff by four times to preserve profitability in terms of the project itself. It is natural to seek a tariff hike of the fishing terminal under the benefit principle. However, the extent of increase of charge paid by foreign fishing vessels should be reduced through remodeling port entrance charge and wharfage fees for other vessels.

INTRODUCTION

INTRODUCTION

1. Background

The Port of Montevideo, the largest port in Uruguay, is located in the capital of the country. The annual cargo volume handled at the Port exceeded 1.8 million tons in 1989 and it plays a most important role in international trade. A the same time, this port functions as the base port for fishing boats of the countries operating in the South Atlantic Ocean.

Recently, container vessels and foreign fishing vessels have been calling at the Port more frequently than before. Since there is a lack of facilities such as a container terminal with container cranes and a terminal for foreign fishing vessels, the Port is often congested due to the delay of operation. Moreover, the present condition of existing facilities is old fashioned for accommodating these vessels.

On the other hand, there is a new trend related to cargo movement in the La Plata River Basin which covers several neighboring countries; namely, the formation of the treaty for founding a new market called MERCADO COMUN DEL SUR(MERCOSUR). When the treaty is finalized, the custom charge within the region will decrease year by year. As a result, it is expected that the movement of cargoes, especially grain, among related neighboring countries will increase in the future.

Based on the situation described above, the ANP has already formulated a master plan with the assistance of the world bank and also completed the some study of the container berth. Although ANP initiated some of the work deemed urgent in the master plan, most of the work is still left unconstructed since the master plan does not include a concrete construction plan for other main facilities such as a grain terminal, fishing terminal and so on.

Accordingly, the Government of Uruguay has requested the Government of Japan to provide technical cooperation in conducting the feasibility study on main port facilities excluding the container terminal in Montevideo Port.

2. Objectives of the Study

Based on the background described above, the objectives of the study are summarized as follows;

To prepare a feasibility study of the Short Term Development Plan for main port facilities in Montevideo Port for the period up to the year 1998.

3. Method of the Study and Study Schedule

The Study will be carried out according to the flow chart shown in Fig. 1.

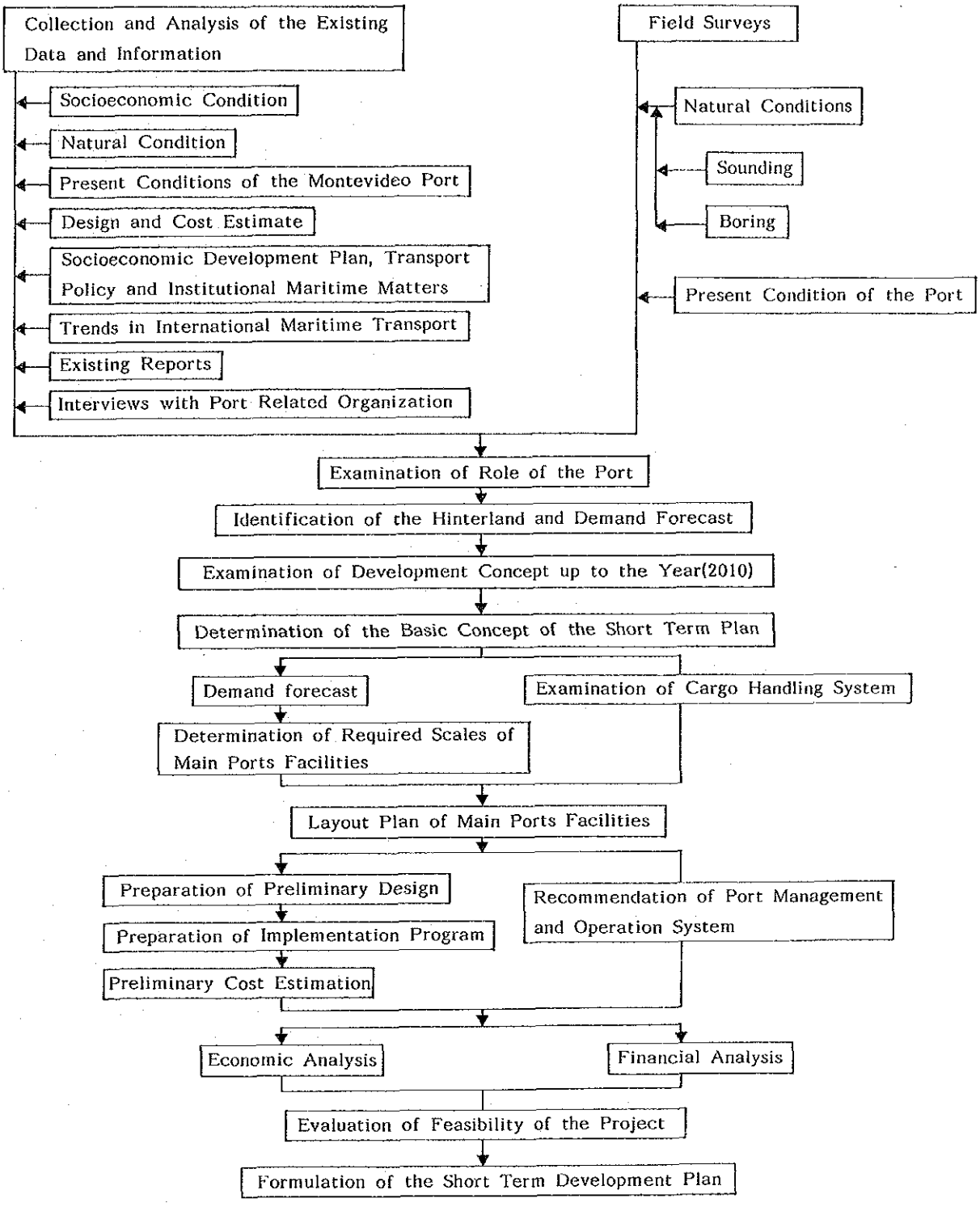


Fig. 1 Flow Chart of the Study

I PRESENT CONDITIONS AND FUTURE DEVELOPMENT CONCEPT

1 GENERAL DESCRIPTION OF THE ORIENTAL REPUBLIC OF URUGUAY

1-1 Socioeconomic Activities

1-1-1 Population

Population of Uruguay is shown in Figure 1-1-1-1. The population of Uruguay was 2,955,200 in 1985 and it is increasing slightly. Population of Montevideo accounts for almost 40% of the total population in Uruguay. Growth rate of population is 0.59% in Uruguay, while that in Montevideo is 69.53%. These figures show that population is concentrating in the capital city.

Increase and decrease of population by department are shown in Figure 1-1-1-2.

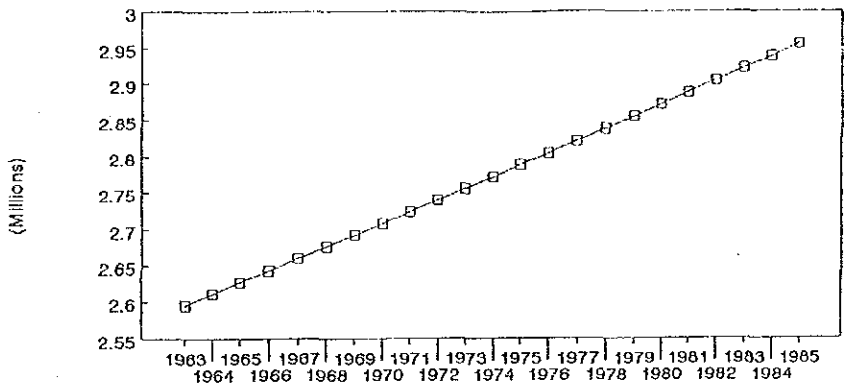


Figure 1-1-1-1 Population in Uruguay

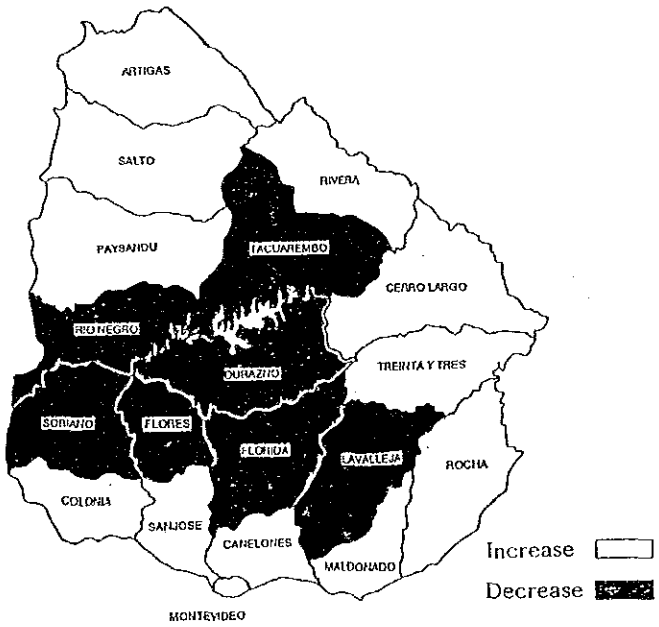


Figure 1-1-1-2 Increase/Decrease of Population by Department in Uruguay

1-1-2 Gross Domestic Product

Gross domestic product is increasing slightly. Growth rate is 2.59% between 1983 and 1990. However, growth rates of some sectors such as Fishery, Quarry and Mining, and Construction were minus during the same period.

Table 1-1-2-1 shows gross domestic product by industrial sector in Uruguay.

Table 1-1-2-1 Growth Domestic Product by Industrial Sector

Unit:million N$ Constant of 1983

Class of Economic Activity	1983	1984	1985	1986	1987	1988	1989	1990
Agricultural & Live stock	23,028	19,951	22,522	22,080	23,140	22,877	23,124	23,674
Fishery	477	538	539	403	370	262	353	257
Quarry & Mining	511	434	346	404	462	369	371	358
Manufacture	44,474	46,466	45,740	51,108	56,156	55,667	55,560	54,750
Electrical, Gas & Water	5,663	5,613	5,796	6,041	6,837	7,415	6,635	7,426
Construction	7,479	6,496	4,659	4,823	5,956	6,356	6,563	6,165
Comerce	18,899	20,068	21,166	23,122	24,899	24,503	24,075	23,961
Transport & Comunication	10,698	10,098	10,595	12,138	12,795	13,434	14,489	14,354
Others	64,188	63,837	64,698	71,535	76,243	75,957	76,687	78,802
Total	175,417	173,501	176,061	191,654	206,858	206,840	207,857	209,747

Table 1-1-2-2 shows share of gross domestic product by industrial sector in Uruguay. Share of Manufacturing sector is the highest, 26 % on average between 1983 and 1990. Share of Agricultural and Live stock sector is second, 11.70 % on average during the same period. Third is Commerce sector where the rate is 11.66 %. Share of Fishery sector is the lowest among industrial sectors with a share of 0.21 %.

Table 1-1-2-2 Share of Gross Domestic Product by Industrial Sector in Uruguay

Unit: %

Class of Economic Activity	1983	1984	1985	1986	1987	1988	1989	1990	Average
Agricultural & Live stock	13.13	11.50	12.79	11.52	11.19	11.06	11.12	11.29	11.70
Fishery	0.27	0.31	0.31	0.21	0.18	0.13	0.17	0.12	0.21
Quarry & Mining	0.29	0.25	0.20	0.21	0.22	0.18	0.18	0.17	0.21
Manufacture	25.35	26.78	25.98	26.67	27.15	26.91	26.73	26.10	26.46
Electrical, Gas & Water	3.23	3.24	3.29	3.15	3.31	3.58	3.19	3.54	3.32
Construction	4.26	3.74	2.65	2.52	2.88	3.07	3.16	2.94	3.15
Comerce	10.77	11.57	12.02	12.06	12.04	11.85	11.58	11.42	11.66
Transport & Comunication	6.10	5.82	6.02	6.33	6.19	6.49	6.97	6.84	6.35
Others	36.59	36.79	36.75	37.33	36.86	36.72	36.89	37.57	36.94
Total	100	100	100	100	100	100	100	100	100

1-1-3 Industrial Structure

Agriculture and live stock breeding is a traditional industry in Uruguay whose share of GDP was 11.3 % in 1990. Main agricultural products are meat, wool, rice, wheat, sorghum, sunflower and citrus. 90 % of exports are agricultural products and related industrial products. Manufacturing accounted for 26.1 % of GDP, and main products are woolen goods and processed leather goods. Paper, glass and chemical products are among the other industrial products. Although Uruguay has not developed marine resources until recent, government is putting a great deal of effort into fishery industry. The fish catch in 1989 increased to about five times of that in 1975.

(1) Agriculture

Table 1-1-3-1 shows existing ranching of species.

And Table 1-1-3-2 shows export volume of meat and sub-products by freight tonnage.

Table 1-1-3-3 shows production/export volume of wool.

Table 1-1-3-1 Existing Ranching of Species

Unit:Head

Year	Bovine	Ovine	Horse
1980	10,658,300	18,652,700	
1981	11,420,800	20,390,700	
1982	11,236,600	20,306,900	
1983	9,704,300	20,477,200	
1984	9,061,900	20,636,900	
1985	9,370,400	21,195,800	
1986	9,008,800	22,085,100	
1987	9,945,300	24,006,500	437,400
1988	10,330,900	24,689,200	466,300
1989	9,446,200	24,871,600	462,000

Source:MGAP(Ministerio de Ganaderia, Agricultura y Pesca)

Table 1-1-3-2 Export Volume of Meat and Subproduct

Unit:freight tons

Year	Beef	Mutton	Horsemeat	Fowl	Other Meat	Subproducts	Total
1984	96,512	5,355	1,732	3,709	600	40,171	148,079
1985	96,981	5,119	1,723	1,943	754	32,346	138,866
1986	135,531	21,064	1,043	3,554	680	48,898	210,770
1987	57,003	4,449	891	2,117	604	27,399	92,463
1988	80,757	8,062	1,275	2,789	473	45,656	139,012
1989	113,374	17,941	2,595	2,784	306	48,998	185,998

Source:INAC(Instituto Nacional de Carnes)

Table 1-1-3-3 Production/Export Volume of Wool

Unit:tons

Year	Export	Production
1982	78,204	78,377
1983	71,444	82,000
1984	70,042	81,676
1985	69,736	70,950
1986	98,030	87,178
1987	98,345	90,203
1988	97,010	88,935
1989	74,192	82,741
1990	114,056	97,815

Source:MGAP

Table 1-1-3-4 shows main grain production volume.

Table 1-1-3-5 shows export volume of rice.

Table 1-1-3-4 Main Grain production Volume

Unit:Ton

Year	Wheat	Barly	Linen	Oats	Sorgum	Sun Flower	Soy Beans	Maize	Rice
1980/81	306,577	55,451	21,438	31,643	198,879	44,970	40,000	180,780	330,287
1981/82	387,768	85,277	11,025	20,584	122,887	46,180	28,000	97,324	418,885
1982/83	363,144	45,025	4,695	26,590	106,623	18,771	11,914	103,710	323,116
1983/84	418,728	80,836	7,438	49,865	118,680	25,870	10,924	111,813	339,760
1984/85	348,861	113,270	8,157	48,469	151,593	30,912	21,465	108,635	420,700
1985/86	246,143	79,736	6,807	20,225	104,500	72,200	35,400	103,000	394,218
1986/87	231,730	62,400	5,630	27,583	90,062	47,963	62,050	117,613	335,486
1987/88	307,824	123,800	2,915	58,285	121,183	32,667	72,000	118,330	380,592
1988/89	413,575	203,826	1,554	63,533	78,854	48,401	45,000	60,156	537,217
1989/90	542,378	202,589	1,048	70,001	59,381	28,709	37,050	112,313	347,294
1990/91	415,716	133,097	3,382	51,033	90,215	56,949	18,000	123,747	492,594
1991/92	213,562	159,268							

Source:DIEA(Direccion de Investigaciones Economicas Agropecuarias)

Table 1-1-3-5 Export volume of Rice

Unit:tons

Year	
1982	245,745
1983	195,964
1984	151,914
1985	241,672
1986	264,999
1987	203,617
1988	270,234
1989	260,345
1990	287,301

Source:MGAP

Table 1-1-3-6 shows production and export volume of citrus. Table 1-1-3-7 shows share of export for production volume of citrus.

Table 1-1-3-6 Production/Export Volume of Citrus

Unit:tons

Year		Lemon	Grape Fruit	Orange	Mandarine	Total
1985	Production	34,000	7,500	75,000	36,000	152,500
	Export	16,260	2,306	34,197	6,808	59,571
1986	Production	37,000	7,800	85,000	40,000	169,800
	Export	16,935	2,844	36,229	7,562	63,570
1987	Production	52,152	7,741	78,829	45,153	183,875
	Export	15,518	2,376	32,753	7,750	58,397
1988	Production	46,740	7,579	93,200	36,928	184,447
	Export	10,014	1,639	36,525	5,963	54,141

Source:MGAP

Table 1-1-3-7 Share of Export for Production Volume of Citrus

Unit:%

Year	Lemon	Grape Fruit	Orange	Mandarine	Total
1985	48	31	46	19	39
1986	46	36	43	19	37
1987	30	31	42	17	32
1988	21	22	39	16	29

Source:MGAP

(2) Fishery industry

1) Fishery industry in Uruguay

There are three main fishing ports, Montevideo, La Paloma and Piria Polis in Uruguay. Uruguayan fishing boats are catching fish in their 200 mile zone and common area of Argentina-Uruguay. These three port locations are shown in Figure 1-1-3-3.

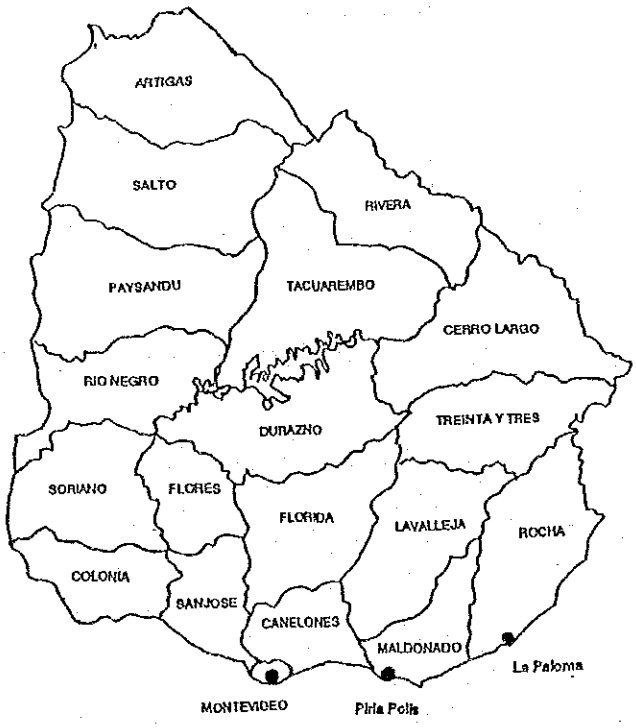


Figure 1-1-3-3 Location of Main Fishery Port in Uruguay

Figure 1-1-3-4 shows fishing area of Uruguay.

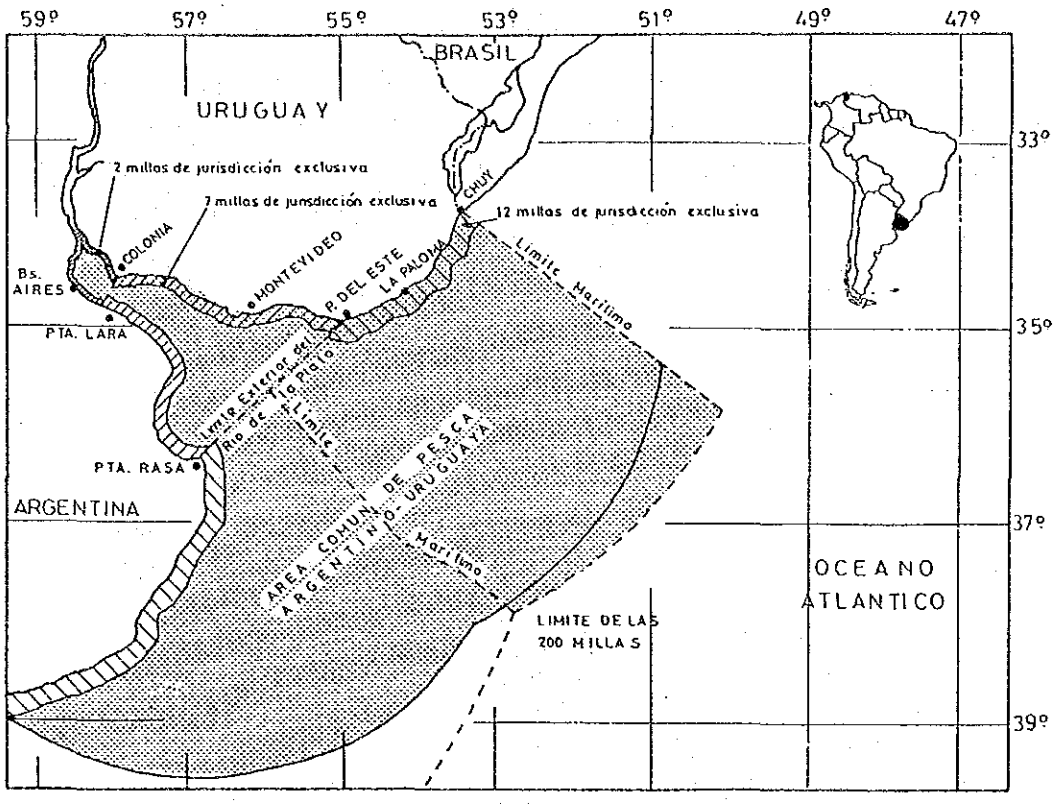


Figure 1-1-3-4 Fishing Area of Uruguay

There are 62 fishing vessels of more than 100 GRT (58 trawlers, one squid-fishing boat and three longline tunafishing vessels) in 1989.

Registered fishing boats over 100 GRT is shown in Table 1-1-3-8.

Table 1-1-3-8 Registered Fishing Boat over 100 Gross Ton

Year	Total Number of Ship With Motor	Total G.R.T	Total Length	Averag GRT	Average Length
1984	62	16,486	2,207	266	36
1985	66	17,057	2,317	258	35
1986	62	15,811	2,113	255	34
1987	64	16,514	2,206	258	34
1988	66	16,968	2,654	257	40
1989	62	10,681	2,125	172	34

Source:INAPE

The main fishing port is Montevideo (approximately 70 percent of the landings), from which most of the deep-sea and coastal vessels operate. The port of La Paloma (Department of Rocha) has also been acquiring increasing importance since the beginning of the 1980s. There are a number oefd freezing and reduction plants in La paloma port. Another fishing port of some importance is Piriapolis (Department of Maldonado), 100 km east of Montevideo.

Table 1-1-3-9 shows fish catch volume by port in Uruguay.

Table 1-1-3-9 Fish catching Volume by Port

Unit:Tons

Year	Total	Montevided	La Paloma	Piria Polis	Foreign Ports	Other Ports
1984	134,025	87,201	42,734	964	2,654	472
1985	139,077	99,846	31,462	2,328	4,712	729
1986	141,289	95,877	36,468	6,234	1,917	793
1987	138,020	95,332	32,920	8,380	231	1,157
1988	107,512	76,287	22,144	8,444	450	187
1989	121,887	91,121	22,532	4,598	3,376	260
1990	90,951	67,172	20,035	2,962	541	241

Source:INAPE

Fish catch by main species is shown in Table 1-1-3-10.

Table 1-1-3-10 Catching Fish by Main Species

Unit:tons

Year	Hake	White Cr.	Weakfish	Squid	Anchovy	Others	Total
1984	65,051	24,246	10,938	2,743	15,525	15,522	134,025
1985	97,150	19,324	7,322	333	0	14,948	139,077
1986	86,213	24,393	12,894	2,061	354	15,374	141,289
1987	83,693	28,173	10,703	2,603	457	12,391	138,020
1988	60,736	25,915	6,847	3,642	601	9,788	107,529
1989	69,329	23,993	10,962	6,002	25	11,576	121,887
1990	55,751	17,488	5,665	622	7	11,418	90,951

Source:INAPE
White Cr.:White Croaker

Table 1-1-3-11 shows share of export volume and domestic consumption.

Table 1-1-3-11 Share of Export Volume/Domestic Consumption

Unit:tons

Year	After Pr.	Export	Domestic	Export %	Domestic %
1984	62,965	58,999	3,966	94	6
1985	68,811	68,309	502	99	1
1986	77,235	74,604	2,631	97	3
1987	71,801	62,496	9,305	87	13
1988	61,580	57,104	4,476	93	7
1989	67,052	59,385	7,667	89	11
1990	47910	41,664	6,246	87	15

Source:INAPE
After Pr.:Obtained Volume after Processed

In terms of export figures, it has experienced spectacular growth (rising from US$ 3.4 million in 1975 to US$ 60.8 million in 1990). Within Uruguay's economy as a whole, however, it has not exceeded 1 percent of GDP.

2) General Situation of the Atlantic Southwest Fishery

The foreign fishing vessels visiting the port of Montevideo are assumed to conduct fishing activities in the sea area called the Atlantic Southwest.

The catch more than doubled in this area between 1975 and 1986 from 823,000 tons to 1,710,000 tons. Fishing by boats from outside the region accounted for 30% of the catch in 1986, compared with 11% in 1980 and only 2% in 1975.

Traditionally one of the most important catches has been for Argentine hake, fished mainly by Argentine and Uruguayan fleets. There has been a substantial increase in the catch for squid by both Argentine fleets and boats from outside the region in the area stretching south from the Plate estuary to the Malvinas (Falklands).

Table 1-1-3-12 Atlantic Southwest Catches by Species and Countries

Unit: 1,000ton

	1970/74	1975/79	1980	1981	1982	1983	1984	1985	1986
Demersals	251	474	598	611	665	771	540	600	640
-hake	153	316	355	327	360	348	262	372	377
-whiting	0	11	78	70	137	258	113	95	104
Pelagics	196	156	157	153	120	173	174	148	160
-sardinella	164	136	146	112	99	139	137	124	130
Crustaceans	50	54	49	49	62	70	83	79	77
Squid	4	43	31	54	208	205	252	270	303
Total	846	1,092	1,186	1,180	1,419	1,561	1,450	1,569	1,710
Argentina	249	376	377	352	459	402	305	397	412
Brazil	551	577	547	558	525	549	625	628	633
Uruguay	16	58	120	147	119	144	134	138	141
Others	33	53	142	123	316	466	386	406	524

Source: FIDI/FISHDAB

1-1-4 Trade

Trade balance had been in the red until 1982. However, the trade balance went into the black in 1983, and trade balance has continued to be in the black.

Main export commodities are traditional products such as meet, wool and leather and other products such as rice, dairy products, fishery products and textile.

Main import commodities are petroleum, machinery, chemical products, transportation machinery and so on.

Table 1-1-4-1 shows transition of trade in Uruguay.

Table 1-1-4-1 Transition of Trade

Unit:Million US$

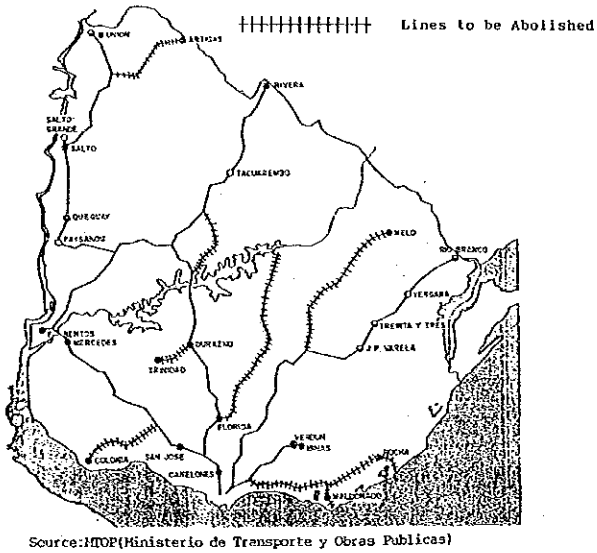
Year	Export	Import	Balance
1980	1,058,549	1,680,346	(621,797)
1981	1,215,375	1,641,120	(425,745)
1982	1,022,886	1,057,863	(34,977)
1983	1,045,100	705,620	339,480
1984	928,906	785,831	143,075
1985	852,352	707,077	145,275
1986	1,087,455	869,980	217,475
1987	1,191,084	1,141,891	49,193
1988	1,394,616	1,176,949	217,667
1989	1,596,082	1,238,323	357,759
1990	1,702,392	1,410,955	291,437

Source:Uruguay import-export statistic
():minus

1-2 Transportation

1-2-1 Railway

Uruguayan railway transportation started in 1853 by private sector. Uruguayan government nationalized the railway in 1948. Since 1970, the Uruguayan government has continued its effort to modernize trains and improve railroad and its facilities. Total railway length is 3,002km. Government plans to be abolish some of the existing rail roads. Figure 1-2-1-1 shows railway network and lines to be abolished.



Source:MTOP(Ministerio de Transporte y Obras Publicas)

Figure 1-2-1-1 Railway Network and Plan of Abolition Lines

Transportation volume in last six years is shown in Table 1-2-1-1. AFE stopped passenger services in 1988.

Table 1-2-1-1 Transportation Volume of Railway

Unit:Thousand

	1983	1984	1985	1986	1987	1988
Cargo Handling Volume (Ton)	900	1,000	800	900	900	1,000
Transpotation Volume (Ton/Km)	202,000	252,900	174,200	199,100	209,000	210,700

Source:AFE

1-2-2 Road

Paved roads amount to 70 % of total road length (9,510 km). Roads branch out to every department from Montevideo where the traffic is heavy, and connect each ountry site where the traffic is light. Figure 1-2-2-1 road network.

Export cargo volume through the road was about 566,000 tons in 1990. 70 % of export/import cargo through the road was carried to/from Brazil, and 24 % to/from Argentina. Table 1-2-2-1 shows cargo export/import through road.

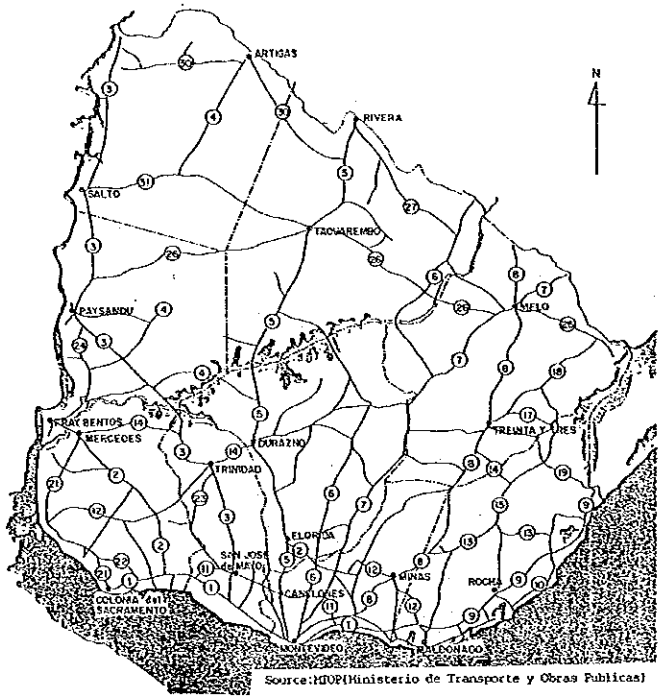


Figure 1-2-2-1 Road Network

Table 1-2-2-1 Cargo Export/Import through Road

Unit:Thousand tons

	Colonia	Fray Bento	Paysandu	Salto	Bella Union	Rivera	Acegud	Rio Branco	Chuy	Total
1985 Export	42	12	2	0	0	83	0	49	59	247
Import	18	80	3	0	3	35	0	62	68	269
Total	60	92	5	0	3	118	0	111	127	516
1986 Export	62	17	3	0	0	93	3	139	157	474
Import	11	104	4	0	2	32	0	70	88	311
Total	73	121	7	0	2	125	3	209	245	785
1987 Export	57	16	9	1	0	51	0	82	87	303
Import	11	128	4	2	2	29	0	79	124	379
Total	68	144	13	3	2	80	0	161	211	682
1988 Export	49	20	4	1	0	68	–	80	98	320
Import	17	104	9	5	2	29	–	71	141	378
Total	66	124	13	6	2	97	0	151	239	698

Source:DNT(Direccion Nacional de Transporte)

1-3 Main Development Policy

1-3-1 Development of River Way (Hidrovia)

Main contents of Economic Feasibility Study of Paraguay-Parana River Way (Hidrovia) are as follows:

(1) Scope of the Study

River area which runs through rivers of Paraguay and Parana

(2) Main Conclusions

1) The study on economic potential of the area influenced by river way shows that cargo flows are forecast between 14.5 and 18.5 million tons in 1995, and between 15.9 and 21.6 million tons in 2000.

2) It is possible to execute the improvement work of the channel, by which big convoys with 3.0 m draft can pass, under condition of cargo volume described above. Internal rates of return calculated under both conditions, i.e., Natural Integration Scenario and Intentional Integration Scenario are 18%, 26%, respectively.

3) Besides economic feasibility, this project brings innumerable indirect benefits in social and economic aspects.

(3) Navigation Plan

The draft will be secured at -3m up to the year of 2000.

1-3-2 Establishment of Common Market of South (MERCOSUR)

Four countries of Brazil, Argentina, Paraguay and Uruguay concluded the treaty for establishing a common market of South America on March 26, 1991. The Government of Uruguay got approval from the Diet and ratified the treaty on 22nd of July. This treaty, Treaty of Asuncion(Tratado de Asuncion), came into effect on 29th of November, 1991. The contents of it are as follows:

1) The common market will be established by the end of 1994. The name of the market is MERCADO COMUN DEL SUR (Abbreviation: MERCOSUR).

2) The common market means not only free transfer of properties, service

Figure 1-3-1-1 HIDROVIA PARAGUAY-PARANA

and products by the abolition of tariff and non tariff barrier, but also establishment of outside common tariff, adoption of common trading policy for outside countries or regions, cooperation of policy for macro and sector economy, and harmony of law system.

3) The schedule of reduction of inside tariff was determined as follows:

Unit: %

Year	91		92		93		94	
Month/Day	6/30	12/31	6/30	12/31	6/30	12/31	6/30	12/31
Rate of Reduction	47	54	61	68	75	82	89	100

2 NATURAL CONDITIONS

This chapter summarizes an outline of the natural conditions in Montevideo Port and the nearby area based on the reports related to "Master Development Plan of Montevideo Port" by the Consultant "INTECSA", adding some data analyzed in this investigation.

2-1 Topography

The Montevideo Port is located at the mouth of La Plata River and has been suffering from the considerable amount of sediments discharged from the upper reach thereof. As shown in Figure 2-1-1, Montevideo Port is surrounded by three breakwaters so as to be prevented from the invasion of sediments causing the shoaling in addition to the wave invasion. The ship basins are maintained to be about 10 meters in depth by dredging. The sounding chart is shown in Figure 2-1-2.

The approach channel of 33 km length runs from the mouth of port, of which the part near to the mouth with about 6.5 km length is called N-S channel, then the corner part continues for 4.5 km, and the remaining part is called W-E channel.

2-2 Meteorology

According to the data from 1981 to 1991, the mean annual rainfall is 1,163.3 mm. The monthly average is around 100 mm with small seasonal variation. The mean temperature in the summer from December to February is 22.5^{o}C and that in the winter from June to August is 11.4^{o}C.

The wind velocity is ordinarily weak but relatively strong in the summer. Table 2-2-1 shows the frequencies of occurrence of wind by direction and intensity during the period from 1990 to 1991. The predominant wind direction of stormy wind is in range from S to W, and its frequencies of occurrence is only 0.7 %.

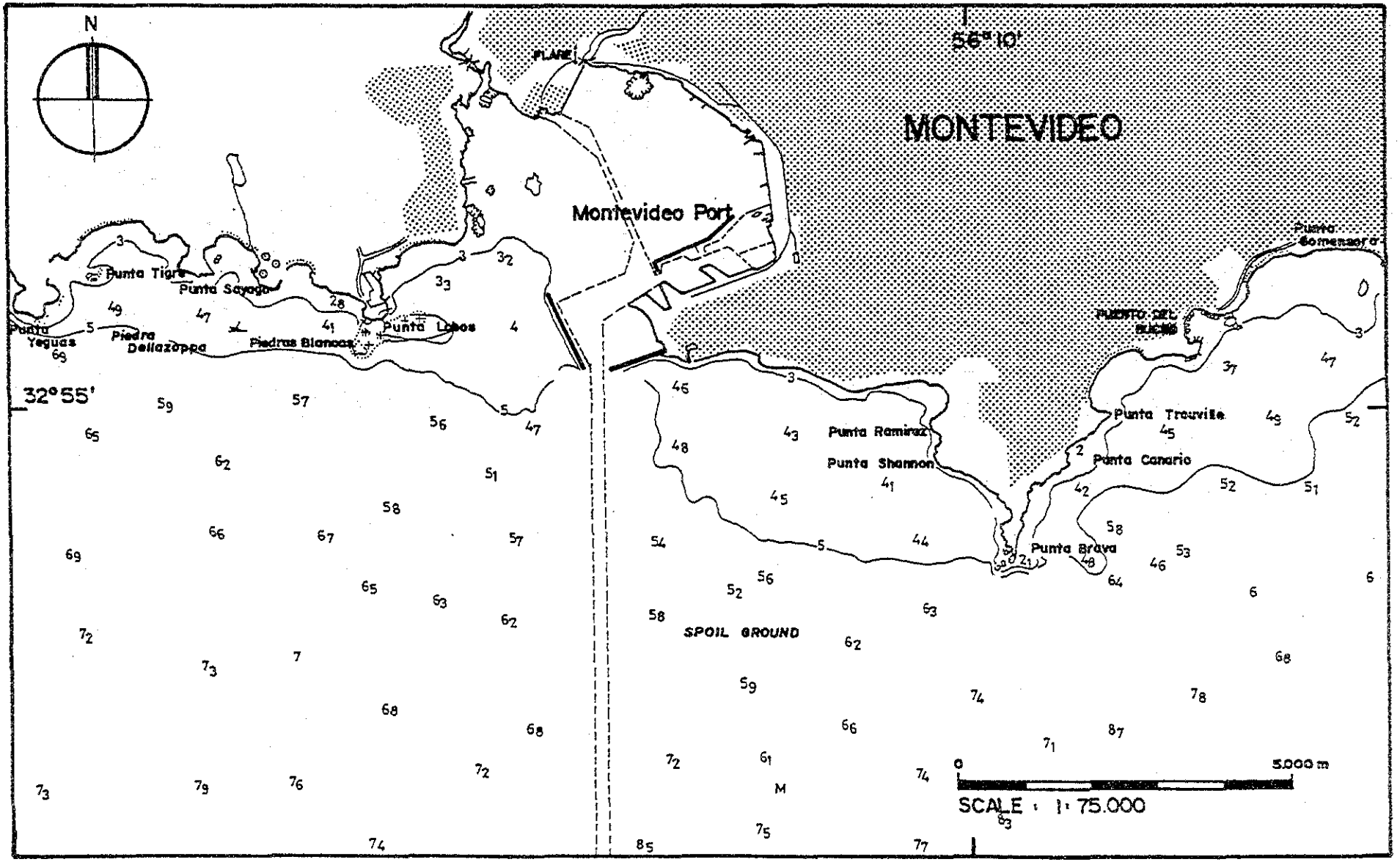


Figure 2-1-1 Location Map of Montevideo Port

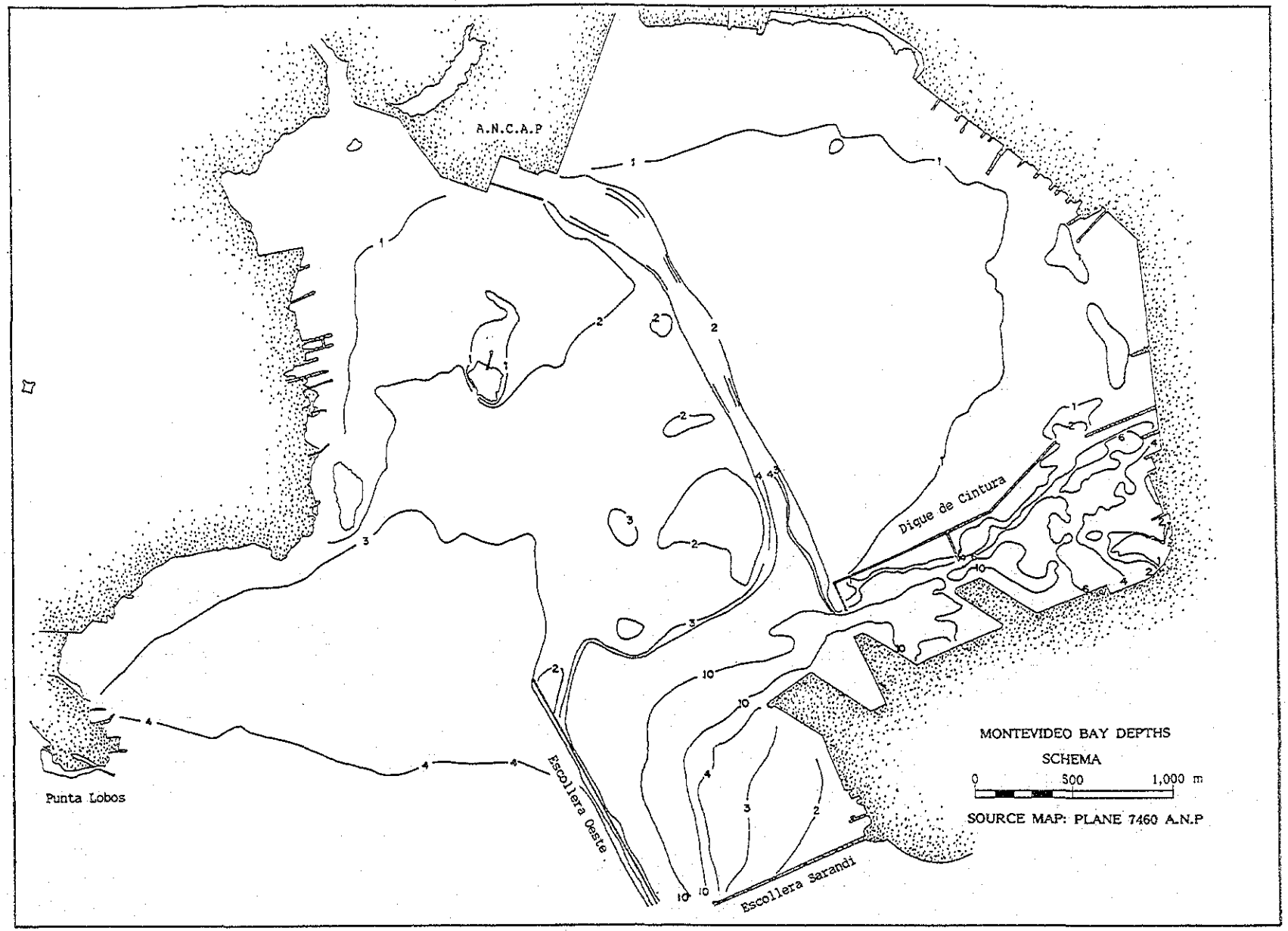


Figure 2-1-2 Sounding Chart of Montevideo Port

Table 2-2-1 Frequency of Occurrency of Wind by Direction and Intensity (1990 - 1991)

Source: Direccion National De Meteorologia

Direction / Wind Velocity (m/sec)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
V < 2.5	---	---	---	---	---	---	---	---	---	---	---	----	---	---	---	---	12.63
2.5 ≤ V < 5.0	3.81	2.53	2.26	2.53	3.11	3.01	2.17	1.93	2.16	0.86	0.58	0.50	0.78	1.04	1.47	2.45	31.19
5.0 ≤ V < 7.5	3.89	3.79	2.59	1.12	1.73	3.89	3.17	2.27	2.80	1.40	1.15	0.91	1.02	0.92	0.91	1.47	33.03
7.5 ≤ V < 10.0	1.46	1.58	0.90	0.19	0.58	1.63	1.42	0.74	1.50	0.99	0.75	0.68	1.10	0.44	0.26	0.47	14.69
10.0 ≤ V < 12.5	0.48	0.51	0.25	0.07	0.21	0.43	0.39	0.19	0.80	0.52	0.49	0.55	0.70	0.22	0.15	0.20	6.16
12.5 ≤ V < 15.0	0.13	0.07	0.01	0.01	0.02	0.05	0.06	0.05	0.14	0.20	0.18	0.18	0.29	0.09	0.03	0.03	1.54
15.0 ≤ V	0.01	---	0.01	---	0.01	0.01	0.05	0.03	0.07	0.04	0.06	0.19	0.21	0.04	0.02	0.01	0.76
TOTAL	9.78	8.48	6.02	3.92	5.66	9.02	7.26	5.21	7.47	4.01	3.21	3.01	4.10	2.75	2.84	4.63	100.00

Note : Percentage of winds not more than 2.5 m/sec is 12.63 %.

2-3 Sea Conditions

2-3-1 Tide and Tidal Current

The average amplitude of tide at the Montevideo Port is 60 cm at spring tide and 30 cm at neap tide. The rising tide lasts approximately one hour longer than the ebb tide. Each tide level is shown below. The maximum high level caused by wind waves during past 50 years was +3.4 m above the tidal datum which corresponds to "Zero of Wharton".

M.H.W.L: + 1.135 m
M.W.L: + 0.910 m
M.L.W.L: + 0.685 m

As for the tidal current, there are predominant currents which enter from the opening between the north end of *Escollera Oeste* and the *Dique de Cintura* and leave from the mouth of port. Although the velocity of entering currents is less than 0.1 m/sec, that of leaving currents reaches nearly 20 cm/sec.

2-3-2 Waves

The results of wave observation by a Datawell-Waverider Buoy which was installed at about 7 meters deep, 14 km south from Punta Brava, during the period from November 16, 1986 to April 5, 1987 are shown in Table 2-3-2-1. This is quoted from the report of "Master Development Plan of Montevideo Port". In this report, it is described that waves with period of more than 5 seconds in average were not observed and the maximum significant wave height was 2 meters.

It has been confirmed by means of some calculations that the reasons why waves of long period generated in deep water were not observed are based on the wave breaking on the shallow bank of Banco Ingles and the attenuation of waves due to the bottom-mud in addition to the wave refraction.

Table 2-3-2-1 Occurrence Number of Waves
(Number of total observation is 1,116)

H1/3 (m)	Occurrence Number	H1/3 (m)	Occurrence Number
0.0	0	1.1	62
0.2	5	1.2	37
0.3	43	1.3	27
0.4	132	1.4	16
0.5	155	1.5	8
0.6	168	1.6	8
0.7	136	1.7	5
0.8	134	1.8	4
0.9	101	1.9	5
1.0	67	2.0	3

2-4 Soil Conditions

The results of boring survey carried out in this investigation at the proposed sites for the grain and fishery terminals are presented in this section. The locations of boring point are shown in Figure 2-4-1 and the soil profiles are in Figure 2-4-2. Of the locations in the Figure, boring point B6 and B7 are carried out by the consultant "E.I.H. Grimaux" before this investigation.

As seen from these figures, there is a soft organic soil layer with the N-value of zero underlying the entire surface area of Montevideo Port and its thickness reaches more than 10 meters in some places. A clayey sand layer underlies the soft surface layer and a hard rock layer is under the clayey sand layer. At the point B4 and B5, this hard rock layer exists at the depth of 9 meters.

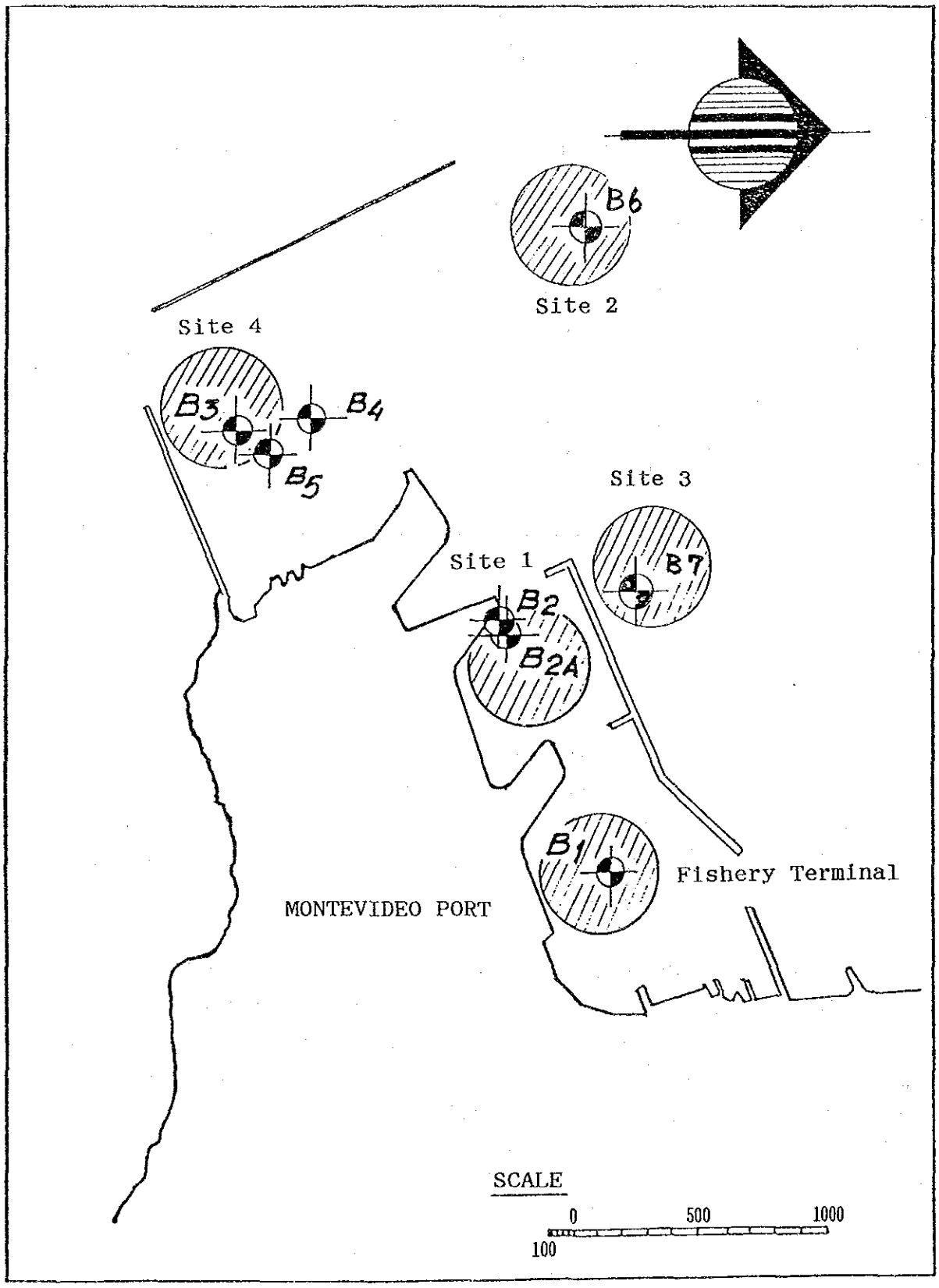


Figure 2-4-1 Location of Boring

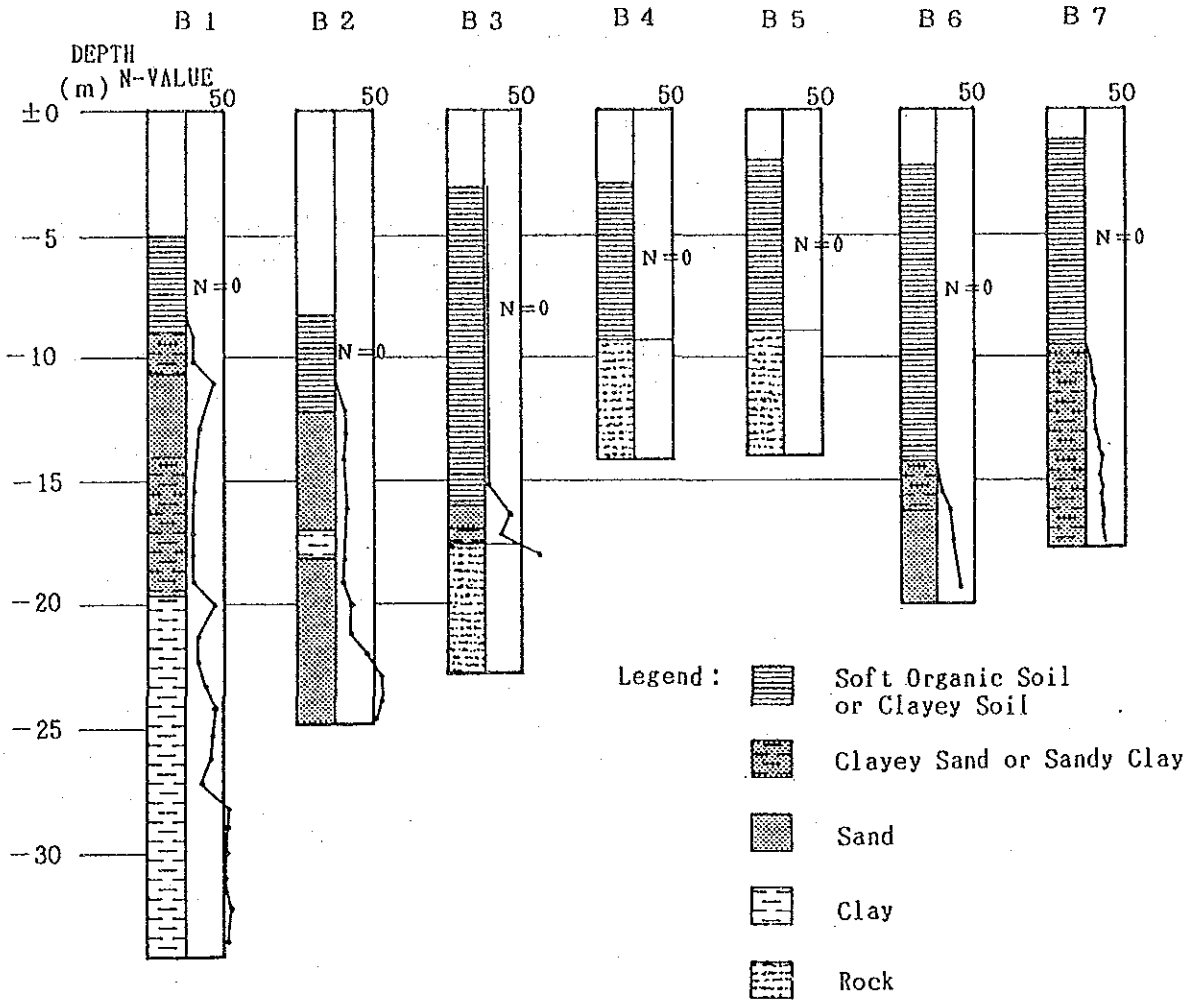


Figure 2-4-2 Soil Profile

3 PRESENT CONDITIONS OF THE PORT OF MONTEVIDEO

3-1 Location and Brief History of the Port of Montevideo

The Port of Montevideo is located at Lat.34 54' S, Long.56 12' W and in front of the capital of the country. This port is facing the mouth of the River of La Plata.

The construction work eventually began in 1901. The infrastructure of the Port was provided for service on 25th of August in 1909. Basic port configuration has not changed until now except for the addition of a container terminal and fishery wharf.

3-2 Present Conditions of Port Facilities

3-2-1 Present Condition of Each Port Facility

The layout of the Port of Montevideo is shown in Figure 3-2-1-1.
Main facilities are as follows:

(1) Breakwater

Table 3-2-1-1 Breakwater

No.	Neme	Length (m)	Structure
1	West Breakwater	1,300	Stone and Block
2	Sarandi Breakwater	940	Stone and Block
3	Cintura Breakwater	1,093	Stone and Block
4	Breakwater A	150	Stone and Block
5	Breakwater B	141	Stone and Block
6	Pier F	385	Stone and Block

Source: ANP

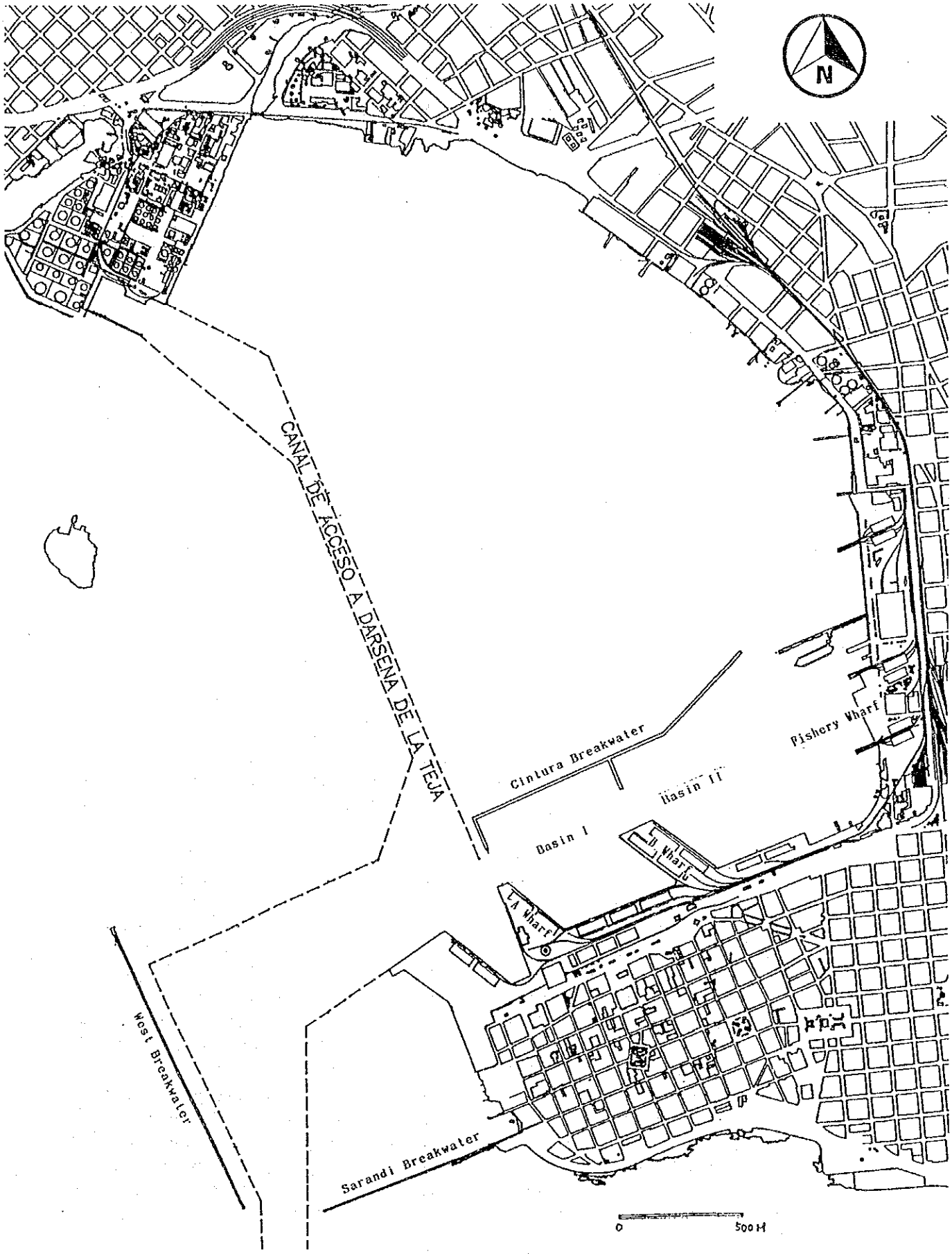


Figure 3-2-1-1 Layout of the Port of Montevideo

(2) Channel and Basin

Table 3-2-1-2 Channel and Basin

No.	Neme	Length (m)	Depth (m)	Width (m)
1	Channel	30,000	-10	(0-9Km) 200
			-10	(9Km—) 100
2	Foreport		-10	
3	Basin I		-10	
4	Basin II		- 8.5	
5	Basin(Cabotaje)		- 4.5	
6	Basin(Fluvial)		- 5	
7	Channel(ANCAP)		- 9	
8	Basin(ANCAP)		- 9	

Source: ANP

(3) Wharves and Jetties

Table 3-2-1-3 Wharves and Jetties

No.	Neme	Length	Depth (m)	Ground Level(m)	Present Usage
1	Escale Wharf	278	-10	4	Container
2	Fluval Wharf	344	-5	4	Navy
3	Rinconada Wharf	88	-5	4	Ferry
4	Maciel Wharf	381	-6	4	Ferry, Tug Boat
5	A Wharf (top)	46	-10	4	Tug Boat
6	A Wharf (east)	303	-10	4	General Cargo
7	Wharf (Basinl)	492	-10	4	General Cargo
8	B Wharf (west)	294	-10	4	Bulk Cargo
9	B Wharf (top)	145	-10	4	Under Consyruction
10	B Wharf (east)	326	-10	4	General Cargo
11	Refrigertion Wharf	392	-10	4	Fishing Boat, Reefer
12	No.1 Wharf	208	-5	4	Fishing Boat
13	Fishery Wharf	335	-4	4	Fishing Boat
14	No.5 Wharf	170	-5	4	Fishing Boat
15	No.6 Wharf	227	-5	4	Auxiliary Craft

Source: ANP

(4) Handling Equipment

Table 3-2-1-4 Handling Equipment

Type	Capacity (t)	Unit	RemarK	Type	Capacity (t)	Unit	Remark
Dockside Crane	40	1	Container	Truck	20	5	
	5	18	Maciel(3)		15	1	
			Wharf A East(7)	Top	40	4	
			Wharf B East(7)	Lifer	28	5	
	3	9	Basin I	Fork	2	37	
	12.5	4	Wharf B West	Lift	3	1	
	40	2	Wharf B West		13.5	3	
	6	4	Reefer		2.5	20	
Mobil	4	6			3	10	
Crane	40	2			3	10	
	20	2			3	14	
	30	1					
Tractor	50	9					
	50	4					

Note: Except repairing Equipment

Source: ANP

3-3 Present Port Management and Operation

3-3-1 Outline of Port Management and Operation in Uruguay

MTOP (Ministry of Transport and Public Works) and the ANP (National Port Administration) are mainly responsible for the management and operation of the ports in Uruguay. The ANP, an autonomous state public enterprise, under control of MTOP, is responsible for constructing, maintenance, management and operation of Montevideo Port. The ANP is also responsible for the management and operation of all commercial ports. DNH (National Directorate for Hydrography, MTOP) is responsible for construction/maintenance of these commercial ports. DNH is also responsible for constructing and operating small craft harbors and the fishing port of La Paloma.

3-3-2 Functions and Organization of the ANP

The ANP, established by Law No.5495 in 1916, is an autonomous state enterprise responsible for provision of cargo handling (except stevedoring which is carried out by the ANSE) and marine services (towage, dredging), construction and maintenance works (including ship repair services) and granting of licences for port services within the port of Montevideo.

The Board of Directors of the ANP is composed of a President, a Vice President and three Directors appointed by the President of the Republic. The ANP is required to seek Government approval for tariff increases, investments and the annual budget.

Under the Board, the ANP has an organization governed by two general managers and has 3,362 employees in total as of March, 1992.

3-3-3 Control of Vessel's Navigation in Montevideo Port

The navigation of vessels is under control of the National Navy, and pilotage service is provided by the Pilotage Office of the National Navy. Pilot service is compulsory in Montevideo Port except vessels less than 1000GRT, vessels belonging to the National Navy and other specific vessels.

3-3-4 Cargo Handling

Land-side cargo handling operations on piers are principally done by ANP's workers and equipment. Ship-side cargo handling operations are done by the ANSE (National Administration for Stevedore Services). These services are available 24 hours.

3-3-5 Tariffs of the ANP

All charges of the ANP are expressed in US dollars. Tariff of maritime services consist of use of port, wharfage and tugboat charge. Tariff of shore services mainly consist of tariffs for imports/exports, tariffs international/national transit, charge for container and storage charge. Tariffs for imports is based on C.I.F. value of the import goods not based on freight volume of goods. On the other hand, tariffs for exports is based on freight volume of goods. Both import and export goods are classified into groups according to N.A.D.I./N.A.D.E. Code, (Import; 4 groups, Export; 10 groups), and each group has a different tariff rate.

Tariffs international/national transit is based on freight volume of goods. Tariffs of international transit is cheaper than those of national one.

Storage charge is based on freight volume of goods and staying period. Transit cargo has 3 months free storage period.

3-3-6 Financial Situation of the ANP

(1) Profit and Loss Statement of the ANP

The Profit and Loss Statements of the ANP between 1987-1990 are shown in Table 3-3-6-1. The ANP shows a deficit in all four years, though there was a surplus in operating income. There may be a lot of reasons for the deficit, but loss of revaluation of foreign loans seems to be the biggest reason. This suggests that the deficit of the ANP is only nominal.

Table 3-3-6-1 Profit and Loss Statement of the ANP

(Unit: US$)

	1987	1988	1989	1990
Operating Reveune	10,808,548	15,314,117	26,819,351	51,723,489
-Reveune form Land Service	8,884,154	12,996,844	22,817,133	42,515,805
-Revenue form Maritime Service	1,210,094	1,734,320	3,562,064	6,453,146
-Sundrt Income	714,300	582,953	440,154	2,754,538
Operating Expense	8,645,305	13,684,696	21,906,206	46,231,352
-Personnel Expense	5,582,911	8,772,707	14,092,344	28,748,712
-Depreciation	1,377,310	2,261,277	3,986,052	8,147,633
-Other Expense	1,505,084	2,650,712	3,827,810	9,335,007
Operating Income	2,343,243	1,629,421	4,913,145	5,492,137
Non-operating Revenue		404,353	1,351,720	4,665,526
Non-operating Expense	7,519,608	8,809,117	17,835,269	38,640,583
-Interest on Long-term Loan	-7,519,608	1,883,401	3,233,940	5,552,307
-Loss of Revaluation of Loan		6,925,716	14,601,329	33,088,276
Non-Operating Income	-7,519,608	-8,404,764	-16,483,549	-33,975,057
Surplus or Deficit	-5,176,365	-6,775,343	-11,570,404	-28,482,920

3-4 Port Activities

3-4-1 General Traffic

(1) Total cargo volume at Montevideo Port

Total cargo volume by packing type at Montevideo from 1985 is shown in Table 3-4-1-1.

Table 3-4-1-1 Total Cargo volume by Packing Type

Unit:tons

Year		Bulk L.	Bulk S.	Container	Con. T1	Con. T2	General	Gen. T1	Gen. T2	Total	Ex+Im
1985	Export	1,875	127,665	74,011	12,960	1,824	392,174	118,001	157,625	886,135	
	Import	74,357	209,143	13,726	12,960	1,824	117,657	118,001	157,625	705,293	1,591,428
1986	Export	31,609	96,164	98,921	17,678	2,115	261,307	64,579	133,323	705,696	
	Import	155,072	324,152	31,319	17,678	2,115	117,451	64,579	133,323	845,689	1,551,385
1987	Export	8,827	26,990	85,667	17,121	1,833	358,146	97,906	152,133	748,623	
	Import	131,522	371,524	33,366	17,121	1,833	169,241	97,906	152,133	974,646	1,723,269
1988	Export	1,332	22,497	125,118	52,293	10,514	517,457	70,168	122,894	922,273	
	Import	485,670	247,624	56,610	52,293	10,514	119,435	70,168	122,894	1,165,208	2,087,481
1989	Export	3,703	36,008	150,951	80,342	4,194	432,594	108,907	1,903	818,602	
	Import	523,027	344,646	72,463	80,342	4,194	83,680	108,907	1,903	1,219,162	2,037,764
1990	Export	0	22,290	176,618	164,161	5,223	355,447	79,853	187,609	991,201	
	Import	232,228	266,843	93,154	164,161	5,223	47,360	79,853	187,609	1,076,431	2,067,632

Source:ANP
Bulk L.:Liquid Bulk
Bulk S.:Solid Bulk
Con. T1:Container of international Transit Cargo
Con. T2:Container of Domestic Transit Cargo
Gen. T1:General Cargo of International Transit Cargo
Gen. T2:General Cargo of Domestic Transit Cargo
Ex+Im:Export Plus Import

Figure 3-4-1-1 shows the transition of cargo volume by packing type. International and domestic transit cargo are expressed by T1 and T2 in this figure.

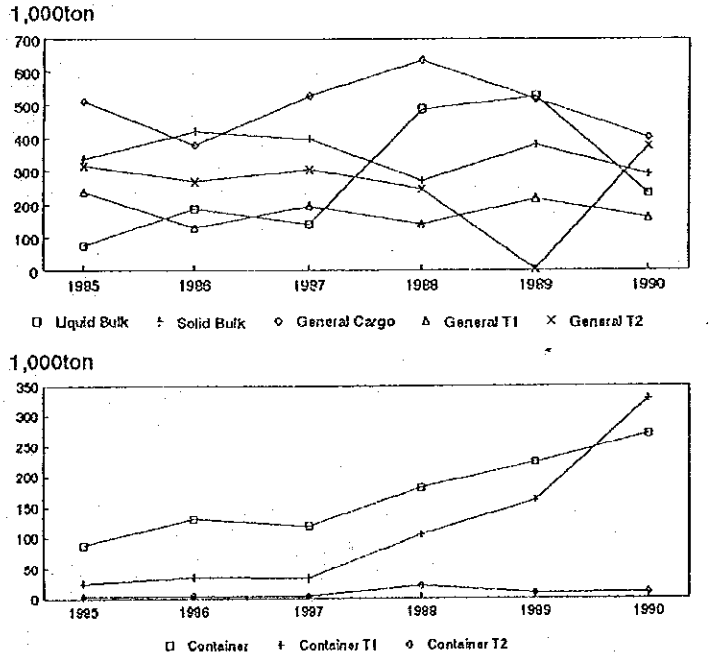


Figure 3-4-1-1 Total Cargo Volume by Packing type

(2) Export

Figure 3-4-1-2 shows export cargo volume by packing type except transit cargo.

Table 3-4-1-2 shows export cargo volume by classification of tariff.

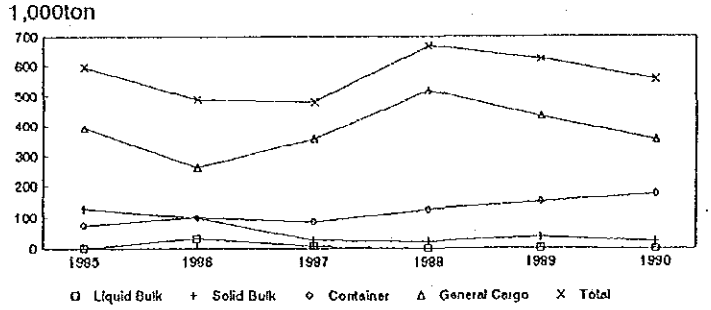


Figure 3-4-1-2 Export Cargo Volume by Packing Type (except Transit Cargo)

Table 3-4-1-2 Export Cargo Volume by Classification of Tariff

Unit:Tons

Commodity by N.A.D.E.	1985	1986	1987	1988	1989	1990
Live Animals & Related Products	137,101	144,867	103,066	155,632	175,027	150,836
Live Sheep(unit:number)	2,142	5,680	2,469	174,134	22,438	1,044
Vegetable products	304,645	156,704	199,585	258,651	220,551	175,297
Oil(Animal & Vegetable)	7,801	12,050	8,975	11,658	6,574	9,045
Food Products	52,522	27,181	23,423	38,312	56,666	32,749
Mineral Products	4,053	32,458	13,007	15,606	7,058	7,663
Chemical Products	10,229	10,751	41,611	21,988	11,087	14,217
Plastic Material	363	461	897	832	593	527
Hide/Leather & Related Products	12,358	11,658	9,319	12,883	15,234	13,767
Wood	501	104	316	58,744	49,543	64,993
Material of Fabrication Paper	208	1,711	709	184	166	179
Textile Material	53,073	75,540	66,122	70,519	54,608	63,127
Shoes, Hat	360	202	294	299	399	465
Manufacturing Stone	7,190	8,640	9,593	17,721	22,632	18,563
Precious Stone, Coin	36	133	57	126	35	125
Common Metals	2,468	3,692	1,719	1,949	1,383	1,478
Machine & Apparatus	895	598	159	260	466	396
Transportation Equipment	283	164	243	432	254	235
Optical Instrument	19	13	4	7	9	17
Arms & Munition	0	0	0	0	0	0
Merchandise & Diverse Products	1,612	1,074	531	601	972	676
Object of Art	8	0	0	0	0	0
Total	595,725	488,001	479,630	666,404	623,256	554,355

Source: ANP

In 1990, main commodities consisted of 96,940 tons of meat 16,145 tons of food subproducts, 74,627 tons fruits, 59,323 tons wool, 20,144 tons dairy products, 64,291 tons wood, 3,850 tons stone and gypsum, 30,036 tons fish, 95,649 tons grain and 93,350 tons others cargo.

(3) Import

Figure 3-4-1-3 shows import cargo volume by packing type except transit cargo.

Table 3-4-1-3 shows import cargo volume by classification of tariff.

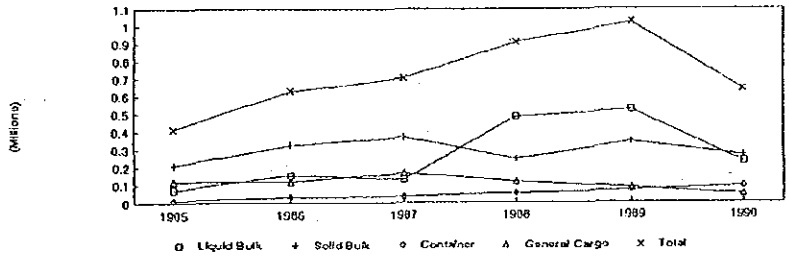


Figure 3-4-1-3 Import Cargo Volume by Packing Type (except Transit Cargo)

Table 3-4-1-3 Cargo Volume by Nomenclature Tariff of Import

Unit:Tons

Commodity by N.A.D.E.	1985	1986	1987	1988	1989	1990
Live Animals & Related Products	684	1,064	6,831	984	499	916
Live Sheep(unit:number)	8	0	0	0	0	0
Vegetable products	35,817	109,905	168,867	37,096	76,124	26,212
Oil(Animal & Vegetable)	867	850	1,377	524	2,888	2,167
Food Products	10,650	5,257	5,290	8,885	6,846	5,497
Mineral Products	119,834	270,970	189,892	599,515	617,774	306,167
Chemical Products	190,852	174,213	243,816	192,340	249,634	227,568
Plastic Material	6,800	8,949	10,543	7,648	8,587	11,390
Hide/Leather & Related Products	439	722	930	694	404	561
Wood	3,792	4,389	9,810	5,973	1,836	1,717
Material of Fabrication Paper	11,452	10,142	10,733	8,435	7,629	7,059
Textile Material	4,146	3,913	6,788	5,890	6,808	5,339
Shoes, Hat	22	40	44	173	31	54
Manufacturing Stone	1,365	1,049	1,223	1,271	1,567	2,399
Precious Stone, Coin	0	40	0	16	1	1,634
Common Metals	10,879	14,448	29,903	19,043	21,237	12,114
Machine & Apparatus	9,558	11,700	12,576	10,537	11,159	10,835
Transportation Equipment	2,188	3,261	2,838	4,836	3,870	4,240
Optical Instrument	313	246	466	915	1,212	261
Arms & Munition	21	16	102	42	29	906
Merchandise & Diverse Products	5,204	6,820	3,619	4,521	5,588	12,543
Object of Art	0	0	5	1	3	6
Total	414,883	627,994	705,653	909,339	1,023,816	639,585

Source: ANP

In 1990, main commodity cargo handling volume consisted of 303,979 tons of mineral products 221,812 tons chemical products 10,287 tons bean and plant, 4,938 tons grain, 2,200 tons machinery and 96,269 tons others cargo.

(3) Transit cargo

Transit cargo consists of international container, international general cargo, domestic container, domestic general cargo.

Figure 3-4-1-4 shows the tendency of transit cargo in recent six years.

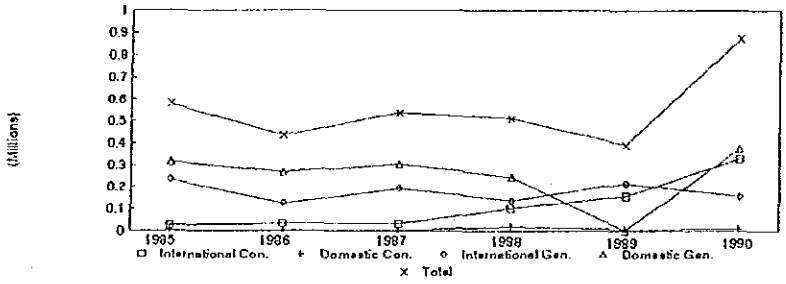


Figure 3-4-1-4 Transit cargo volume in Montevideo Port

(4) Container cargo

Average cargo volume per container has increased little by little Table 3-4-1-4 and Table 3-4-1-5 show containers handled in terms of TEUs at Montevideo Port.

Table 3-4-1-4 Containers Handled (in TEU) at Montevideo Port

Year	Import			Export			Total
	Laden	Empty	Total	Laden	Empty	Total	IM+EX
1985	6,426	5,467	11,893	9,040	2,573	11,613	23,506
1986	9,360	6,802	16,162	11,428	3,629	15,057	31,219
1987	12,953	7,758	20,711	13,658	5,632	19,290	40,001
1988	14,411	8,569	22,980	15,708	6,723	22,431	45,411
1989	16,281	9,328	25,609	17,758	7,219	24,977	50,587
1990	20,618	12,215	32,833	22,718	8,735	31,453	64,286

Source: ANP

Table 3-4-1-5 Container Cargo Traffic

	1985	1986	1987	1988	1989	1990
Cargo Volume in container(TON)	100,697	147,918	136,154	234,021	303,756	433,933
Number of Container(TEU)	23,506	31,219	40,001	45,411	50,587	64,286
Number of container empty con.(TEU)	8,041	10,431	13,390	15,292	16,547	20,950
Average volume per container	7	7	5	8	9	10
Ratio non empty container(%)	34	33	33	34	33	33

Source: ANP

3-4-2 Ship calling at the Montevideo Port

Table 3-4-2-1, which shows the GRT distribution of the vessels calling at Montevideo Port.

The number of vessls that called at Montevideo Port and the average gross registered tonnage by vessel type are shown in Table 3-4-2-2.

Table 3-4-2-1 GRT Distribution of Vessels at Montevideo Port

GRT	1987	1988	1989	1990
Below 500	58	1,965	2,169	1,760
501- 1000	133	262	323	269
1001- 2000	336	298	411	413
2001- 3000	373	394	276	199
3001- 4000	221	204	258	140
4001- 5000	25	43	45	46
5001- 6000	51	47	44	46
6001- 7000	41	49	40	21
7001- 8000	49	39	36	40
8001- 9000	88	90	91	77
9001-10000	127	109	111	121
10001-15000	265	249	238	278
15001-50000	122	162	192	192
Over 50000	4	2	1	1
Total	1,893	3,913	4,235	3,603

Source: ANP

Table 3-4-2-2 Vessels Calling at Montevideo Port Ship Type

Year	Passen-ger	Passenger & Cargo	Cargo	Bulk	Tanker	Reefer	Container	Fishing	Others	Total
1985	362	14	653	40	181	67	91	207	35	1,650
	1,234,941	82,023	5,008,110	640,872	925,464	408,834	1,548,717	424,738	119,914	10,393,613
	3,411	5,859	7,669	16,022	5,113	6,102	17,019	2,052	3,426	6,299
1986	300	87	700	29	173	57	69	239	20	1,674
	1,164,744	312,153	5,599,838	421,889	1,078,336	263,195	1,120,733	474,568	119,652	10,555,108
	3,882	3,588	8,000	14,548	6,233	4,617	16,243	1,986	5,983	6,305
1987	28	482	754	22	168	96	102	202	39	1,893
	359,375	1,580,430	5,970,323	360,164	834,715	443,715	1,431,650	412,729	139,692	11,532,793
	12,835	3,279	7,918	16,371	4,969	4,622	14,036	2,043	3,582	6,092
1988	31	370	708	33	197	110	119	2,315	30	3,913
	364,925	1,324,014	5,261,139	477,529	1,012,943	542,090	1,873,598	1,083,967	109,103	12,049,308
	11,772	3,578	7,431	14,471	5,142	4,928	15,745	468	3,637	3,079
1989	29	397	766	17	231	123	110	2,537	25	4,235
	364,981	1,612,019	5,737,721	286,468	923,259	518,593	2,207,692	1,222,872	96,054	12,969,659
	12,586	4,061	7,490	16,851	3,997	4,216	20,070	482	3,842	3,062
1990	175	146	600	29	189	175	130	1,928	231	3,603
	971,646	416,374	4,654,646	426,102	677,341	1,122,388	2,345,992	725,673	1,355,055	12,695,217
	5,552	2,852	7,758	14,693	3,584	6,414	18,046	376	5,866	3,524

Source:ANP
Upper:Nos of Ships Calling
Middle:Total GRT
Lower:Average GRT

3-5 Fishing Vessels' Activity

3-5-1 Domestic Fishing Vessel

(1) Registered Vessel in the Port of Montevideo

There are 68 vessels registered at the Port of Montevideo.

(2) Vessel Size Distribution

Vessels less than 100 GRT represent 30.9 %, and vessels with 100 to 300 GRT represent 55.9 %. Accordingly, 86.8 % of vessels in the port are less than or equal to 300 GRT.

(3) Pattern of Behavior

1) Monthly Fluctuation of vessels' entering

Although there is not a large fluctuation among months, there are many entries in both months of July and August.

2) Normal pattern of Each Vessel

It is said that vessels more than 100 GRT normally operate ten days in the sea, and stay at the Port for one day for unloading and preparation. On the other hand, the cycle time of the vessels less than 100 GRT is about six days, i.e., five days in the sea and 18 hours at the Port.

3) Staying Period

The average staying period of each vessel in three months(July to August) in 1991 shows no significant difference based on vesel size.

3-5-2 Foreign Fishing Vessel

(1) Vessel Size Distribution

Ship arrival in 1990 is 500. Number of vessels more than 2,000 GRT is fifty one (51), representing a share of 10.2%. On the other hand, number of vessels less than 500 GRT is 240 and the proportion is 48.0%.

(2) Transition of Foreign Fleet Visiting the Port of Montevideo

According to the statistics of ANP, USSR was ranked No.1 with its number of visiting vessels reaching 111 in 1989. It was followed by Poland 109, China 89, Japan 76, Spain 53 and Korea 22.

According to eleven months' data of 1991, there occurred some changes in the composition of foreign countries. Soviet Union, Poland and Japan lowered their positions, while Spain and Korea were ranked No.1 and 2, respectively, in number. In particular, Korea showed a dramatic increase. Recently, there is a trend for vessels from Taiwan to increase.

(3) Pattern of Behavior of Foreign Fishing Vessels

1) Monthly Fluctuation of the Number of Arrival Vessels

The number of calling vessels at the Port reaches its maximum level around June or July when fishing of squid is completed. In these months, double the average number of vessels visit the port. After these months, foreign fishing vessels calling at the Port decrease drastically to one-third or a quarter of the peak level.

2) Staying Period in the Port

According to the data of foreign fishing vessels visiting the Port from July to September in 1991. 37.7% of vessels completed their stays within 3 days, 20.8% between 4 days and 6 days, 10.4% between 7 days and 9 days. Accordingly, 68.9% of foreign fishing vessels depart the port within 9 days after their arrivals. Besides these vessels, there are other vessels which stay at the Port until January when the new fishing season begins.

3) Frequency of Berth Changing

The berthing priority of foreign fishing vessels is ranked very low and they must relinquish the berth to a vessel with a higher priority if that vessel can not moor at the berth.

According to the same data written above, approximately 50 % of vessels have to change their berths from the one they used upon entry. More than a quarter have to change more than twice.

4) Transshipment of Fish Catch

There are three methods used in the transshipment of fish catch: ship to ship transshipment in the water area, ship to ship transshipment while mooring at the quay and transshipment through storage facilities on the land. The most common approach is the first one and this accounted for the majority of all transshipment in 1990.

4 PRESENT CONDITION OF GRAIN TRANSPORTATION

4-1 Present Condition of Ports in the River Plate Area

4-1-1 Uruguay

Main ports handle grain cargoes, for example, wheat, soybeans, beet pulp pellets, barley etc., and are located in three areas of Uruguay as shown in the map below.

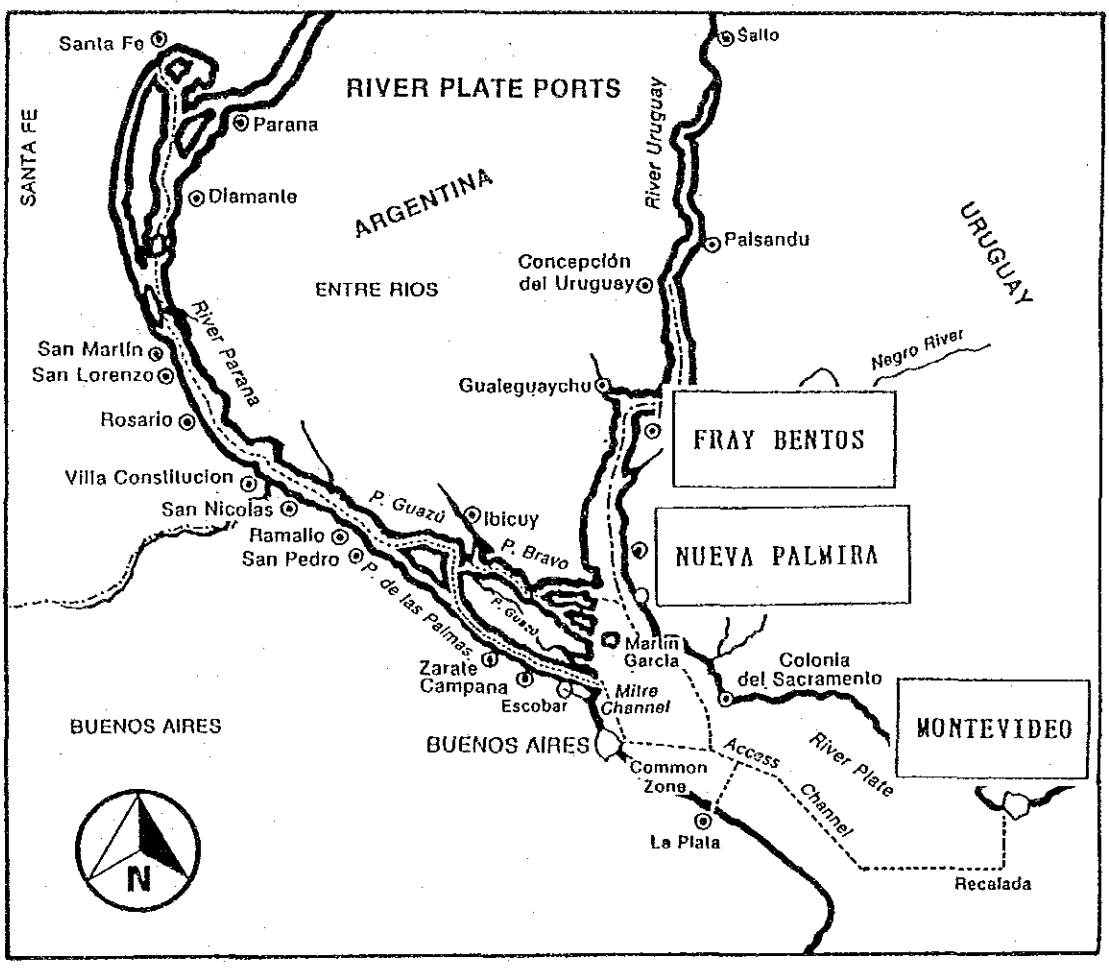


Figure 4-1-1-1 Ports Located along the Uruguay River, the Low Part of Parana River and the Mouth of La Plata River.

(1) Fray Bentos

Port of Fray Bentos is situated on the left bank of the river Uruguay, about 340 km by river from Montevideo and 234 km from Buenos Aires. This port, where the first bridge was constructed on the Uruguay River, is linked by land to Argentina and by rail to Paraguay.

(2) Nueva Palmira

The port is situated on the left bank of the river Uruguay, about 248 km by river from Montevideo. Large size vessels cannot be fully loaded because of the approximately 8 m draft of Martin Garcia bar or 9 m draft of Mitre Channel. (Figure 4-1-1-1)

Table 4-1-1-1 Grain Cargo Facilities in Uruguay

Name of Port	Fray Bentos	Nueva Palmira		Montevideo
	MGAP	MGAP	PRIVATE	ANP
Length of Wharf (m) (Ocean) (River)	 224 125	 240 240	 240 170	Wharf B No.6,7 294.35 –
Breadth of Wharf (m) (Ocean) (River)	 25 34	 11 11	 8 Cylindri.Con 10	 19 –
Depth of Wharf (m) (Ocean) (River)	 – 9 – 9	 – 8.1 – 4.2	 – 8.4 – 4.0	 – 9.5 –
Capacity of Silo (tons) Horizontal Vertical Bin Big Small Total	 1: 12,000 12: 9,000 6 — 21,000	 1: 10,000 14: 32,000 6 — 42,000	 3: 75,000 0 — 75,000	 Nil
Handling Equipment Capacity Loading hour/tons Unloading : Belt Conveyer :	1 Pneumatic 400 120 400	1 Pneumatic 500 500 400	Loader & Crane Loader× 400 Crane × 300 400	 1 Unit ×60-80 Crane 40t × 2 : 12.5× 4
Handling Cargoes	Wheat, Soybean Beet Pellet	Wheat	Wheat, Soybeans Pellets	Rice, Soybean
Handling Volume ('90) Tons	64,810	41,000	638,906	30,995

Martin Garcia bar:

The maximum permissive draught for crossing the bar is normally 7.92 m (26f) and the vessels must have a speed of at least 10 knots. For ships of less speed the draught is reduced to 6.70 m (22f) and even to 6.10 m (20f) when the speed is between 5 to 8 knots.

(3) Montevideo

The eastern wharf on pier 'B' is used for handling bulk grain cargoes.

4-1-2 Argentina

The loading of dry bulk cargoes in Argentina is conducted in four areas; Up-River Port (including Rosario, San Martin and San Lorenzo), Buenos Aires located in the La Plata River, Alpha Zone, offshore of Montevideo, and Bahia Blanca.

(1) Rosario

Rosario is situated on the right bank of the river Parana. It is about 420 km from Buenos Aires and Argentina's chief export center for grain and by products. The grain terminals of the port stretch out along the bank for about 10 km. To navigate this area, vessels must have a safety margin of 1 foot below keel.

Table 4-1-2-1 Grain Elevators in Rosario Area

Name	Length (m)	Depth (m)	Cap./Silo (tons)	Loader (t/hour)	Recep. ton/hour (Truck)	(Train)	Remark
FACA	130	9.5	19,700	1,000	1,200	-	
G.GARCIA	140	9.1	80,000	1,100	900	500	
UNIT II	130	-	22,800	600	300	300	No work
UNIT III	80	9.0	87,500	1,000	500	1,000	
UNIT IV	145	10.7	36,280	1,000	0	1,000	
UNIT VI	250	10.4	140,500	1,500	1,200	1,200	
UNIT VII	215	9.0	80,000	1,000	0	3,200	uncoplete
PLAZOLETA	150	9.0	-	-	-	-	Open Berth
P. ALVEAR	144	10.5	70,000	1,800			
Total			536,780	9,000			

Note: FACA = Federacion Argentina de Cooperativas Agrarias

Table 4-1-2-2 Cargo Volume in Rosario Area ('82-'89)

Unit:10^3ton

Elvator	'82	'83	'84	'85	'86	'87	'88	'89
UNIT I	-	-	-	-	-	-	-	-
F.A.C.A	-	330	520	1,167	1,073	744	887	175
GENARO GARCIA	-	824	122	93	324	195	191	62
UNIT II	-	-	-	-	-	-	-	-
UNIT III	887	1,211	1,131	2,134	634	272	246	238
UNIT IV	675	451	711	679	323	-	303	103
UNIT VI	2,366	2,218	1,392	1,979	1,010	819	960	642
PLAZOLETA A.G.P	2,632	2,186	2,271	2,149	1,776	914	437	150
TOTAL	6,560	7,220	6,147	8,201	5,140	2,944	3,024	1,370
PUNTA ALVEAR	-	934	1,448	1,903	1,981	1,185	1,494	661
G.TOTAL	6,560	8,154	7,595	10,104	7,121	4,129	4,518	2,031

(2) San Martin, San Lorenzo

San Martin, situated on the right bank of the river Parana, is 447 km from Buenos Aires; San Lorenzo is 445 km from Buenos Aires. In these areas, grain elevators handling maize, sun pellets, soybean and sorghum, have been constructed and managed by private companies.

Table 4-1-2-3 Grain Elevators in San Martin, San Lorenzo

Name	Length (m)	Depth (m)	Cap./Silo (tons)	Loader (t/hour)	Recep. ton/hour (Truck)	(Train)
TERMINAL VI	180	12.0	350,000	2,000	1,800	600
CARGILL	130	12.2	76,500	2,000	1,000	400
NIDERA	150	10.7	130,000	1,200	1,100	500
BUNGE	140	10.7	22,000	1,600	400	0
INDO S.A	100	12.2	155,000	1,000	600	200
A.C.A.	184	15.2	58,000	1,800	600	600
VICENTEN	180	12.2	35,000	2,400	1,600	0
Total			826,500	12,000		

Table 4-1-2-4 Handling Volume in San Martin, San Lorenzo ('82-'89)

Unit: 10^3Tons

Name	'82	'83	'84	'85	'86	'87	'88	'89
TERMINAL VI	-	-	-	-	-	411	1,520	1,793
CARGILL	1,353	1,013	941	1,327	1,331	1,154	1,195	976
BUNGE & BORN	488	653	430	668	518	262	212	174
INDO	352	500	325	580	488	536	567	322
NIDERA (IMSA)	-	500	506	1,017	1,328	817	1,041	731
A.C.A.	-	-	-	417	1,060	807	784	545
VICENTIN	-	-	-	-	-	484	893	650
TOTAL	2,193	2,666	2,202	4,009	4,725	4,471	6,212	5,191

(3) Buenos Aires

The port tops off vessels including panamax size loaded until 26 feet at Up-River Ports. But in the port of Buenos Aires, the volume of loading grain cargoes for ocean-going ships is limited from 42,000 tons to 45,000 tons due to navigational safety in the River.

Table 4-1-2-5 Cargo Handling System in Buenos Aires

Name	Length (m)	Depth (m)	Cap./Silo (tons)	Loader (t/hour)	Remark
A.C.A.	220	6.9	16,500	400	
UNIT I	750	9.0	170,000	1,000	
PUBLIC	-	9.0	-	4,000/day	Belt Conveyer

(4) Alpha Zone

Alpha Zone is 50 km offshore of Montevideo. The depth is about 12 m. It is usually operated by top-off vessels to top off panamax size vessels. (Figure 4-1-2-2)

There is " RIVER PLATE TREATY" of Alpha Zone in which the territorial waters were agreed upon by Uruguay and Argentina in 1976.

Top-off vessels ranging from 60,000 DWT to 70,000 DWT are regarded as big floating elevators with loading facilities. The instruments of operation are only grabs or grabs added to conveyer. The transport of transshipped grain cargoes is carried out in two ways. One is carried out by top-off vessels themselves and another by big barge (37,000 DWT) accompanied with a tug boat from Up-River to Alpha Zone.

According to the operation data of 1984, operating activity was carried out as follows:

Loading	(Up-River Port)	6	days
Navigation & Delay	(Alpha Zone - Up-River - Alpha Zone)	24	days
Loading	(Alpha Zone)	5	days
	Total	35	days

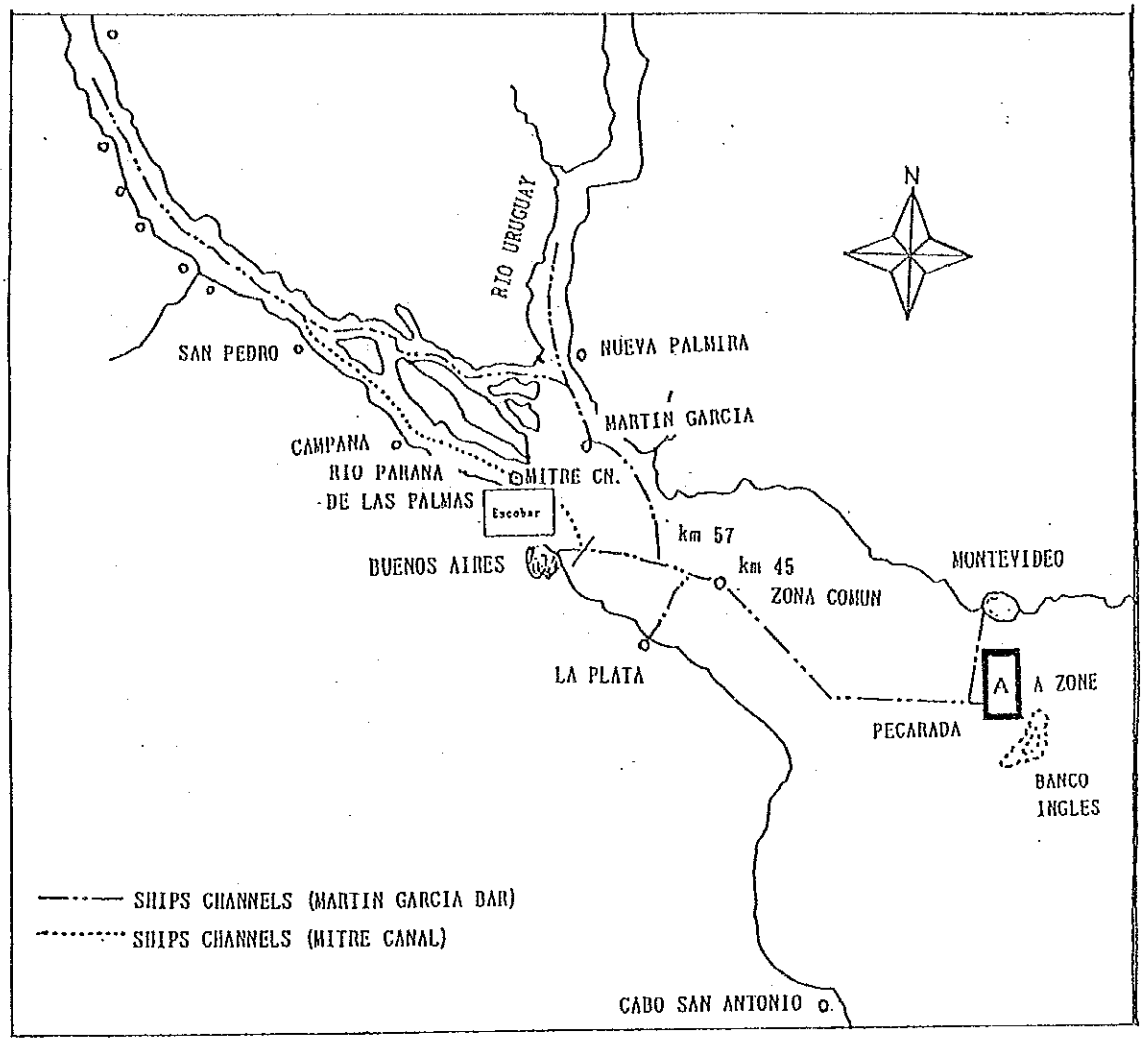


Figure 4-1-2-2 The River Plate

Table 4-1-2-6 Handling Volume of Alpha Zone ('83-'85)

Unit:Tons

	'83	'84	'85
January	22,500	41,135	28,100
February	41,900	208,238	152,224
March	36,500	104,192	202,947
April	147,027	211,164	402,479
May	63,899	225,392	454,319
June	90,136	236,344	201,457
July	254,781	107,524	194,797
August	149,031	78,640	140,594
September	94,813	24,300	NO WORK
October	126,505	NO WORK	NO WORK
November	21,800	NO WORK	NO WORK
December	NO WORK	NO WORK	NO WORK
Total	1,048,892	1,236,929	1,776,917

(5) Bahia Blanca

Port of Bahia Blanca is about 1,040 km sea-route from Buenos Aires and has developed with the export of grain, especially wheat, sorghum, and by-products. The railway and a network of roads link it to the rest of the country and to bordering countries. Also, the port has greatest water depth in Argentina and top-off service is similarly conducted for vessels not fully loaded at the ports of Rosario, San Martin, Buenos Aires etc.. (Table 4-1-2-7)

Table 4-1-2-7 Grain Elevators in Bahia Blanca

Name	Length (m)	Depth (m)	Cap./Silo Tons	Loader T/Hour	Recep. TN/Hour (Truck)	(Train)	Remark
UNIT III	230,200	11.1	140,000	1,500	Nil	-	
UNIT IV	"	11.1	8,000	Nil	200	Nil	Connect U/III
UNIT V	230	11.6	60,000	2,000	1,000	Nil	

Mitre Channel:

The Mitre Channel begins at 12 km point of the access channel to Buenos Aires and continues to the Parana de las Palnas (48 KM) which from 177 km forms the southern branch of the Parana delta. Normally, it is kept dredged to a depth of 9 m (29.6 feet). A margin of 0.30 m (1 foot) must be left below the keel but for navigation at night (from dusk to dawn) 0.45 m (1.6 feet) clearance is required.

4-1-3 Brazil

(1) Paranagua

The port is well equipped for handling grain and by-products, pellets and meal. Below is a table showing the equipment used for loading grain cargoes.

Table 4-1-3-1 Port Facilities of Grain in Paranagua Port

Name	Length (m)	Depth (m)	Name/ Grain	Capac./Silo Tons	Capac./Loader T /per Day,Max
CORRIDOR	500	11.1	Soybeans	210,000	15,000
			Pellets	250,000	50,000
			Meals	40,000	7,000
			Total	500,000	

4-1-4 Paraguay

Table 4-1-4-1 shows capacity of grain terminal of Paraguayan river ports.

Table 4-1-4-1 Port Facilities for River Barge in Paraguay

Port/ Company	River	Loader tons/hour	Silo Type	Silo Cap./tons	Handling Cargo
Concepcion	Paraguay				
Nanawa		270	Ver.	250	Soybeans, Pellets
Algesa		150	Ver.	4,000	Maize & Wheat
San Antonio					
Gical S.A.		500	Ver.	4,000	"
			Hor.	75,000	
Villeta					
Capsa		200	Hor.	10,000	"
Ayolas	Parana				
Algesa		150		Nil	"
Encarnacion					
Transparag.		500	Hor.	60,000	"
Hohenau					
Ciapsa		300		Nil	"
P.D.Joaquin					
Esteve		500	Ver.	4,000	"
P. Paloma					
Cargill		500	Ver.	21,000	"
P. Torocua					
Agriex		300	Ver.	13,200	"
P. Tati Yupi					
Agrocereales		150		Nil	"
S.D.Guaira					
Agrocereales		120	Ver.	2,000	"
Tedesa		470	Ver.	18,000	
TOTAL		4,110		211,450	

4-1-5 Bolivia

Bolivian soybean are exported from the port of Aguirre which is located on the bank of the Tamengo river.

4-2 Present Transportation System

4-2-1 Present Transport Route

Every country (Argentina, Bolivia, Paraguay and Southwest Brazil) makes use of the river route to carry a lot of grain cargoes for export by river ships or ocean-going vessels as shown in Figure 4-2-1-1.

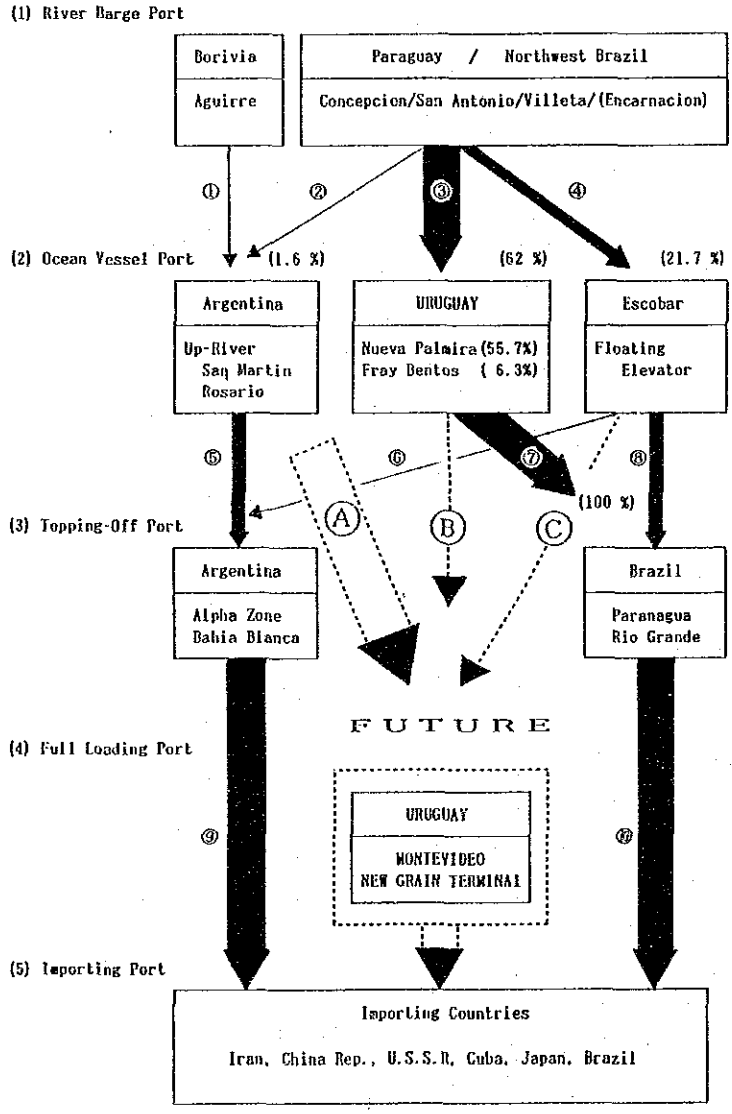


Figure 4-2-1-1 Present Transport Route

4-2-2 Present Distribution Cost by Each Means of Transportation

The present transportation cost of grain cargoes from Argentina and Paraguay to Montevideo port is shown in Table 4-2-2-1 and 4-2-2-2, respectively.

Table 4-2-2-1 Transportation Tariff from Argentina ('92)

	Truck	Railway	River Ship
Route	Rosario - Zarate - G. Chu Fray Bentos - Montevideo	Rosario-Zarate - Concordia Salto - Montevideo	Up-River Port (Rosario) - Montevideo
Distance (km)	750	1,285	600
Period (day)	3	7	8
Tariff (US $/ton)	60	31.72	5.57
Remark		a)Rosario - Salto (680km) = 14.60 US $ /ton b)Zarate Transit = 1.39 US $ /ton c)Salto - Montevideo(605km) = 15.73 US $ /ton Total = 31.72 US $ /ton (a+b+c)	a)Rosario - Nueva Palmira = 8.50 US $ /ton b)B. Aires - Nueva Palmira = 9.00 US $ /ton

SOURCES: AFE (Administracion de Ferrocarriles del Estado)
CATIDU (Camara Autotransporte Terrestre Internacional del Uruguay)

Table 4-2-2-2 Transportation Tariff from Paraguay ('92)

	Truck	Railway	River Ship
Route	Encarnacion - Concordia Salto - Paysandu - MVD.	Encarnacion - F.- Concordia Salto - Paysandu - MVD.	Encarnacion -Nueva Palmira Nueva Palmira - MVD.
Distance (km)	1,046	1,238	2,194
Period (day)	3	5	15
Tariff (US $ /ton)	52	34.73	38.00
Remark	1,300 US $ per Truck	a)Encar.- Frontera (22 km) = 4.40 US $ b)Frontera - Salto (611 km) = 14.60 US $ c)Salto - MVD (605 km) = 15.73 US $ Total = 34.73 US $ /ton (a+b+c)	a)Enc.-N. Palmira (1,940 km) = 21 US $ b)Tranzit (Nueva Palmira) = 4.00 US $ c)N. Palmira - MVD (254 km) = 5.00 US $ Total = 30 US $ /ton (a+b+c)

SOURCES: AFE (Administracion de Ferrocarriles del Estado)
CATIDU (Camara Autotransporte Terrestre Internacional del Uruguay)

5 SEDIMENTATION OF MATERIALS AT THE APPROACH CHANNEL AND THE PORT AREA

5-1 General

At the Montevideo Port, the maintenance dredging of several millions of mud are annually conducted in the approach channel and the inner basins. The consultant "INTECSA" performed the detailed investigation on the future maintenance dredging. Here will be reviewed the method of estimation on the maintenance dredging volume, checking its rationality.

5-2 Review on the Analysis of the Maintenance Dredging at the Approach Channel

5-2-1 Calculation of Shoaling Thickness by means of Semi-empirical Formula

Assumed that the ratio of shoaling at the channel is proportional to the difference between the channel depth and the natural equilibrium depth of the site where the channel is excavated, the following equation is obtained:

$$dC/do = K\ (Ce-C) \qquad (1)$$

Where, C : channel depth (meters)
Ce: natural equilibrium depth that is equal to the water depth before dredging the channel (meters)
t : duration (years)
K : proportional coefficient

If the channel depth at t=0 is Cd, from equation (1),

$$C = Cd + (Ce - Cd)\ (1 - e^{-Kt}) \qquad (2)$$

Moreover, replacing the duration t with (t2 - t1), the annual shoaling thickness A (m) is expressed as follows, where A is equal to the dredging thickness a year when dredging is conducted every (t2-t1) years.

$$A = (Ce - Cd)(1 - e^{-K(t2-t1)})/(t2 - t1) \qquad (3)$$

In order to obtain the value of K in the above equation, an experimental dredging was conducted at -9m of Ce along the W-E channel, the value of K being obtained as 0.490 on the basis of the equation (2). Moreover, as for the N-S channel, Table 5-2-1-1 was obtained by using the equation (3) and the data of ANP during 1979 to 1985 on the actual maintenance dredging.

Table 5-2-1-1

		Shoaling thickness A (m/year)	Maintenance depth Cd (meter)	Equilibrium depth Ce (meter)	Coefficient K ($year^{-1}$)
Approach Channel	Km 0 -2	2.08	-10.5	-5.5	0.440
	Km 2 -4	1.87		-6.0	
	Km 4 -6.5	1.46		-7.0	
	Average	1.77			

5-2-2 Estimation of Shoaling Thickness by means of the Overall Method

The rate dm/dt of bottom erosion was expressed by the following equation:

$$dm/dt = - Mo(J/Jo - 1) \quad (4)$$

Where m: eroded thickness of sea bottom
t: duration
J: bottom friction stress
Jo: critical friction stress from which erosion begins
Mo: erosion constant

If the tidal current velocity is sinusoidal with the period T and the amplitude V' and the critical velocity from which the erosion begins is Vo, the erosion thickness Me per one period is obtained as follows:

$$Me = - (2T/\pi)Mo[(K/2-1)(\pi/2 - \theta) + (K\sin 2\theta)/4] \quad (5)$$

Where $K = (V'/Vo)^2$ and $\theta = \arcsin (Vo/V')$

On the other hand, the rate dm/dt of deposition of materials was expressed as follows:

$$dm/dt = CW(1 - J/Jo') \quad (6)$$

Where, Jo' = critical friction stress from which deposition begins
C = concentration of suspended materials
W = particle falling velocity
m = deposition thickness

Using the same sinusoidal tidal current velocity as above and taking Vo' as the critical velocity from which the deposition begins, the deposition thickness Ms during one period is expressed as follows:

$$Ms = (2T/\pi)CW[\theta'(1-K'/2)+(K'/4)(\sin 2\theta')] \quad (7)$$

Where $K' = (V'/Vo')^2$ and $\theta' = \arcsin (Vo'/V')$

From the above, the shoaling thickness M during one period T becomes as follows:

$$M = Me + Ms \quad (8)$$

The following conditions were applied to obtain the shoaling thickness from the above equations.

(1) The tidal current of 42 m/sec in amplitude repeats throughout the year. Owing to that one tide is 12.42 hours in period, the number of tide during one year is 705.
(2) The critical velocity from which erosion begins is 20cm/sec and that of deposition is 10 cm/sec.
(3) The erosion coefficient Mo is 2.43×10^{-8} (m/sec).
(4) At the North-South Channel, the shoaling height A is 2.08 meter for Ce = -5.5 m and Cd = -10.5 m.

Moreover, taking into account the variation of current velocity in the

channel by the angle between the direction of the channel and the tidal current, obtained was the shoaling thickness as shown in Table 5-2-2-1, from which the annual maintenance dredging volumes for each maintained depth were calculated as shown in Table 5-2-2-2.

Table 5-2-2-1 Estimation of the shoaling thickness at the Approach Channel in meters (From the "Master Development Plan")

N-S Channel

Ce / Cd	5.50	6.00	6.50	7.00	7.50	8.00	8.50
5.50	0.01	0.00	0.00	0.00	0.00	0.00	0.00
6.00	0.36	0.01	0.00	0.00	0.00	0.00	0.00
6.50	0.66	0.33	0.01	0.00	0.00	0.00	0.00
7.00	0.91	0.61	0.31	0.01	0.00	0.00	0.00
7.50	1.13	0.85	0.57	0.29	0.01	0.00	0.00
8.00	1.32	1.06	0.80	0.54	0.27	0.01	0.00
8.50	1.50	1.24	0.99	0.75	0.50	0.26	0.01
9.00	1.66	1.41	1.17	0.94	0.71	0.48	0.24
9.50	1.81	1.56	1.33	1.11	0.89	0.67	0.45
10.00	1.95	1.71	1.48	1.27	1.06	0.85	0.64
10.50	2.08	1.84	1.62	1.41	1.21	1.01	0.81
11.00	2.20	1.97	1.75	1.54	1.34	1.15	0.96
11.50	2.32	2.09	1.87	1.67	1.47	1.28	1.10
12.00	2.43	2.20	1.99	1.79	1.59	1.41	1.23
12.50	2.53	2.31	2.10	1.90	1.71	1.53	1.35
13.00	2.64	2.41	2.20	2.00	1.82	1.64	1.47

W-E Channel

Ce / Cd	9.00	9.50	10.00	10.50	11.00	11.50	12.00	12.50	13.00
5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9.50	0.16	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	0.28	0.15	0.01	0.00	0.00	0.00	0.00	0.00	0.00
10.50	0.39	0.27	0.14	0.01	0.00	0.00	0.00	0.00	0.00
11.00	0.48	0.38	0.26	0.14	0.01	0.00	0.00	0.00	0.00
11.50	0.56	0.46	0.36	0.25	0.13	0.01	0.00	0.00	0.00
12.00	0.62	0.54	0.45	0.35	0.24	0.13	0.01	0.00	0.00
12.50	0.67	0.60	0.52	0.43	0.33	0.23	0.12	0.01	0.00
13.00	0.72	0.66	0.58	0.50	0.42	0.32	0.22	0.12	0.01

Table 5-2-2-2 Estimate of the Annual Maintenance Dredging Volume in unit of 1000 m^3

(Source: "Master Development Plan")

Depth	N-S Channel+Curve	E-W Channel	Total
Channel width: 100m			
10.0	2,210	294	2,504
10.5	2,613	553	3,167
11.0	3,028	861	3,890
11.5	3,455	1,209	4,664
12.0	3,890	1,596	5,486
12.5	4,340	2,081	6,421
13.0	4,803	2,679	7,482
Channel width: 150m			
10.0	2,875	420	3,296
10.5	3,360	778	4,138
11.0	3,851	1,190	5,042
11.5	4,348	1,645	5,994
12.0	4,849	2,143	6,993
12.5	5,362	2,769	8,132
13.0	5,885	3,540	9,426
Channel width: 160m			
10.0	3,008	446	3,454
10.5	3,509	823	4,333
11.0	4,016	1,256	5,272
11.5	4,527	1,733	6,260
12.0	5,041	2,253	7,294
12.5	5,567	2,907	8,474
13.0	6,101	3,713	9,815
Channel width: 260m			
10.0	4,338	699	5,038
10.5	5,003	1,272	6,276
11.0	5,662	1,913	7,576
11.5	6,315	2,606	8,922
12.0	6,960	3,348	10,308
12.5	7,612	4,283	11,895
13.0	8,266	5,435	13,702

5-3 Review on the Analysis of the Maintenance Dredging Volume in the Inner Basin.

5-3-1 Calculation based on the Semi-empirical Formula

The following values for the parameters in the equation (2) were obtained by using the same method as the case of the Approach Channel from the results of the experimental dredging.

K = 0.299 ($year^{-1}$) and Ce = -5.23(meters)

Moreover, the following tables were obtained on the basis of the actual data on the maintenance dredging during 1979 to 1989.

(1) Foreport

Table 5-3-1-1 Estimated Shoaling Thickness (meter/year)

Cd (meter)	K = 0.299 Ce = -5.23 meters	K = 0.160 to 0.220 Ce = -3.0 to -5.0 meters
-10	1.38	1.10 to 1.07
-11	1.67	1.25 to 1.28
-12	1.96	1.41 to 1.50
-13	2.23	1.57 to 1.71

(t2 - t1 = 0.25 year)

(2) Fishing Basin

Table 5-3-1-2 Estimated Shoaling Thickness (meter/year)

Cd (meter)	K = 0.205 Ce = -1.5 meters
-5	0.65
-6	0.83
-7	1.02
-8	1.20

(t2 - t1 = 1.0 year)

5-3-2 Estimation of Shoaling Thickness by means of Overall Method

As for the shoaling thickness at the inner basin, it was calculated from the following equations by using the velocities V of tidal current for five minutes which were measured in the hydraulic model test with the tidal range of 50 cm.

For erosion : $Me = -Mo((V/Vo)^2-1)\,\Delta t$ (t = 5 minutes) (9)

For sedimentation : $Ms = CW(1-(V/Vo')^2)\,\Delta t$ (t = 5 minutes) (10)

For the above calculation, the followings are assumed:

(1) The critical velocities Vo and Vo' are 0.2 m/sec and 0.1 m/sec, respectively, similarly to the case of the the Approach Channel.
(2) The annual shoaling thickness in the Foreport is 1.16 m for the maintenance depth of -10.5 m from Table 5-3-1-1.
(3) The value of Mo is 3 X 10^{-8} m/sec and the ratio of Mo and CW is 0.14.

The results are shown in Table 5-3-2-1 where the value for - 11.5 m of Cd is calculated by using the velocity obtained multipling the velocity for -10.5 m of Cd by 10.5/11.5.

Table 5-3-2-1 Estimated Shoaling Thickness (meter/year)

Section	Cd = -10.5 m	Cd = -11.5 m
Foreport Area near the Port Mouth	0.73	(0.99)
Foreport Area near the Container Terminal	1.16	(1.41)

Also, the same estimation was carried out for several alternatives in which the length of breakwater varies, but those results are not included here.

5-4 Consideration

5-4-1 The Maintenance Dredging of the Approach Channel

In order to check the rationality of values of Table 5-2-2-1 obtained based on the overall method, it is necessary to determine the value of CW. This value has been obtained as 3.4 X 10^{-7} (m/sec) from the equation (8) under the condition that A is 2.08 m for Ce = -5.5 m and Cd = -10.5 m. Using this value, the shoaling thickness has been calculated for the case of N-S and W-E channels, and the results have coincided with the values of Table 5-2-2-1.

Next, the recent actual data on the annual maintenance dredging volume, which are shown in Table 5-4-1-1, have been compared with the estimated values of Table 5-2-2-2. The both values nearly coincide each other although the former value is a little smaller than the latter. Consequently, the rationality of values of Table 5-2-2-1 has been recognized.

Table 5-4-1-1 Annual Dredging Volume in the Recent Years in Cubic Meters
(From the information of the Oficina Tecnica De Dragado, ANP)

Year	Approach Channel	Foreport	Basin 1	Basin 2	Fishing Basin
1990	3,726,840	630,265	110,714	553,721	
1989	1,894,145	2,304,900		162,000	
1988	2,380,350	1,275,812	305,440	710,103	
1987	5,928,525	1,310,700	287,954	50,747	
1986	4,059,389	3,712,579	257,650		
1985	4,497,455	2,594,530	42,071	80,500	
1984	5,325,403	1,481,817	229,536	40,715	
1983	2,437,690	2,485,701	33,739	342,012	62,710
1981	4,598,511	3,256,368	334,656	231,346	12,769
mean	3,802,497	2,108,288	188,050	282,498	

5-4-2 Estimate of Maintenance Dredging Volume for the Foreport

As for the maintenance dredging volume at the Forport, the shoaling thickness A has been calculated using the values such as K = 0.299 $year^{-1}$, Ce = -5.23 m and Cd = -10.5 m in Table 5-3-1-1 which was estimated on the basis of semi-empirical formula. Using this value of A, the maintenance dredging volume has been calculated for the area of 1,300 X 10^3 m^2 of the Forport, and the result is a little larger than the actual data of Table 5-4-1-1. On the other hand, the value calculated on the basis of the estimated shoaling thickness of Table 5-3-2-1, which is obtained using the overall method, is a little smaller than the actual data.

But the above differnce between the estimated value and the actual data is not large and the rationality of the estimation has been recognized.

6 BRIEF CONSIDERATION OF FUTURE DEVELOPMENT CONCEPT

6-1 Purpose of Consideration

It is necessary to confirm the future development concept of the Port to avoid discord between the plan of main port facilities, which is the objective of the Study, and the long term development direction of the Port.

There is a Master Plan formulated in 1987. This consideration is conducted briefly, taking account of the development direction shown in the Master Plan.

6-2 Items to Be Solved in the Port of Montevideo

It is possible to point out some items to be solved, considering the present situation of the Port.

6-2-1 Low Efficiency of Cargo Handling

There are several points explaining the low efficiency of cargo handling. Points are as follows:

(1) Discord between Ship-side and Land-side Operation
(2) Unusually High Berth Occupancy Rate
(3) Small Volume of Cargo Handled at the Berth
(4) Low Rate of Working Hour of Crane
(5) Low Utilization of Refrigerating Warehouse

6-2-2 High Berth Occupation of Fishing Vessels

There are many foreign fishing vessels calling at the port of Montevideo. However, there is a lack of facilities for accommodating fishing vessels in the Port. The high berth occupancy rate is caused by foreign fishing vessels' use of general cargo berth for their mooring.

6-2-3 Containers Overflowed into All Areas of the Port Other Than Container Terminal

There are many containers stacked in various parts of the port area. It is very important to administrate containers adequately for efficient cargo handling.

6-2-4 The Need for a Port Development Strategy

The Port of Montevideo is a port of long history. Many facilities are left in old-fashioned situations and many improvement works have to be carried out. However, it seems that there is a lack of strategy to guide the improvement of the Port.

6-3 Basic Functional Allotment in the Bay

6-3-1 Basic Functions of the Port

Roles expected to be played by the Port of Montevideo are as follows:

(1) Base Port for Import/Export of Cargo in Uruguay

The Port of Montevideo is virtually the only international trading port in Uruguay. This role should be maintained and enhanced.

(2) Transshipment Base Port for Cargo from/to La Plata River Basin

The Port is located at the mouth of the River of La Plata. This location provides several advantages from sea transportation point of view. For one thing, it is easier to maintain a sufficient depth than at other ports in La Plata river basin, and for another, it is possible to reduce transportation cost of main vessels by using this port as a transshipment base.

(3) Base Port for Foreign Fishing Vessels Operating in the South Atlantic Ocean

The South Atlantic Ocean is famous for richness of fishing resources. Nowadays there are many foreign fishing vessels operating in this sea area. Some of them use this port for transshipment of cargo, refueling, water receiving and so on.

(4) Base Port for Domestic Fishing Boat

Fishing industry is one of the important industries in Uruguay. Fishing port is a fundamental base of the fishing industry.

(5) Others (ship repairing, passenger traffic and bunkering)

6-3-2 Functional Allotment

The functional allotment can be assumed from the layout plan of the port facilities in the Master Plan as follows:

(1) North east zone

Ship repairing, Basin for ANP ships

(2) East zone

Fishing port

(3) Central zone

Commercial port (Conventional vessels, Cargo-passenger vessels)

(4) Foreport zone

Container terminal, Naval base

Three zones are to be allocated for expansion, i.e., the north-east zone for ship repairing, the east zone for fishing activity and the foreport zone for container terminal.

From the view points of existing facility layout and future expansion space, selection of these three zones for future development is appropriate.

For the further long term development, two areas would be considered, i.e., within the Montevideo Bay and out of the Bay. Both sites have merits and demerits.

6-4 Rough Evaluation of Handling Capacity of General Cargo Berth

6-4-1 Trend of Export/Import Cargo Volume in Montevideo Port

Demand in 2010 will be 3,463,000 tons according to same process used to calculate the volume in 1998.