STUDY ON ECONOMIC DEVELOPMENT OF THE ARGENTINE REPUBLIC

FINAL REPORT

Vol. I: ARGENTINE ECONOMY

IV. TRANSPORTATION

JANUARY 1987

JAPAN INTERNATIONAL COOPERATION AGENCY

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1. OVERVIEW OF AND PERSPECTIVE FOR TRANSPORTATION DEVELOPMENT

1-1 Introduction

During the period of the present study, Study on Economic Development of the Argentine Republic, the Argentine Government was compiling a revised edition of the "Plan Nacional de Transporte (PNT) - Programa del Sector Transporte." Since this revised PNT was not finalized before the study team completed its field survey, the problem cited below in connection with each individual field of the transport sector and the basic approach proposed for their solution are all based on the concept and views of the Japanese experts which they formed in the course of surveys of existing conditions of Argentine transport facilities and as a result of frequent exchange of opinions with their Argentine counterparts specialized in the transport sector. These surveys and the exchange of opinions were made for the following four themes.

1) Efficient utilization of Parana and La Plata rivers

2) Containerization in Argentina

3) Cargo terminal development in Buenos Aires

4) Alternative accesses toward the Pacific

To be more specific, these views are based on the selective and subjective analysis of data collected by the Japanese experts who covered a limited scope of survey within a limited survey period, not on the comprehensive, objective analysis of existing conditions of transport facilities and traffic data which will be presented in the revised PNT.

Regarding the study team's comments based on the transport system development in Japan, reference should be made to the explanation given under the following items in Chapter 4 (Transportation), Volume II (Japan's Experience).

1) Provision and Improvement of Transport Systems in the Course of Japan's Development

2) Cargo Information System in Japanese Ports

3) Container Terminals in Japan

4) Truck Terminals in Japan

1-2 Transportation System in General

1-2-1 Existing State of Transportation Systems and Problems

Argentina has pursued a substantial course of economic development since the 19th century mainly by the export of agricultural produce such as wheat and beef. The greater part of these products were produced in an area lying within a radius of 600 km from Buenos Aires, and were transported to Buenos Aires, the country's largest consumer city and export port, as well as to other port cities such as Rosario and Bahia Blanca. Such centralization of economic activities inevitably lead to the convergence of about 70% of total population and about 85% of GDP in the said area called Humid Pampa (Pampa Humeda).

This trend was reflected in the transportation system development in the country which is characterized by the formation of a typical radial network of railways and roads extending outwardly from Buenos Aires. Navigable rivers such as the La Plata and the Parana constitute part of this radial transport network developed with Buenos Aires as the center.

Argentina's transportation system now presents a number of problems. First, the country has a well-developed transportation network covering the Humid Pampa region. However, owing to the financial stringency of the Government resulting from years of continued stagnation of national economy, the transport infrastructure has been left without new investments for construction, not to speak of necessary replacements or regular maintenance and improvement service of facilities. This has resulted in the general aging and deterioration of the transport infrastructure observed today.

Second, in order, for Argentina, to be able to break out of the prevailing economic difficulty and make its way to a stabilized, long-term growth, it is necessary to make the best of the high development potential of the areas surrounding the Humid Pampa region which has already been developed. Considerable amounts of new investments will be required for this regional development because of the deficient stock of transport infrastructure in these areas. Considering the financial condition of the Government, it will be difficult to complete the development of these areas in a short time. Accordingly, selective regional development of various productive activities should be pushed forward under a firmly established regional development policy.

Third, the tariff of each mode of transportation does not necessarily reflect the actual transportation cost. For this reason, the mode-wise shares in total traffic demand do not represent the optimum shares that can be justified from the viewpoint of national economy. As a consequence, the river transportation on the Parana and the railway transportation in general are in the state of under-utilization, although there are other contributing factors. It is therefore necessary to introduce a new tariff reflecting the actual transportation cost of each mode under a government policy, so that the operation of each means of transportation will reflect its economic factors.

Fourth, Argentina's transport infrastructure lags behind the global trend in certain areas partly because it has been left without necessary new investments, as pointed out above. This is notable especially in the areas of ports and harbors and marine transportation. Although PANAMAX type carriers have now come to play the central role in the world's maritime freight transportation service, they cannot be loaded to capacity at any of Argentine ports excluding Bahia Blanca owing to the draft limit. This is producing the adverse effect of raising the export price and weekening the competitiveness of Argentina's export grains which are otherwise highly competitive. Furthermore, containerization is extremely delayed in Argentina, and larger container ships of more than 3,000 TEUs cannot enter any channels owing to their small depth. If these drawbacks remain unremoved, they will put serious impediments in the way of industrial development in the future.

Fifth, judging from the Japanese experience in the transport sector development, it is considered necessary to develop an information system in the transport sector, especially an inter-model information interchange and processing system. Furthermore, higher speed and greater punctuality will be required for both passenger and freight transportation service. Development of freight transportation service to meet the growing demand for diversified, small-lot cargo traffic besides the conventional bulky cargo traffic demand will become an important factor in Argentina's industrial development. Argentina's transport sector is required to bring a satisfactory solution for each of these problems in the furture.

1-2-2 Suggestions for Transportation System Development

The following suggestions on how to solve the problems in Argentina's transportation system mentioned in 1-2-1 are made on the basis of the study team's surveys and observations and the exchange of views and opinions between the Japanese and Argentine experts.

1) Because of the deteriorating transportation facilities that has resulted from delays in additional investments, replacements and maintenance service for transport infrastructure. Accordingly importance will have to be attached to the maintenance service of existing facilities to upgrade their capacities. Since such maintenance operation will have to be conducted selectively, the following measures will prove effective.

   a) Indentification of the places and facilities calling urgently for the maintenance operation or replacement, and determination of priority order on such places and facilities.

   b) Organizational reinforcement for the maintenance operation, and training of engineers and managers to be engaged in the maintenance operation.

   c) Promotion of domestic production of equipment and materials necessary for the maintenance/replacement of facilities, and rearing of related industries.

2) It is recommended that the following measures be taken for selective, phased promotion of the economic development of areas other than the Humid Pampa region and the infrastructural development of the transport sector.

a) Formulation of regional development strategy/policy, and determination of development priority for each areas.

b) Clarification of share in responsibility for regional development between central government offices and between the central and provincial governments.

c) Formulation of a transport infrastructure development plan along with the regional development strategy/policy mentioned in a) above, and determination of priority order for individual infrastructural development programs.

3) It is recommended that a new tariff taking into account the actual transportation cost of each mode be established by taking the following steps.

a) Mode-wise survey of the actual transportation cost.

b) Simulation of the impact resulting from the application of the new tariff based on the actual transportation cost.

c) Revision of the tariff on the basis of a comprehensive review of all kinds of impact.

4) Regarding the necessity to catch up with the new, prevailing trend in the world maritime transportation service, a detailed discussion is given in Section 2 (Efficient Utilization for Grain Transportation of Parana and La Plata Rivers) and Section 3 (Containerization in Argentina). The following are the conclusions given in the two sections.

a) The network of grain loading facilities should shift its center from the Parana-La Plata river system to the Atlantic coast, with special efforts to acquire greater capability for loading PANAMAX type carriers to capacity at a single port.

b) Container handling facilities at Buenos Aires should be expanded to meet the increase in container traffic demand in the short run. In the long run, however, it will be necessary to construct new port facilities capable of berthing 3,000 - 4,000 TEU-class full container ships.

c) These new port facilities should be designed to minimize the dredging cost.

d) Land transportation facilities should be developed in parallel with the development of port facilities.

5) From the Japanese experience in the transportation system development, it is considered that the Argentina's transport sector will have to make efforts to develop an information system, to

provide faster and more punctual transportation service, and to meet the growing user demand for handling diversified, small-lot cargoes. Containerization (Section 3) and Cargo Terminal Development in Buenos Aires (Section 4) can be positioned as improvement efforts in this direction.

1-3 Railway Transportation

1-3-1 Existing State of Railway Transportation and Problems

The railway transportation service in Argentina was initiated in 1857 for transportation of agricultural products from producing areas in the Humid Pampa region to Buenos Aires and other river ports (Figure IV-1-1). The track construction work proceeded at a rapid pace thereafter to form an extensive railway network covering mainly La Pampa and surrouding areas. The operating kilometerage reached about 44,000 km at the peak of its operation, which was reduced to about 34,000 km by 1984 by the abolition of about 10,000 km. In 1948, the Government purchased 5 private railway companies other than Belgrano line which was a public railway, so that the existing management system is composed of 6 railway divisions that have taken over the lines of said private companies. 3 different gauges are used, i.e., the broad gauge (1,676 mm) by 4 lines, and the standard gauge (1,435 mm) and narrow gauge (1,000 mm) by 2 lines. The electrified section covers a distance of 165 km in the outskirts of Buenos Aires, and the double track section covers the trunk line from Buenos Aires to stations of port cities along the Parana river.

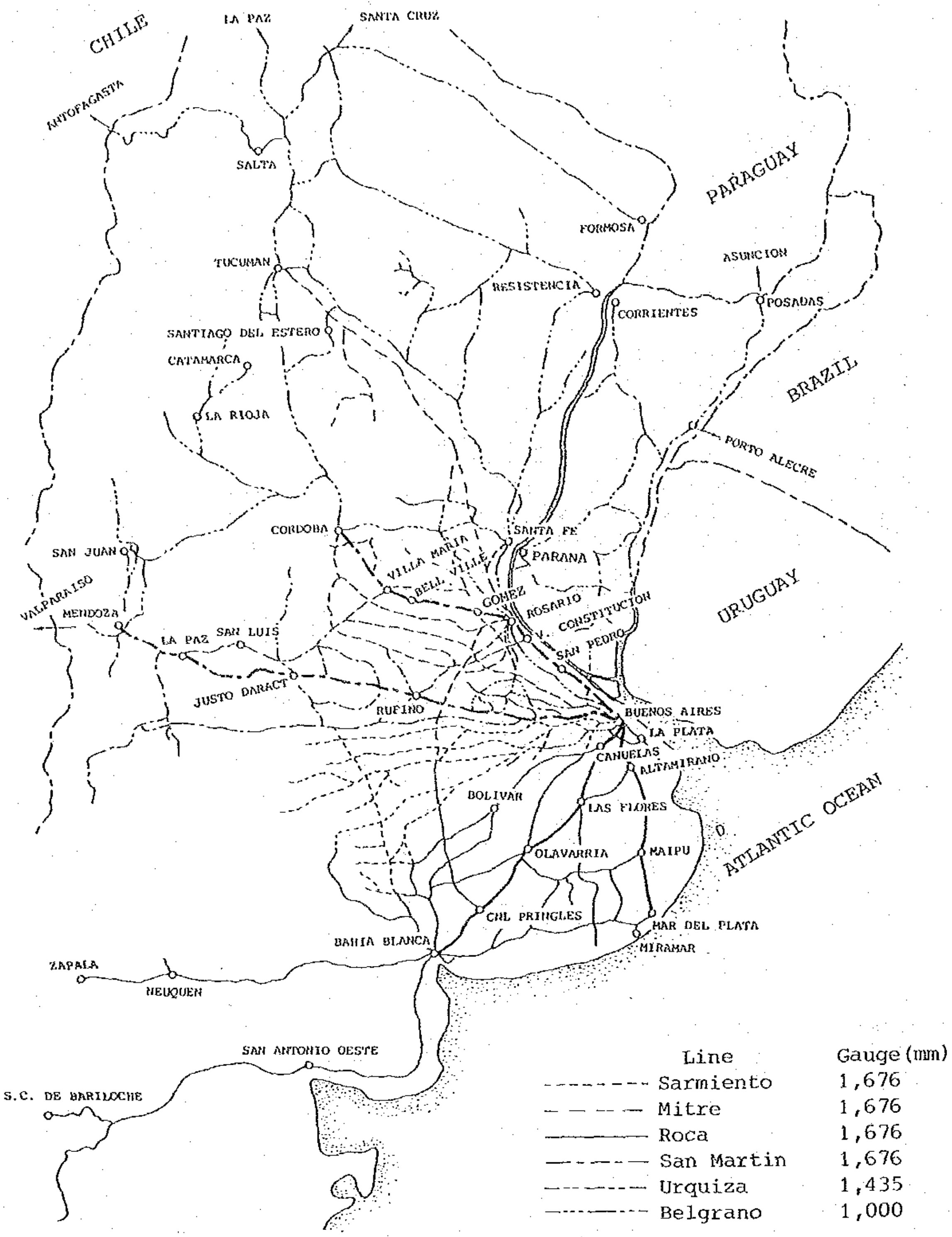
The railway transportation volume has been on the decline in Argentina after reaching its peak in 1959. The 1984 data shows 290 million persons (10.5 billion persons/km) for passengers, and 20.4 million tons (11.2 billion t/km) for freight. These are about 60% of the peak levels registered in 1959. Revenues in 1984 registered a total of US$354 million, of which two thirds was earned by freight transportation, and expenditures in the same year recorded a total of US$1,509 million, of which about 70% was appropriated for personnel cost. The number of railway workers, now standing at a total of 105,000 persons, is about half the level in the peak year.

The National Railway has been unable to appropriate a sufficient budget for replacement, maintenance and repair service of railway facilities including vehicles, not to speak of new equipment investment, so that deterioration is notable with all equipment and facilities.

The only exception to this general trend of superannuation is the electrification of a 45-km suburban section of the Roca line which was completed with Japan's technical cooperation. After this new line was opened in November 1985, it attracted many passengers with its new facilities and service, showing a three-fold increase of passengers as compared with the level before the electrification.

There are two major problems in Argentina's railway transportation service. First, high-speed, punctual train service is made impossible

Figure IV-1-1 Railway Network in Argentina



Source: Ferrocarriles Argentinos

Notes : 1. Thick line indicates the electrified section, including planned one.
2. Some southern lines are not shown in the Figure.

owing to the deterioration of railway equipment and facilities which is notable especially for tracks and locomotives.

Second, comfortable, reliable train service is not offered to passengers/customers because passenger and freight cars deficient in both quality and quantity.

There are other problems lying in the way to the development of railway transportation service. One is the use of three different gauges which precludes the possibility of inter-line through service, and the other is the radial network configuration focused on Buenos Aires and other river ports, which imposes a restraint on planning a new, south-north trunk line system.

1-3-2 Measures for Railway Transportation Development

Enforcement of a new, overall railway service development policy is made difficult owing to the continued financial stringency faced by the National Railways. Owing to the inability to carry out a progressive development policy, actions currently taken are limited to "remedial" improvement measures for defects in focal points. Nevertheless, efforts are being made to transform the existing railway system, which remains just as it was built years ago, to a new, modern system capable of meeting the rapid changes in the environment surrounding the railway transportation service.

Improvement programs enforced in the past include the abolition of about 10,000-km deficit-ridden line from the operating kilometerage which recorded 44,000 km in 1955, the introduction of unit trains for grain transportation in December 1983 in time with the centralization of freight stations and yards, and the completion of the suburban electrified section of the Roca line after a 25-year planning period, which realized the expected business results by introducing entirely new facilities and service and infused vigor and vitality into the National Railways.

There are also plans and surveys formulated or conducted for railway service development, such as the Railway Transportation Development Plan of Argentina (Politica Ferroviaria 1979-1981), the Buenos Aires Area Freight Station Modernization and Centralization Project (1978), the Freight Information System Plan, the Development Survey of the Bahia Blanca Trunk Freight Route, the Master Plan for Railway Electrification (November 1982), and the Survey for Improvement of Rolling Stock Factories. Feasibility studies are expected to be conducted shortly for two projects, the Signal Modernization Project and the San Martin Line Suburban Section Electrification Project.

As a project now in progress, the Grain Railway Transportation Improvement Project for Bahia Blanca Port Development may be cited. Construction work is already in progress under this project, which includes the construction of producing area storage facilities, development of the port yard area, improvement of freight handling facilities, and remodelling of rolling stock.

1-3-3 Suggestions for Future Direction of Railway Transportation Development

Argentina's railway transportation system shows a general deterioration of equipment and facilities. Transportation volume and share are declining for both passengers and freight owing to the dwindled quality of service. Although a large portion of the country's population is concentrated in the capital region embracing Buenos Aires, the huge expanse of its land area makes it indispensable for its national development to heighten the roles of railway service for freight transportation in inland areas.

To chart the future course of railway service development, it is suggested that the Government should formulate a policy on the role of railways in the entire transport system. The National Railways should also work out a policy for harmonious development of various types of railway transportation service, such as the urban commuter transportation service, interurban middle- and long-distance passenger transportation service, and long-distance bulk freight transportation service.

Management rationalization is of utmost importance to the National Railways because its operational deficit is imposing a heavy burden on the national finance. The rationalization policy should be pushed forward especially to cut down the personnel cost which is the main cause of the deficit.

For some years to come, therefore, the National Railway will have to focus its efforts on management rationalization aimed specifically at its financial reform, while at the same time making full use of all existing railway facilities to improve the quality of service. From a long-range point of view, on the other hand, the National Railways should make consistent railway development efforts to provide high-quality transportation service meeting user demands and to fulfil the role it is expected to play in the overall national transportation system.

1-4 Roads and Road Transportation

1-4-1 Existing State of Roads and Road Transportation and Problems

(1) Role of road transportation

In Argentina, roads are playing the most active part for the transportation of both passengers and freight. The roads, with 55% of the total ton-kilometers of cargo or 80% of the total tonnage hauled during 1982, have been increasing their share in freight transportation year after year. The ratio by which the transportation industry is contributing to the GNP is 8 to 9%, of which 70 to 75% comes from the road transportation sector.

The road transportation sector creates employment opportunities worth about 10% of the working population, and holds an important place in the Argentine economy. According to a census taken in 1980, the truck drivers alone accounted for 439,000 out of a total 9 million working population.

(2) Road length

The Argentine road network had been expanded dramatically in the 1960s. Entering the 1970s, multi-lane highways were constructed with access limited along the heavy-traffic corridors and at the entrance of major cities. As of the end of 1984, the national highways reached 38,000 km (pavement ratio: 68%) in aggregate length, and the provincial highways reached 183,000 km (pavement ratio: about 28%), or 221,000 km in all. As the entire national land of major economic importance but some peripheral areas has been served with these arterial roads, emphasis is now placed on the improvement and rehabilitation of the existing roads rather than on new construction.

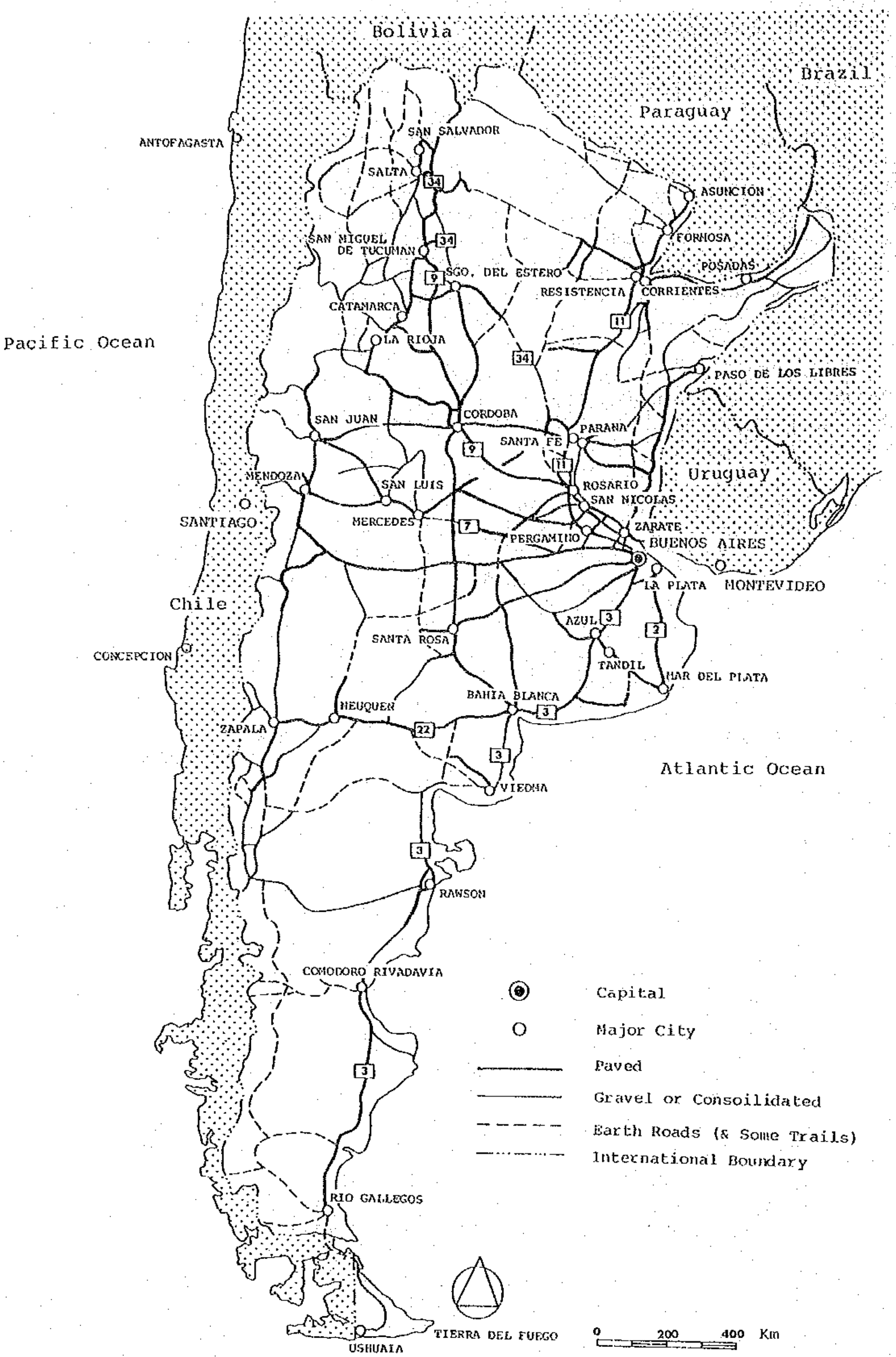
(3) Road network and traffic volume

As the population and economic activities gravitate toward the capital, the road network is fanned out from Buenos Aires toward local areas (see Figure IV-1-2). The circumferential roads that interlink the arterial roads radiating from Buenos Aires are not enough in terms of both quantity and quality. The road coverage in the non-Pampa regions such as NOA, NEA, Cuyo and Patagonia is comparatively low, posing one of the problems to be solved in promoting the decentralization of population and economic activities.

A traffic count system was developed in the early 1970s. Since then, efforts have been made to install additional traffic count stations and modernize traffic count facilities. National Highway Board (Direccion Nacional de Vialidad: DNV) has been preparing annual statistics on traffic through national highways.

Figure IV-1-3 shows a diagram of traffic flow in Pampas region prepared based on the statistics available from DNV. The most heavily congested in Route 9 running from Buenos Aires to Cordoba via Rosario, with an annual average daily traffic volume (AADT) for both directions of 7,000 to 10,000 vehicles. This is followed by single-digit Routes

Figure IV-1-2 Trunk Road Network 1983



2, 3, 5, 7, and 8 and Route 11 which runs from Rosario to Formosa. These national highways show an AADT of 2,000 to 4,000 vehicles.

In Argentina, trucks account for as much as 30 to 40% of the total roadway traffic volume; in the local areas, there are many sections of highways where the trucks account for more than 50% of the total traffic.

The Buenos Aires-Rosario-Cordoba corridor takes on the character of an industrial highway with truck traffic accounting for 40 to 60%.

(4) Road administration and investment

The planning, design, construction and maintenance of national highways are de jure under the jurisdiction of the Secretariat of the Public Works of the Ministry of Public Works and Services (MOSP), but are de facto managed by the National Highway Board (Direccion Nacional de Vialidad: DNV), a semi-autonomous organization.

The DNV has its headquarters in Buenos Aires, where budgetary control and adjustment of national highway network planning are carried out. The site construction work, improvement, and maintenance work are managed by twenty-four district offices distributed throughout the country.

The annual investments by the DNV amount to 200-250 million Australs (approx. US$250 - 300 million) of which about 45% is raised from the International Bank for Reconstruction and Development (IBRD) and the Inter-American Development Bank (IDB), etc. While those spans of national highways which should be financed as soon as possible for reconstruction were estimated in 1985 to be at least 4,000 km in aggregate length, the annual budget stated above is not enough to rehabilitate 1,000 km of national highways. In recent years, the greater part of the road budget has been used for repairs and maintenance of important roads in a critical conditions.

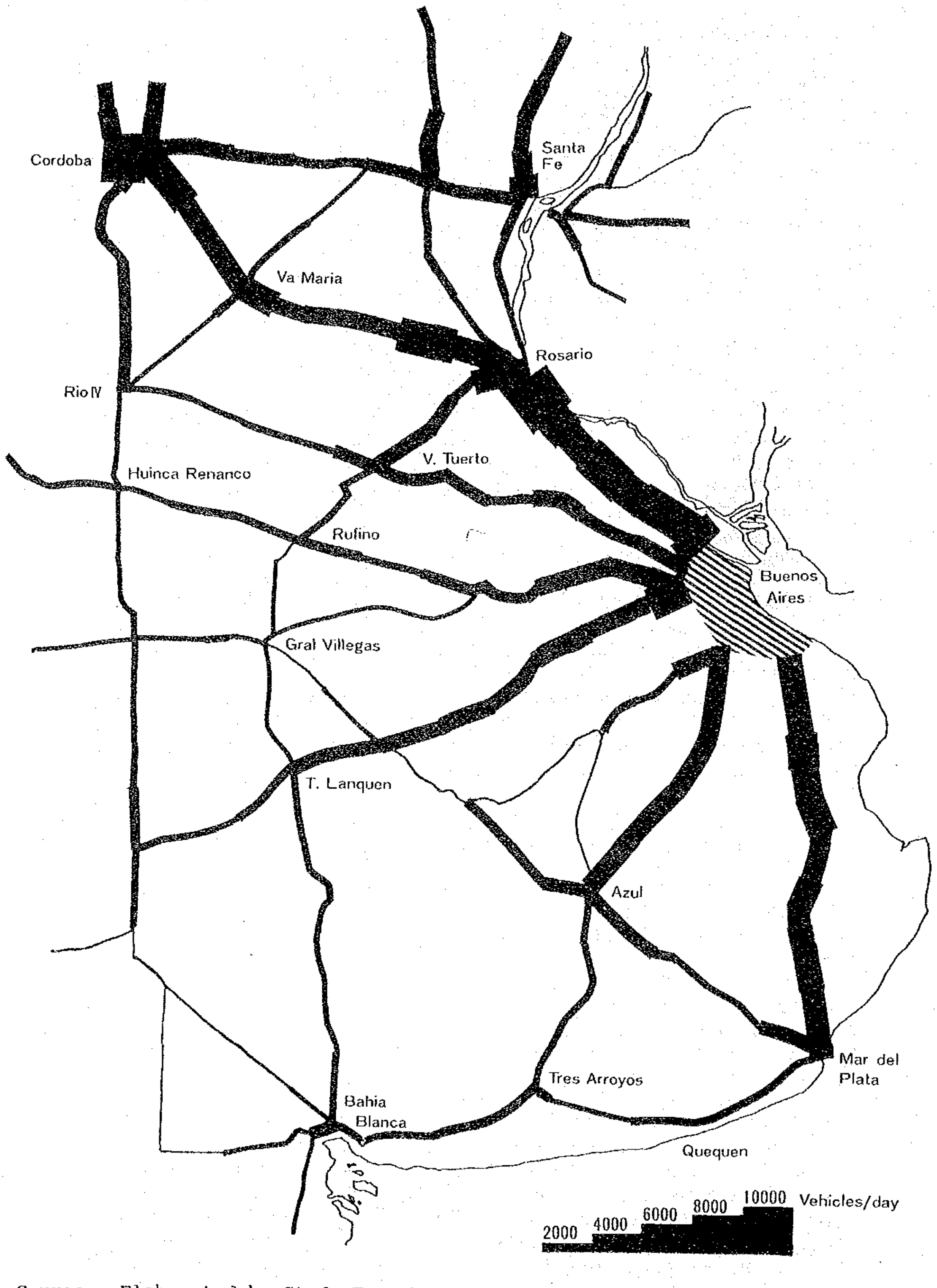
Most of the Argentine national highways are of the two-lane type with a roadway width of 3.35 m x 2. Their repavement costs US$100,000 per km on the average.

The construction of a new road costs US$200,000 to 300,000 per km in the flat terrains and US$500,000 to 1,000,000 per km in the hilly terrains.

The planning, construction and maintenance of provincial highways are undertaken by respective provincial highway authorities. The budget earmarked for provincial highways usually is limited to a small sum of about US$5 million to 30 million; the provincial highways, for the most part, are greatly in need of repairs.

The DNV is in the process of pushing forward with its road rehabilitation program financed by the fifth loan from the IBRD. The total amount of loans is US$100 million, of which about 60% is appropriated for the reconstruction of national highways with the remaining 40% for the reconstruction of provincial highways. The total cost for the program is about US$220 million because 45% of it

Figure IV-1-3 Annual Average Daily Traffic Volume, 1984



Source: Elaborated by Study Team based on DNV's data.

is covered by loans. The road reconstruction projects are selected to fulfill two requirements: 1) the internal rate of return (IRR) be greater than 12%, and 2) the net present value (NPV) be greater than US$100 million.

Many of the projects eligible to these requirements exist in Jujuy, Salta, Corrientes, Rio Negro and Neuquen, and the development of roads in the outskirts of Pampas region have been put priorities. The ratio of work done to the total planned work volume according to the program was about 18% as of the end of 1985.

(5) Problems of roads

The road infrastructure and road traffic seem to have fewer problems than other transportation modes, but the following problems are noticed in the aspects of financing, management and planning.

1) Unfair user charges

The most significant of all the problems is too little budget for the magnitude of needs for road reconstruction. So far, the Argentine Government has followed a policy that the beneficiaries should pay the cost for road recnstruction in the form of automobile acquisition tax, automobile transfer tax, automobile registration tax, automobile insurance tax, and excises on fuels, lubricants, tires, etc.

According to a 1983 survey conducted by the Transport Planning Board (Direccion Nacional de Planificacion del Transporte: DNPT) of the MOSP, it is disclosed that there is a great disparity among the beneficiaries, and that the trucks operating on inter-city routes are not bearing their fair share due for the benefits enjoyed from the traffic facilities.

The sources of fund for road reconstruction should be amplified while redressing an unfair allocation of burdens to do justice to all the beneficiaries according to the principle of equal burden sharing.

2) Damage on roads due to overloaded trucks

The limits on truckloads are specified in Article 9 of Law No. 13893; namely, any ordinary truck is not permitted to exceed 10.6 tons in axle load, and a trailer truck for grain transportation is not permitted to carry cargo in excess of 30 tons in gross tonnage.

In actuality, however, there are seen many trucks carrying cargoes in excess of specified limits. These overloaded trucks wear out the roads in a shorter period than the planned service life. A survey reports that more than 60% of trucks carrying grains to Rosario Port are overloaded.

3) Frequent traffic accidents

With the growth of vehicular population, traffic accidents have been increasing, particulary in urban areas. According to a statistical survey, the fatal accident rate per vehicular kilometer of automobiles running on the national highways is said to be more than three times higher than in the USA and Canada. The facilities and legal system for accident prevention should therefore be developed as soon as possible.

4) Shortage of traffic data

While the traffic data taken at the major spots of the national highways have been kept and organized well, the date on the demand structure of passenger and cargo traffic are meagre, making it difficult to work out plans for road construction and management in a logical way. Although the draft Five-Year Plan for the period 1986-1990 argues the necessity of the rationalization of intermodal transportation and construction of truck terminals, but yet there are no data upon which to formulate a program for the implementation of the Plan. In 1982, the DNV conducted a nation-wide Origin-Destination survey, but the enumeration and analysis of the survey data has not yet been completed as of July 1986. It is truly regrettable that the precious survey data are going stale without being used.

1-4-2 Road Development Policies

According to the 1979 National Transport Plan, the road reconstruction and development demand was estimated for the period 1981-1990, and US$350 million was figured out as a proper amount to be invested annually by the DNV into the road reconstruction and development projects during that period. The proposed projects include the pavement of 5,100 km of earth roads and gravel roads, resurfacing and/or strengthening of 19,500 km of existing paved roads, and construction of 1,200 km of expressways and city bypass lines.

The rate of increase in traffic volume thereafter, however, warns that the planned investment is not enough for a substantial improvement, though it may be able to maintain the current level of traffic service.

In the 1986-1990 National Development Plan now being formulated by the Argentine Government, the following objectives and policies are taken up for the planning of road traffic and road structures and facilities.

(1) Road traffic

Objectives

Establishment of efficient, reliable and viable systems for inland and international transportation of passengers and cargoes.

Policies

1) Realization of inter-provincial cooperation for the rigorous enforcement of the National Traffic Law.

2) Tightening of laws, regulations and controls for the purpose of enhancing the traffic reliability and safety.

3) Conclusion of bilateral and multilateral treaties for the realization of passenger and cargo transportation services with the "Southern Cone (los paises del cono sur)" countries and Latin American countries.

4) Improvement of inter-city traffic services.

5) Evaluation and implementation of the methods of coordinating the provincial and national traffic regulations.

6) Improvement of safety, comfortability, meneuverability and operability of vehicles for passenger traffic.

7) Encouragement of the manufacturers of chassis and car bodies.

8) Promotion of the development of passenger terminals (preferably of the multi-modal type).

9) Improvement of the level of public transit services on the traffic corridor interconnecting metropolises, and encouragement of the diversion of passenger car users to the public mass transit services.

10) Imposition of tight controls on overload trucks.

11) Promotion of the development of multimodal cargo terminals.

12) Development of integrated multimodal transport system, and stimulation of the modernization of cargo handling and bulk-breaking technologies.

(2) Road infrastructure

Objectives

1) Development of arterial network ensuring proper traffic conditions and supporting production activities.

2) Study of a program for the transfer of national highways to provinces.

3) Promotion of regional development through coordinated efforts with provincial government entities.

4) Promotion of the consturction of international highways in cooperation with the neighboring countries.

Policies

1) Prevention of premature damage on arterial roads by strict enforcement of traffic regulations including those concerning weights and sizes of vehicles.

2) Selective investment in those projects of major arterial roads and their access roads which are indispensable for ensuring exports.

3) Promotion of road maintenance projects before anything else.

4) Improvement of the existing road maintenance system through the transfer of the road construction and management authority to provinces or by privatization of road construction and reconstruction undertakings.

5) Implementation of a management system that is designed to check whether the traffic regulations are observed.

6) Establishment of a system that is instrumental to ensuring permanent coordination between the road plans prepared by the central and provincial governments.

7) Implementation of projects effective for the safety of road traffic.

8) Improvement of road construction processes and design standards.

1-4-3 Suggestions for Future Direction of Road Transportation Development

At touched upon in the foregoing, the Argentine Government is contemplating, in its next five-year plan, administering multi-facet policies developed in terms of development of both road facilities and the road traffic management and control. Already aware of the problems pointed out in 1-4-1, the Argentine Government has been pushing ahead with its preparations for solving them.

As regards traffic safety, for example, the National Commission for Traffic and Highway Safety was installed in 1980. In succession, the Division for Traffic Safety was organized within the DNV to study measures for traffic safety, including those designed to moderate controls on overloaded trucks while enforcing the traffic regulations strictly. The Committee for Coordination of Grain Transportation (Comite Coordinacion del Transporte de Granos: CCTG) is currently promoting a plan that obliges every trip to be kept on record for the purpose of processing and harnessing traffic data systematically. What counts most here will be to promote these government policies and plans steadily.

Although the government spending in road project has been on a steady decline since the latter half of the 1970s, the Argentine Government should step up its efforts to diversify the sources of funds for road construction and reconstruction in view of the fact that the road transportation is playing an important part in supporting the Argentine economy.

Considering the limited availability of funds, more importance should be attached to economic viability in selecting road projects. In view of this, the projects meeting the following requirements should be given priority.

1) Roads subserving the development of agriculture, livestock farming, mining and other key productive industries.

2) Roads subserving the rationalization of low-cost transportation such as by inland waterways and coastal shipping.

3) Roads subserving big projects such as the relocation of capital, port and harbor development and electric power development.

4) Roads subservient to the promotion of trade with the neighboring countries.

5) City bypass lines.

While the Argentine Government is forging ahead with its plan to transfer some of national highways to the provincial governments as a part of its decentralization policy, it should also consider supplying sufficient aids in both funds and technology to the provinces. As the money that can be spared by the provincial governments for road projects is by far less than by the Central Government, there is no doubt but that the provincial governments will experience hardships in the maintenance and management of transferred roads and that the road conditions may become the worse for transfer.

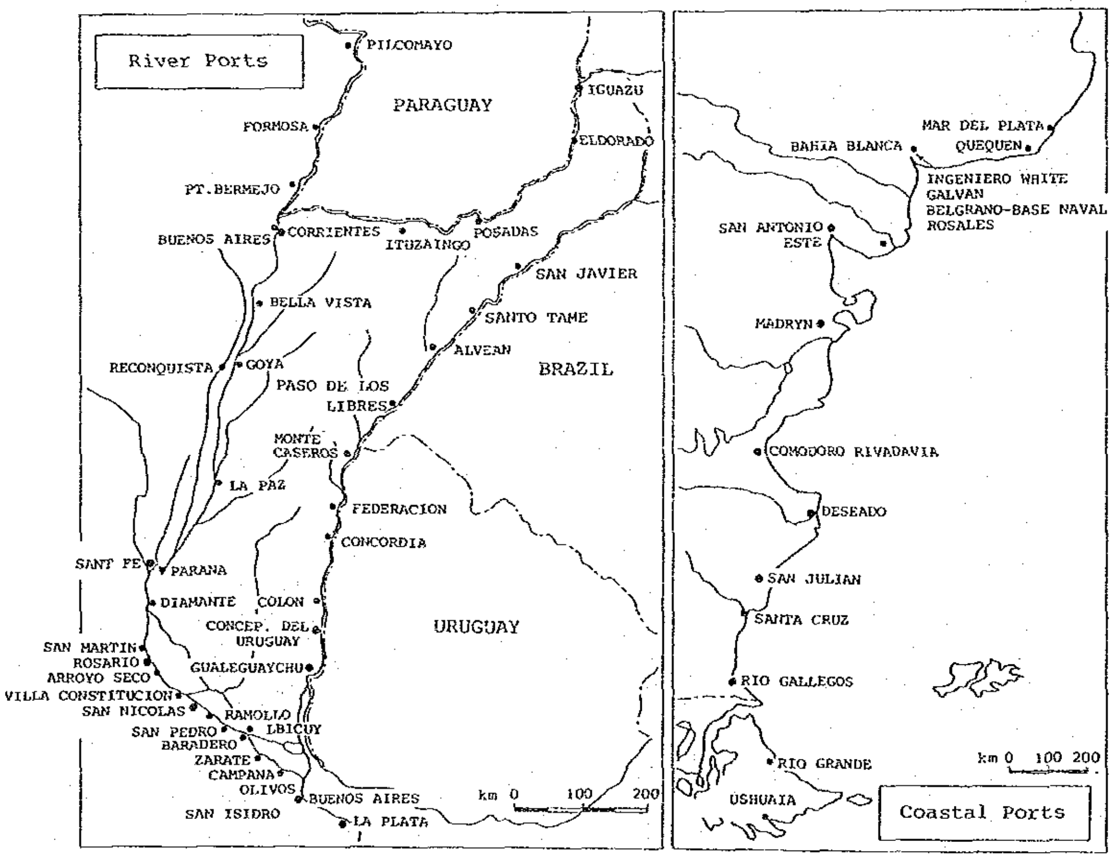
1-5 Ports and Harbors

1-5-1 Existing State of Ports and Harbors, and Problems

(1) Existing state

Argentina has 40 ports, of which 27 are river ports built along the Parana and the Rio de La Plata, and 13 are sea ports on the Atlantic coast from Rasa Point to Fuego Is. (see Figure IV-1-4). All these ports are placed under the management of the General Port Administration (Administracion General de Puertos: AGP) which is under the control of the Transport Secretariat of the Ministry of Public Works and Services. Management of harbour facilities of all these ports, including channels, anchorages and basins, is undertaken by the Port Construction and Navigable Waterway Bureau (Direccion Nacional de Construcciones Portuarias y Vias Navegables: DNCP y VN) of the Sub-secretariat of Water Transportation, which also performs the maintenance dredging of waterways and maintenance and repairs of navigation aids. Construction and maintenance of infrastructural facilities, such as protective and mooring facilities is undertaken by the AGP with its own fund, while the construction and maintenance of waterways are conducted by the DNCP y VN with the government fund.

Figure IV-1-4 Location of Argentine Ports



The following charges are collected for use of ports and channels.

1) Charges collected by the AGP as its own receipts.

   a) Charge collected from incoming boats for use of the port.
   b) Charge collected for cargo handling service in the port.
   c) Charge collected for other services (use of port facilities, lease of land, etc.)

2) Charges collected by the AGP and transferred to the Treasury.

   a) Entrance fee (Entrada).
   b) Fee for using navigation aids (Faros y Balizas).
   c) Quarantine fee (Visita de Sanidad).

Navigation control in the access channel to the port is conducted by the Inland Waterway and Maritime Safety Bureau (Prefectura Naval Argentina: PNA), and port services such as cargo handling, pilotage and towing are offered by private enterprises.

A large number of terminals belonging to public corporations other than the AGP and private sector enterprises are found in the port area which is under the management of the AGP.

Volume of cargoes handled at all the said 40 ports in 1984 registered a total of about 85.1 million tons, of which foreign trade cargoes accounted for 45.5% or about 38.7 million tons, and domestic trade cargoes for 55.5% or about 46.4 million tons.

In the said total of foreign trade cargoes, outgoing cargoes held a dominant share of 83.5% with about 32.3 million tons, while incoming cargoes recorded a share of 16.5% with about 6.4 million tons. Agricultural and marine products accounted for the greater part (90.8%) of export cargoes, registering a total of about 29.3 million tons, of which grains totaled about 21.5 million tons, occupying a share of 66.6% in the total volume of export cargoes. By-products of grains are not listed in the statistics of ports and harbors, but the JNG's data indicates that they amount to about 3.8 million tons. Thus, exported grains including their by-products amount to a total of about 25.3 million tons, accounting for as much as 86.3% of total volume of export cargoes.

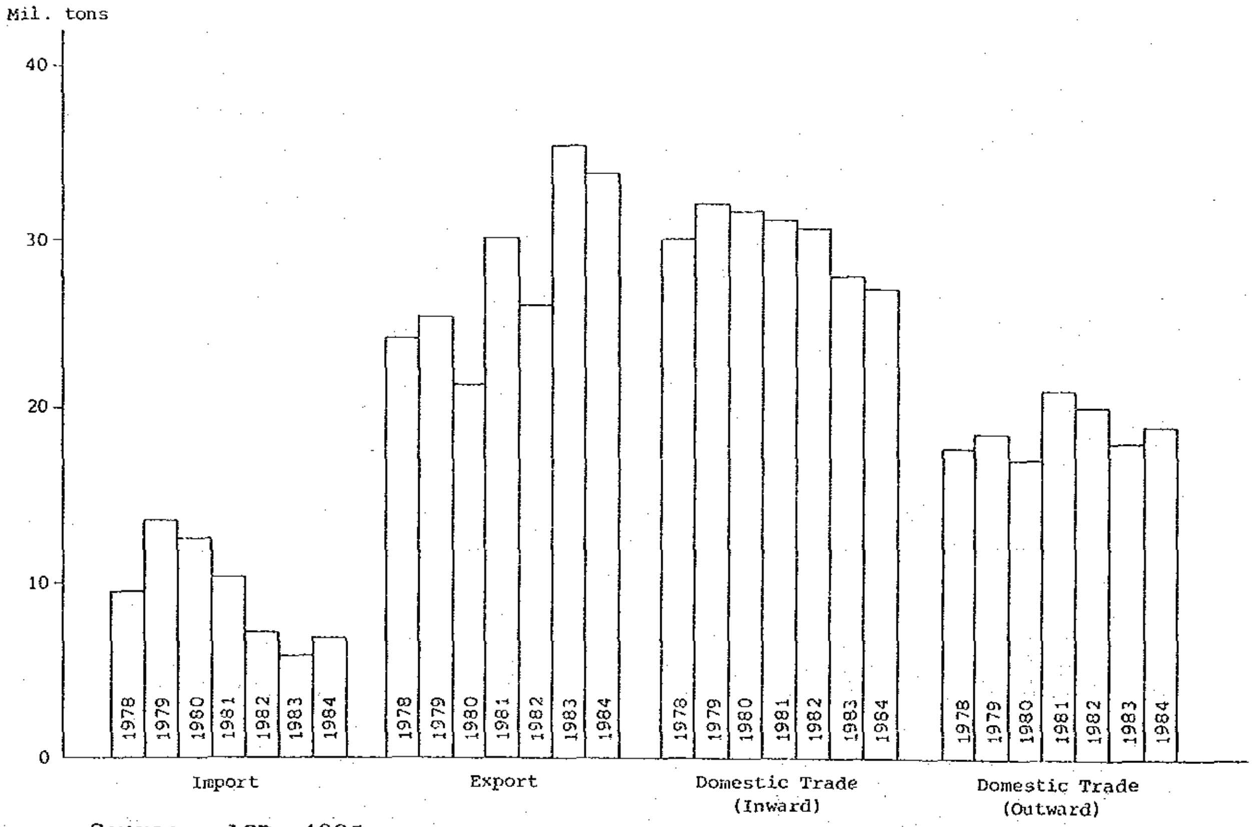
Among all import items, iron ores place first with about 2.4 million tons, followed by steel products registering about 1.0 million tons. These two items combined account for more than half (53.1%) of total import volume. The greater part of imported iron ores are landed at three ports in the middle and lower reaches of the Parana, i.e., Villa Constitucion, San Nicolas and Campana.

Regarding domestic import cargoes, crude oil, petrolum products and sand are the largest in volume. These three items amount to a combined total of about 24.0 million tons, or 90.2% of total domestic import cargo volume. Crude oil places first among the top three items with about 12.0 million tons, of which the greater part (9.1 million tons) is shipped from the oil fields near Comodoro Rivadavia Port in Patagonia and landed at two ports, i.e., Rosales Port in the Bahia Blanca having oil refineries in the hinterland and Campana Port in the lower reaches of the Parana. Domestic import volume of petroleum products is about 7.0 million tons. These are landed at many different ports, both river and sea ports (see Table IV-1-1).

Marine container traffic at Argentine ports registered a total of about 130,000 TEUs (incl. empty containers) in 1984, of which 67.7% were loaded containers and 32.3% were empty ones. The ratio of outgoing loaded containers to incoming ones was 42 : 58. Seen by port, Buenos Aires registered a total container handling volume of about 110,000 TEUs, accounting for 91.7% of total container port traffic in 1984. It is probable that the bulk of containers handled at Buenos Aires were foreign trade cargoes (see Table IV-1-2).

The 7-year data of cargo traffic through ports from 1978 to 1984 indicates an uptrend of export volume consisting mainly of grains and a sharp drop of import volume from 1979 to 1983 which showed some recovery in 1984. Volume of domestic trade cargoes followed a crab-like curse in the said period (see Figure IV-1-5). In 1984, a total of 3,290 ocean-going vessels called at Argentine ports. Seen by port, Buenos Aires registered 1,478 ships, other river ports 1,083 ships, and sea ports 729 ships.

Figure IV-1-5 Trend of Cargo Traffic Through Ports (1978-1984)



Source: AGP, 1985

Table IV-1-1 Volume of Foreign and Domestic Trade by Port (1984)

(Metric Ton)

Code	Commodities	Foreign trade		Domestic trade		Total	Transshipment
		Import	Export	Inward	Outward		
00	General cargo	235,102	113,927	60,377	36,948	446,354	20,770
01	Live animals	6	24	80	26	136	
02/1	Meat	878	211,251		18	212,147	5
02/2	Processed Meat	354	37,811		41	38,206	29
03	Fish	7,853	130,646	282,275		420,774	105
04	Milk, eggs, honey	1,879	32,626		94	34,599	177
05	Other animal-related products	10,216	3,547	768		14,531	2
07	Vegetable, beans	5,457	361,626	55	4,444	371,582	5,219
08	Fruits	18,192	310,928	4,066		333,186	249
09	Coffee, tea	35,261	48,153			83,414	1,582
10/1	Wheat.	8	7,352,025			7,352,033	18,000
10/2	Maize		5,432,562	2,592	4,095	5,439,249	3,200
10/3	Sorghum	106	5,143,899		67,703	5 211,708	
10/4	Other cereals	16	432,725	14,287	25,425	472,453	1,212
11	Prod. of milling industries	601	4,827,272	53,600	37,717	4,919,190	70,100
12	Oil seeds & oleaginous fruits	5,434	3,159,208	13,555	38,127	3,216,324	42,986
15	Animal & vegetable oil & fat	23,185	1,390,848	53,920	26,185	1,494,138	4,049
17/1	Sugar	11	315,586	5	22	315,624	9,741
17/2	Sugar confectionary	5,821	95,272			101,093	53
22/1	Wine	224	26,733	412	400	27,769	79
22/2	Beverage	10,514	72,753	119	14	83,400	666
23	Meat meal	16	102,708	24	2,330	105,078	
24	Tobacco	480	29,664		25	30,169	829
25/1	Sand	89,904	201	4,899,186	130,560	5,119,851	68
25/2	Gravel & stone	66,586		267,989		334,575	61
25/3	Cement	1,654	91,545	19,244	17,186	129,629	
25/4	Salt, sulphur, earths	345,853	51,884	19,304	23,563	440,604	1,873
26/1	Solid fuel	553,529	278,687	516,301	588,858	1,937,375	48
26/2	Iron ore	2,380,461	23	531,193		2,911,677	
26/3	Other mineral	307,652	13,638	1,181		322,471	
27/1	Crude petroleum		22,324	12,000,372	11,171,192	23,193,888	330,814
27/2	Gases	23,804	96,429	457,679	398,693	976,605	
27/3	Liquid fuel	169,328	787,300	7,097,860	7,011,467	15,065,955	105,123
28	Chemical products	491,265	291,848	20,721	1,317	805,151	11,094
31	Fertilizer	160,988	820		12	161,820	1,046
32	Tanning extracts	20,627	60,535	78		81,240	783
41	Raw skins & hides, & leather	145	52 040			52,185	116
44	Wood	75,409	35,607	40,473	1,178	152,667	1,652
47	Paper-making materials	32,551	48,522		2,444	83,517	258
48	Paper & paper board	45,012	14,888	3,589	1,091	64,580	111
50	Texitiles	24,324	30,314		15	54,653	2,157
63	Wool, cotton	4,973	167,594	6,210	1,079	180,486	3,589
68	Construction materials	22,738	10,680	848	2,670	36,936	19
70	Glass & glassware	7,432	7,360		81	14 873	74
73	Iron & steel	1,021,138	510,929	221,383	179,634	1,933,084	8,500
81	Other metals & articles thereof	41,215	66,018	20,591	4,963	132,787	13,187
84/1	Machinery & mechanical appliance	76,464	21,228	2,153	276	100,121	4,941
84/2	Electric equipment	9,957	3,521	4	140	13,622	222
86	Vehicles	73,023	12,339	739	488	86,589	9,337
	Total	6,407,646	32,308,068	26,613,233	19,781,151	85,110,098	674,126

Source: AGP, 1985

Table IV-1-2 Containers Handled at Argentine Ports (1984)

Port	Incoming				Outgoing				Total (TEU)
	20ft*		40ft*		20ft*		40ft*		
	loaded	empty	loaded	empty	loaded	empty	loaded	empty	
Buenos Aires	36,528	15,681	6,091	1,974	24,800	13,246	4,082	2,343	119,235
Galvan	52	1,749	-	57	2,209	60	4	-	4,192
San Antonio	82	714	-	15	517	-	6	-	1,355
Madryn	-	200	-	-	930	-	-	-	1,130
Ushuaia	2,073	78	7	-	289	1,520	-	-	3,974
Others	112	-	10	-	9	-	-	-	141
Total	38 847	18 422	6 108	2 046	28.754	14 826	4 092	2 343	130 027

Source: AGP, 1985
Note : * indicates the length of containers.

(2) Problems

Major ports in Argentina were constructed many years ago, some having a history of 100 years or longer. Many river ports, including Buenos Aires, La Plata and Rosario, were built in the late 19th along La Plata and the Parana because these rivers provided natural channels permitting ships to navigate deep into inland areas as well as calm anchorages, whereas the Atlantic coast had few bays shutting off the violent wind and waves from the outer sea. This was certainly a wise choice considering the size of ships and the level of port construction technology during the days when these ports were constructed.

Bahia Blanca Port is situated on the Atlantic coast, but it was built at about the same time as the river ports mentioned above in the innermost, calm area of a bag severed from the coast by a natural channel having a length of as large as about 100 km.

In the 1910s some time after completion of these ports, the construction of two ports on the Atlantic coast was initiated at about the same time. These were Mar del Plata built on the coast directly facing the Atlantic Ocean and Quequen Port built in the estuary of the Quequen. Construction of these two ports called for the installation of breakwaters to protect the port area from the waves from the outer sea.

In the beginning of this century, ocean-going ships with a tonnage of about 10,000 DWT were classified as the largest vessels. However, the pace of mammothization of ocean-going ships since that time has been so rapid that the prevailing size of ocean-going ships now exceeds 200,000 DWT for oil tankers, 100,000 DWT for iron ore carriers, 60,000 - 70,000 DWT for bulk grain carriers, and 50,000 GT for container ships. While many of large-size ships now in service are of the PANAMAX type, some of the world's leading ports are now making capital investments for port facilities improvement to permit free entry of super PANAMAX type ships in anticipation of the opening of a second Panama Canal. It appears that Argentina's ports are left behind this global mammothization trend of ocean-going ships.

If a PANAMAX type ship is used for transportation of grains which account for the greater part of Argentina's export cargoes, loading at a river port along the Parana or La Palata or at Quequen Port must inevitably followed by costly transsshipment of top-off operation at the estuary of La Plata or in some foreign port in Brazil, etc. At present, however, no PANAMAX type ships can leave Bahia Blanca Port in full-load condition. Cost disatantanges are caused by shipments of other export cargoes by small-size ships.

Iron ores, which are one of major import items, are transshipped to barges at the estuary of La Plata because ironworks are located along the Parana.

Regarding container ships, Buenos Aires which cover the greater part of Argentina's container traffic can permit the entry of only the first generation 1,000-TEU class ships in full-load condition.

Draft of large-size ships entering Argentine ports is restricted because of the small access channel depth. Shallow sections of channels to the river ports along the Parana and La Palata are maintained at a depth of only about 10 m, even if the mean tide level is taken into consideration, but the maintenance dredging of these channels amounting to an annual average of about 45 million m^3 is required owing to the sediment transportation by the two rivers. After a big flood, the channels are temporarily closed to navigation owing to shoaling.

Maintenance dredging amounting to an annual average of about 1.5 million m^3 is also required for the 100-km long access channel to Bahia Blanca on the Atlantic coast. This is because of the slip-down of muddy soil into the channel from the marshy land along its banks and the intrusion of alongshore drift from the outer sea. A channel dredging project is now being formulated at Bahia Blanca to permit the passage of large-size ships with a draft of 45 ft, and the completion of this project is expected to add substantially to the annual volume of maintenance dredging.

Shoaling of channels and anchorages is also caused at Quequen Port owing to the intrusion of alongshore drift and sediment transportation as well as at Mar del Plata Port owing to the intrusion of alongshore drift, and this amounts to 500,000 m^3 at Quequen Port and 150,000 m^3 at Mar del Plata Port.

Maintenance dredging conducted in all channels in Argentina, including the channel along the Uruguay, amounts to an annual total of about 50 million m^3. To carry out this voluminous maintenance dredging service, the DNCP y VN owns 28 dredgers, but it has no sufficient budget that can be appropriated for maintenance and repair service. Nor has its own, directly-run repair facilities, which means that tenders must be invited for repair service, so that a considerably long time is required for repairing dredgers. As a consequence, the operating rate of the DNCP y VN's dredgers is not sufficiently high, and there are many channel sections that are maintained at the present target depths. There are also cases where the DNCP y VN cannot cope with a heavy shoaling caused by a big flood or insufficient maintenance dredging and is forced to the dredging service of outside contractors.

Thus, the access channels of all ports excluding Bahia Blanca do not have a sufficient depth, and yet their maintenance dredging incurs considerable cost and time. For this reason, grain carriers gather at Bahia Blanca Port to complete transshipment. In the peak period, they wait for an average of more than 1 month, and the longest waiting time on record is 2.5 months.

The problems enumerated above can be summarized in two points, as follows.

1) Most of Argentina's ports and their access channels do not permit the entry of ocean-going ships which have greatly been increased in size worldwide.

2) Large amounts of cost and labor are expended for maintenance of channels whose depth is not large enough for the passage of large-size ocean-going ships.

1-5-2 Suggestions for Future Direction of Ports and Harbors Development

The following suggestions are made on the basis of the existing state of Argentina's ports and problems discussed in the foregoing pages.

1) Development of deep-sea ports

Considering the sizable increase expected of grain exports and the need to catch up with the on-going containerization of cargo transportation, it is essential in the long run to develop deep-sea ports on the Atlantic coast. As will be discussed later, one of the alternatives is to concentrate investments in Quequen Port, in addition to the expansion of Bahia Blanca Port.

2) Reorganization of the domestic transport system

The development of deep-sea ports necessitates the reorganization of the domestic transport system which services these ports. The reorganization needs to include two possible approaches. One approach is to develop, together with the road network, a railway transport system efficiently linked to the deep-sea ports. The other is to redevelop the existing river ports so that they primarily service domestic cargo traffic or function as feeders and distributers for the deep-sea ports. The latter approach needs to seek possibilities of reducing the costs of maintenance dredging, for example, by considering the introduction of large-size and shallow-draft river-sea barges in inland waterways to link with the deep-sea ports.

2. EFFICIENT UTILIZATION FOR GRAIN TRANSPORTATION OF PARANA AND LA PLATA RIVERS

2-1 Introduction

At present, Argentina produces about 40 million tons of grains a year, of which about 25 million tons are supplied to overseas markets. Grains are thus an important source of the country's foreign currency earnings. The growth of the manufacturing industry, another important production sector in the country, lags behind the levels in other countries in terms of international competitiveness. As grains exported from Argentina are highly competitive in the international market, the country has no choice but to increase their exports at least as a short or intermediate range plan to secure the funds for paying off foreign debts now amounting to US$50 billion and for fostering the growth of the manufacturing sector.

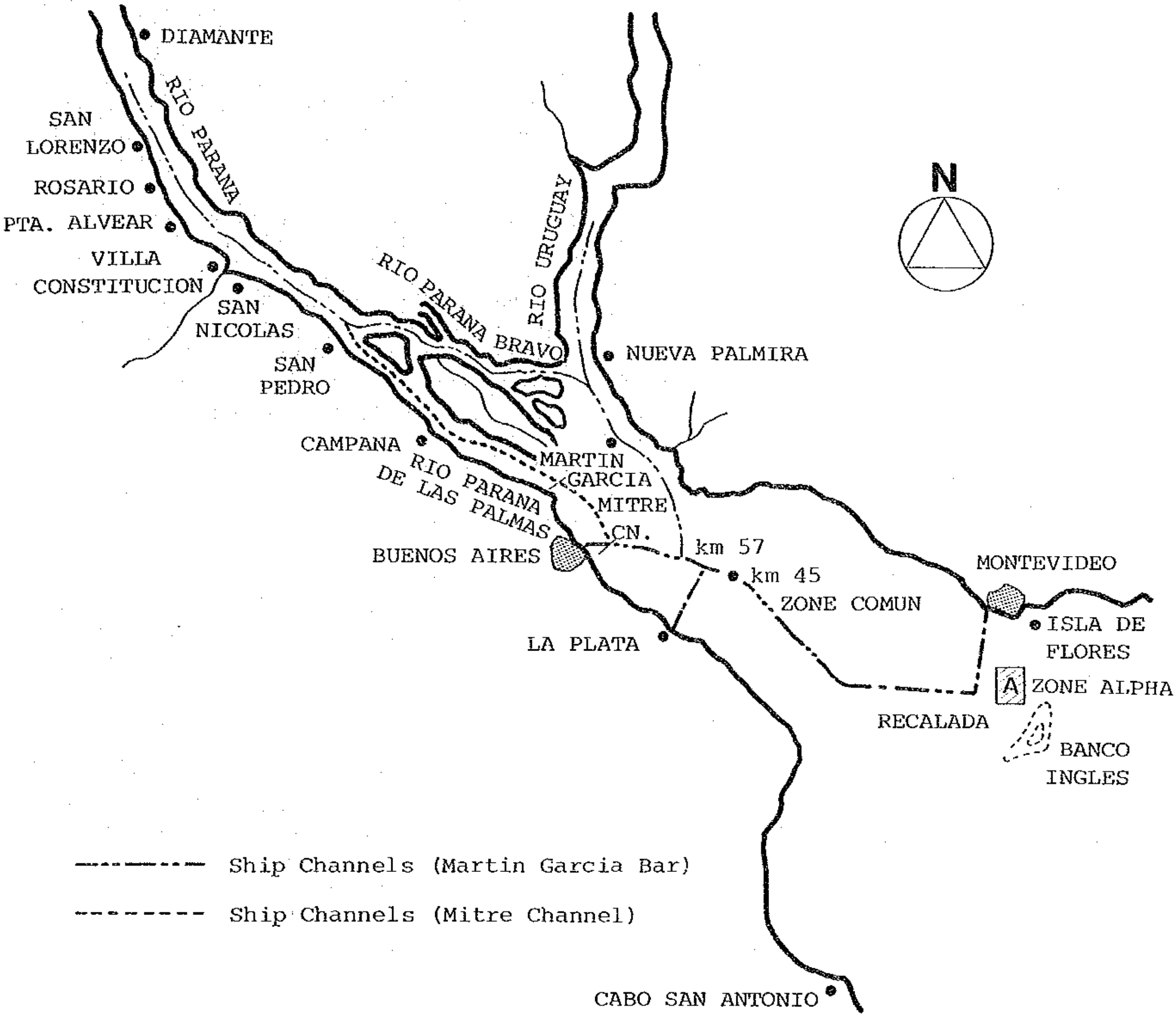
The National Agricultural and Livestock Program 1985-1988, announced in 1984 by the Secretariat of Agriculture, Livestock and Fisheries, refers to the possibility of increasing the production of five export crops (wheat, maize, sorghum, sunflower and soybean) to 60 million tons. Preparatory planning has been going on to realize this possibility by the end of the 1980s. 60 million tons of production implies an export surplus of some 40 million tons, including by-products of oilseeds. The expected increase calls for a phenomenal capacity increase of the entire grain transportion system, including the grain transportation capacity from producing areas to shipping ports, grain storage capacity in producing areas and shipping ports, grain receiving and loading capacity at ports and river/channel transportation capacity.

Presently, efforts for the improvement of Argentine's grain transportation system are forcused to the development of Bahia Blanca Port with technical and financial cooperation from the IBRD and other bilateral aid agencies. The Bahia Blanca development project is one of the cores of Argentine's grain transportation system development scheme, but no detailed reference is made to it in this study because it is considered as an on-going project.

Argentina's main grain export ports are Bahia Blanca on the Atlantic coast in the southern part of Buenos Aires Province and the river ports in the Parana-La Plata river system shown in Figure IV-2-1. These ports are not operated independently of each other, but are in a mutually complementary relation in the entire grain transportation system. Specifically, PANAMAX type grain carriers with a size of 50,000 - 60,000 DWT, which now play the central role in the world grain transportation service, can be loaded only to half the capacity at river ports because of the small water depth at these ports and channels, and are required to be loaded down by transshipping operation in Zone Alpha in La Plata's estuary, or in Zone Beta in the south of it, or at another shipping port of Bahia Blanca.

The greatest drawback to the export of grains from Argentina is that shallow-water river ports must be used for their shipment. All river ports in the Parana-La Plata river system, extending from Barraqueras to Buenos Aires, are exposed to constant silting of port

Figure IV-2-1 Distribution of Grain Handling Ports along Parana and La Plata Rivers



facilities and channels resulting from natural restraints on river ports, and are required to make ceaseless efforts for maintenance dredging to maintain the target water depth.

All these ports suffer from a number of disadvantages. Specifically, there is no knowing when they will have to be closed for a long time owing to a flood, etc., the maintenance dredging incurs a huge cost, and the complexity of operation caused by half-full loading at river ports to be followed by full loading by transshipping operation using the topping-off facilities in La Plata's estuary or at Bahia Blanca adds greatly to the time and cost of grain transportation.

The Government and related agencies have exerted their utmost in the past to achieve the highest efficiency of port operation under these adverse conditions. Owing to the recent stringency of the national finance, however, it has been made impossible to carry out sufficient maintenance, repair and renewal service of facilities at regular intervals and the aging of grain transportation facilities is in rapid progress, inviting a progressive decline in the operating efficiency.

In this chapter, the various problems entailed in the existing grain transportation system are cited in 2-2, and the acute need for formulating a long-range grain transportation development policy is pointed out in 2-3, with a number of alternative ideas presented that may be useful in framing the said long-range policy. Items to be surveyed at the stage of master planning for the policy formulation are also enumerated. Furthermore, improvement measures desired to be taken in the short run by maintaining conformity with the long-range policy are discussed in 2-4. In 2-5, the study team's suggestions based on the above argument are summarized and presented.

2-2 Existing State of Grain Transportation, and Problems

2-2-1 Grain Transportation System in Argentina

Argentina's export grains, comprising wheat, maize, sorghum, soybeans and sunflower for the most part, are produced mainly in the provinces of Buenos Aires, Santa Fe and Cordoba. These grains are dried and stored after harvesting, and the effective grain storage capacity is estimated to range from 27 to 28 million tons at present. Since this is considerably smaller than the total grain production of 40 - 45 million tons, Argentina is forced to export a large portion of its grain production not just to secure foreign currency earnings but also to cover up the shortage of storage capacity.

When orders are received from export merchants, grains stored in producing area elevators are transported by railway or truck to port elevators at river ports along the Parana and La Plata such as Rosario, San Lorenzo and Buenos Aires, or at Bahia Blanca or other ports on the Atlantic coast. In the total grain traffic from producing areas to ports, trucks hold a dominant share but railways occupy a share of only about 30%. River transportation using barges is negligible.

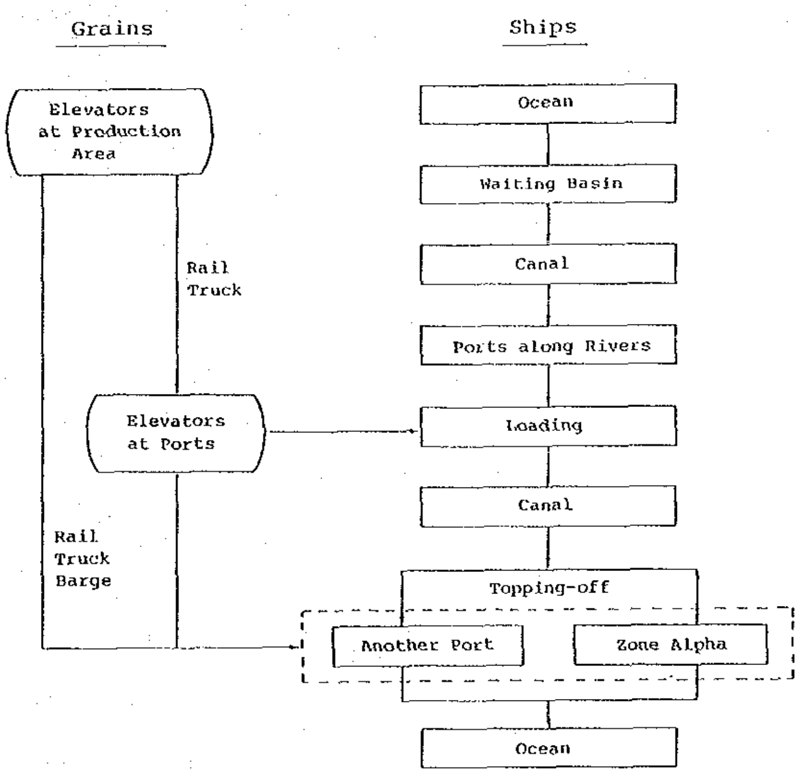
On the other hand, all grain carriers excluding those sailing directly to Bahia Blanca and Quequen for loading down enter Recalada in

La Plata's estuary. From this point on, all carriers come under the control of the Prefectura Naval Argentina (PNA) and navigate upstream with a pilot aboard to grain loading ports along the Parana and La Plata. All these river ports are under the direct management of the General Port Administration. Carriers smaller than 30,000 DWT in size can be loaded to capacity at any ports up to San Lorenzo in the Parana-La Plata river system. But PANAMAX type carriers can be loaded only to half the capacity because of the draft limit in the river system, so that transshipping operation is required to make them loaded fully.

Carriers fully or half loaded at river ports along the Parana and La Plata leave for the Atlantic by navigating down the up route in the reverse direction. Fully loaded carriers leave directly for destination, but those calling for transshipping operation proceed to an area having a water depth large enough for full loading, such as Zone Alpha or Zone Beta in La Plata's estuary, or to Bahia Blanca where PANAMAX type carriers can be loaded to capacity.

Figure IV-2-2 illustrates the flow of grains and the movement of grain carriers mentioned above.

Figure IV-2-2 Grain Transportation System



Source: Study Team

Note : The above procedure indicates the case of loading to the grain carriers of PANAMAX size, which necessitates the topping-off operation.

2-2-2 Transportation from Grain Producing Areas to Export Ports

(1) Transportation by railway

(a) Railway network

Argentina's railway network was originally constructed for the dual purpose of developing the country's vast, fertile land area and transporting grains produced. Since grain shipments to overseas markets were made from river ports along the Parana and La Plata, the railway network consists mainly of the radial routes extending to Buenos Aires and other river ports and the lines leading to sea ports on the Atlantic coast, including Bahia Blanca which is the core of the southern Pampa region.

Besides these trunk lines, there are two other lines, one linking the northern area with Santa Fe, Rosario and the other running in the Mesopotamia area in the east of the Parana. The network density is high in the Pampa region which is the country's granary. Of the three gauges used in Argentina, the broad gauge lines cover the granary of the central and southern areas (20,400 km), the narrow gauge lines cover mainly the northern area, serving for regional development of underdeveloped region (12,900 km), and the standard gauge lines run in the Mesopotamia area in the east of the Parana (2,800 km) and are linked with Uruguayan and Brazilian lines of the same gauge.

River ports along the Parana have triple rails permitting the operation of both broad and narrow gauge lines. Port elevators of the National Grain Board (Junta Nacional de Granos: JNG), Argentine Cooperative Association (Asociacion de Cooperativas Argentinas: ACA) and Argentine Agriculture Cooperative Federation (Federacion Argentina de Cooperativas Agrarias: FACA) are provided with sidings and freight car unloading facilities, but some of new elevators installed and operated by private enterprises are provided only with truck unloading facilities.

Double-tracking work has been conducted mainly for trunk lines running in the neighborhood of Buenos Aires and along the Parana, and about 30% of all trunk lines are now double-tracked. Electrification is completed only for four lines with 145 stations in the commuter line section in the suburbs of Buenos Aires. The number of freight stations, which once totaled about 2,000, has now been reduced to about 710 as a result of a freight station centralization plan, of which 340 have a cargo handling capacity of 1,500 tons and number of yard is 28. By the introduction of an industrial and unit train system in December 1983, trunk lines with a length of about 16,000 km are now operated for freight transportation service and some lines discontinued the freight transportation service.

(b) Transportation facilities

Railways in Argentina are favorably conditioned for alignment in terms of both curve radius and gradient because they are laid mostly in the vast plains, but tracks and railway structures are not given sufficient maintenance service. Maintenance work is limited to "remedial" repair works of accidents and disasters, and axle load and speed are controlled to cover up the deficiency in maintenance service. Track conditions as divided into 4 ranks of "very good," "good," "normal" and "bad" are in the ratio of 12:30:43:15.

As regards diesel locomotives used as freight train traction engines, there are many different types but include a few newly purchased ones. In addition, deterioration and poor maintenance is notable for all locomotives. As a consequence, the operating rate of all locomotives, numbering about 1,070, is about 65%. Since they are used preferentially for passenger train operation, there is a heavy shortage of locomotives for freight services especially in the broad gauge sections.

Freight cars put in service account for about 75% of all 36,400 cars. However, only about 35% of them are in normal service condition, and more than half (about 60%), having been used for 31 years or more, are in poor service condition. Bulk grain cars, having a loading capacity of 50 tons, are classified into the hopper type designed for grain loading from top and unloading from bottom and the general-purpose type designed for manual unloading from the sides. Unloading time required for the former is about 3 minutes, and that required for the latter is about 15 minutes. JNG's elevators have a daily freight car unloading capacity of 150 cars/unit. Freight cars operated on broad gauge lines number 5,800 (hopper type - 33%, general-purpose type - 36%), but those operated on narrow gauge lines number 1,600 (bulk grain cars - 46%). The small number of hopper type freight cars operated on narrow gauge lines is causing cargo retention at ports, making the shortage of freight cars more critical. The shortage of freight cars is conspicuous in the northern and northwestern areas covered by narrow gauge lines where there is a high degree of dependence on railway transportation. As a means of covering up this shortage of freight cars, there is a plan to promote private ownership of freight cars.

The coupling system used on broad gauge lines is not an automatic coupler system, and the freight car braking system, divided into the vacuum type and the compressed air type, is connected only with the locomotive and a few cars. This works as a minus factor holding down the speed of freight trains. While the maximum speed of locomotives is 57 - 140 km/h, that of freight trains is 40 km/h, which is reduced to 5 - 10 km/h in some sections owing to the poor track condition. For all these reasons, the average design operation speed is limited to about 30 km/h even on trunk lines.

The maximum freight hauling capacity is 2,500 tons, but the axle load restriction imposed tracks set limits to incoming locomotives. As a consequence, the maximum hauling capacity ranges from 1,600 to 1,700 tons on trunk lines. Loading silos at producing area stations have a total capacity of 9 million tons because they were installed when railways played the central role in grain transportation. Although 80% of this total capacity is required to be carried by railways, the silo turnover rate has now dropped owing to the decline in railway utilization.

(c) Grain transportation by railways

Recent railway freight transportation data indicates that grains hold a share of about 35% in total cargoes transported in terms of tonnage and about 20% in terms of ton/km, showing an increase of slightly less than 10% from the level 10 years ago. Thus, grains carry great weight in the National Railway's freight transportation service (see Tables IV-2-1 and IV-2-2). Seen by item, wheat, maize and sorghum hold dominant share in total grain transportation volume.

The flow of grain transportation by railways is as outlined below. The producer or the grain collector in the producing area carries grains to the starting station and put them in the storage silos operated either by the National Railways or a private enterprise, and applies for grain transportation service. The starting station arranges for freight cars and trains, and the consignor loads up grains in the freight cars. The freight train, which is either a regular train or a special one, collects grains at one or several stations to the grain yard near the port, enters the unloading place where elevators are installed, unloads grains from each 1 or 2 freight cars onto the belt conveyor.

In the past, grains collected at a number of stations were sorted in the grain yard for the formation of a train. Under the unit train system introduced for efficient grain transportation in December 1983, freight trains with a total loading capacity of 1,000 tons or 1,500 tons are now operated to collect grains at 1 - 3 stations for through transportation service. Under this system, a flexible tariff is introduced which provides a discount of up to 16% from listed freight or even a higher discount rate on certain conditions. In the northern part of the northwestern area, the JNG has introduced a system of bearing total freight for a distance of more than 500 km as part of its grain production promotion policy.

Owing to the shortage of railway transportation capacity, however, consignors are required to apply for grain transportation service 21 days before the scheduled date of shipment. Furthermore, the low speed of operation and frequent occurrence of troubles of the way to the destination make it impossible for them to know the exact date of arrival. Thus, freight transportation service is unable to meet consignor demand for flexibility and reliability, so that total railway transportaiton volume shows a stagnant growth.

Table IV-2-3 shows the cargo handling volumes of JNG's elevators which cover the greater part of railway freight traffic volume in each port. As seen in the table, railways account for 25% of total grain traffic volume, and the distance covered by railway transportation generally ranges from 100 to 500 km, averaging about 300 km, although a distance of about 1,500 km is covered by long-distance transportation service.

Trucking service is utilized by virtually all private elevators not just for short-distance transportation but also in an emergency. This is because railways cannot successfully meet competition from the truck industry which offers flexible transportation service at a flexible rate, and consignors have no choice but to use the trucking

Table IV-2-1 Annual Changes in Railway Freight Traffic (tonnage)

(million tons)

Line	Roca			Mitre			San Martin			Sarmiento			Urquiza			Belgrano			Total		
Commodity	1973	1977	1982	1973	1977	1982	1973	1977	1982	1973	1977	1982	1973	1977	1982	1973	1977	1982	1973	1977	1982
Wheat.maize.etc	1.319	1.399	797	1.497	2.617	2.142	768	1.220	1.440	1.016	1.468	1.725	193	158	142	316	651	822	5.111	7.513	7.068
Suger	2	2	2	215	308	285	2		6	1					1	706	781	681	926	1.091	975
Wine	8	3	1				490	622	385	6	2					123	128	115	627	755	501
Cement	885	1.032	706	86	22	80	30	36	140		1	1	6	11	17	65	23	207	1.071	1.125	1.151
Ores (Limestone.etc.)	61	41	64	49	53	58	321	212	375			1				220	284	223	651	590	721
Stones	299	326	710	98	72	312	39	71	161			8	35	98	305	160	358	335	631	925	1.831
Petroleum	1				262		560	702	1.304	1						1.349	344	308	1.911	1.308	1.612
Gasoline.kerosene	288	268	103	140	182	115	1.002	873	745	16			58	52		155	183	270	1.659	1.556	1.233
Others	1.324	1.033	624	1.092	757	637	727	754	630	414	342	239	915	831	492	2,031	1.587	1.384	6.503	5.304	4.006
Total	4.187	4.104	3.007	3.177	4,273	3.629	3.939	4.490	5.186	1.456	1.813	1.974	1.207	1.150	957	5.125	4.339	4.345	19.091	20.169	19.098

Notes: 1) All figures are based on FA's data.
2) Wheat, maize, etc.= Maize, wheat, sunflower, soybeans and other cereals.
3) Ores = Pierda Caliza y dolomita.

Table IV-2-2 Annual Changes in Railway Freight Traffic (ton/kilometer)

(million ton/km)

Line	Roca			Mitre			San Martin			Sarmiento			Urquiza			Belgrano			Total		
Commodity	1973	1977	1982	1973	1977	1982	1973	1977	1982	1973	1977	1982	1973	1977	1982	1973	1977	1982	1973	1977	1982
Wheat.maize.etc	342	291	234	338	533	483	294	426	524	401	537	661	83	32	50	92	207	462	1.550	2.026	2.414
Suger	3	2	2	242	309	287			5						1	679	949	861	1.124	1.260	1.156
Wine	9	3	1				512	668	410	4	1					130	136	136	655	808	547
Cement	407	564	351	43	8	46	23	26	142				4	5	13	38	12	188	515	615	740
Ores (Limestone.etc.)	41	30	39	35	32	28	316	226	414							118	201	63	510	489	544
Stones	111	111	226	56	42	126	28	58	106				13	27	61	80	140	180	288	378	699
Petroleum					215		480	393	804							1.262	121	65	1,742	729	869
Gasoline.kerosene	167	155	67	104	134	90	883	783	676	3			32	35		93	127	224	1.282	1.234	1.057
Others	871	809	560	600	397	398	604	606	485	211	189	154	659	566	399	1.897	1.472	1.450	4.842	4.039	3.446
Total	1.951	1.965	1.480	1.418	1.670	1.458	3,140	3,186	3.566	619	727	815	791	665	524	4.589	3.365	3.629	12.508	11.578	11.472

Notes: 1) All figures are based on FA's data.
2) Wheat, maize, etc. = Maize, wheat, sunflower, soybeans and other cereals.
3) Ores = Pierda Caliza y dolomita.

service despite its rather high cost because railway transportation service is not reliable.

With the growing cargo handling rate of private elevators, the National Railways is planning to promote the installation of sidings in newly constructed ports, as seen in San Lorenzo Port, and to accerate the improvement of existing facilities.

Table IV-2-3 Cargo Handling Volumes of JNG's Elevators

(tons)

Port	Railway 1984	Railway 1985	Truck 1984	Truck 1985
Bahia Blanca	2,202,289	2,356,144	2,406,520	2,361,493
Barranqueras	83,786	2,484	295,742	294,284
Buenos Aires	627,626	519,342	668,489	888,100
Concepcion del Uruguay	-	-	4,975	1,509
Diamante	27,640	53,476	270,321	314,501
Mar del Plata	-	-	116,721	246,688
Necochea	79,907	101,226	1,280,508	1,445,205
Rosario	2,025,044	2,300,605	1,413,405	1,472,268
San Lorenzo	-	-	91,605	-
Santa Fé	161,471	180,869	265,890	275,770
Villa Constitución	338,646	453,694	930,219	819,428
San Nicolas	58,542	-	1,213,998	1,571,361
San Pedro	-	-	554,535	609,837
Total	5,604,951	5,967,840	9,512,928	10,300,446
Share (%)	37	37	63	63

Source: JNG, 1985

(2) Transportation by trucks

Trucks hold a dominant share of 75% in total export grain traffic despite the lower tariff of other modes of transportation. This is mainly due to the flexibility and high speed of trucking service. Another cause of the large share of trucks is that the traffic demand reaches its peak in the January-March period (wheat) and in the April-May period, and this peak demand cannot be met by the existing grain cars of the National Railways.

The mechanism of grain distribution is quite complex, but the grain transportation by trucks from producing area silos to shipping ports presents only two patterns. In one case, primary unions and collectors (acopiadores) transport grains using their own trucks. In the other, truck operaters transport them on orders from primary unions and collectors or from producers. There are very few cases where producers carry them to the port in their own trucks.

85% of all transporters are small-scale enterprises operating with only 1 - 2 trucks, and the remaining 15% is accounted for mostly by medium-sale companies with an operational holding of 5 - 10 trucks. The great majority of transporters specializing in grain transportation in the Pampa region are owner-drivers operating with just one truck, and most of them are members of the Confederation of Truck Transporters (CATAC) and are covered by the insurance system run by the CATAC.

The size-wise distribution of trucks owned by transporters in 1980 is as shown below.

Light trucks (less than 3 tons)	40,200	14%
Medium-size trucks (3 - 6 tons)	101,000	36%
Semi-heavy trucks (6 - 9 tons)	111,300	40%
Heavy trucks (9 tons or more)	26,500	10%
Total	279,000	100%

Trailers owned by these transporters in the same year accounted for 75% of trucks larger than 6 tons in size, or numbered 105,000 in total. The age-wise distribution of these vehicles is as shown below.

	Trucks	Trailers
Less than 10 years	53%	45%
10 - 20 years	42	41
20 years or older	5	14

The typical combination of these vehicles for grain transportation is that of a 10-ton truck and a 20-ton trailer.

The charge for grain transportation service is determined by the negotiation between the transporter and the consignor according to the demand-supply situation. Although the JNG (National Grain Board) has established a tariff to be applied when it commissions transporters to carry grains, it is not used as a criterion for price negotiation between transporters and consignors. Table IV-2-4 is a new tariff established by the JNG in the new currency on June 15, 1985. The free market price is about 10% higher than the charges shown in this tariff, but a 20 - 25% extra fee is charged in the peak season.

Table IV-2-4 Tariff Table of Truck Transportation Established by Junta Nacional de Granos, 15 June, 1985

(US$/ton)

km	Tariff	Tariff per km
1	0.10	0.101
50	2.78	0.056
100	3.86	0.039
150	4.94	0.033
200	6.01	0.030
250	6.84	0.027
300	7.66	0.026
350	7.66	0.026
400	9.30	0.024
450	10.12	0.022
500	10.94	0.021
550	11.77	0.021
600	12.59	0.021

Source: Junta Nacional de Granos
Note : Additional 15% of rate are to be charged in the case of running unpaved road.

On the other hand, the DNV's data indicates that the operating cost of heavy trailer trucks in January 1986 was as shown in Table IV-2-5. As seen in the table, the operating cost per kilometer is US$1.11 if the annual operating distance is 20,000 km and US$0.56 if the annual operating distance is 70,000 km. Accordingly, the operating cost C for an annual operating distance of D km can be formulated as follows.

$$C = 0.3277 + 0.1729 \times 10^{-6} + \frac{0.001555 \times 106}{D}$$

The annual operating distance of trucks specializing in grain transportation, as disclosed in an interview with the CATAC, is 40,000 - 50,000 km. The operating cost per kilometer corresponding to this annual operating distance amounts to about US$0.75.

Assuming that a trailer truck is operated for transportation of 30 tons of grains over a distance of 300 km and carries no cargoes on the return trip, then the income from the carriage based on the JNG's tariff amounts to US$230.00, while the operating cost for the going and return trips amounts to US$450,000. The following are the plausible reasons why the truck industry is operated as a profitable business under such conditions.

Table IV-2-5 Operating Cost of Heavy Truck with Trailer (Jan. 1986)

(US$/km)

Cost Item	Annual Operating Distance 20,000 km	70,000 km
1. Fuel	0.0611	0.0611
2. Lubricant, Filter	0.0143	0.0143
3. Tire	0.0692	0.0692
4. Tire Repair	0.0158	0.0158
5. Depreciation	0.0571	0.0571
6. Repair	0.0571	0.0571
7. Wash, Wax	0.0142	0.0142
8. Bonus for Driver	0.0291	0.0291
9. Equipment	0.0047	0.0047
Variable Cost (1-9)	0.3277	0.3277
10. Driver's Salary	0.1483	0.0424
11. Insurance for Vehicle	0.1924	0.0550
Person	0.0064	0.0019
Cargo	0.0202	0.0058
12. Licence	0.0167	0.0048
13. Capital Oppotunity Cost	0.1937	0.0553
Direct Fixed Cost (10-13)	0.5777	0.1652
14. Rent	0.0367	0.0157
15. Administration Cost	0.1397	0.0399
16. Tax	0.0267	0.0134
Indirect Fixed Cost (14-16)	0.2031	0.0690
Total	1.1085	0.5619

Source: DNV

Note : The figures in the table indicate the case of a trip of running 300 km, the rate of loading 50% and of one driver. The cost of waiting time is not included.

1) Most trucks are overloaded by 1.2 - 1.5 times the loadage.

2) Trucking service is offered at a rate 10 - 20% high than the JNG's tariff.

3) Depreciation expense and opportunity cost are not included in the cost owing to the high age of trucks.

Figure IV-2-3 shows a traffic flow diagram of all trucks including those not used for grain transportation, prepared on the basis of the DNV's data. It is probable that the traffic flow diagram of grains transported by trucks will present a similar pattern.

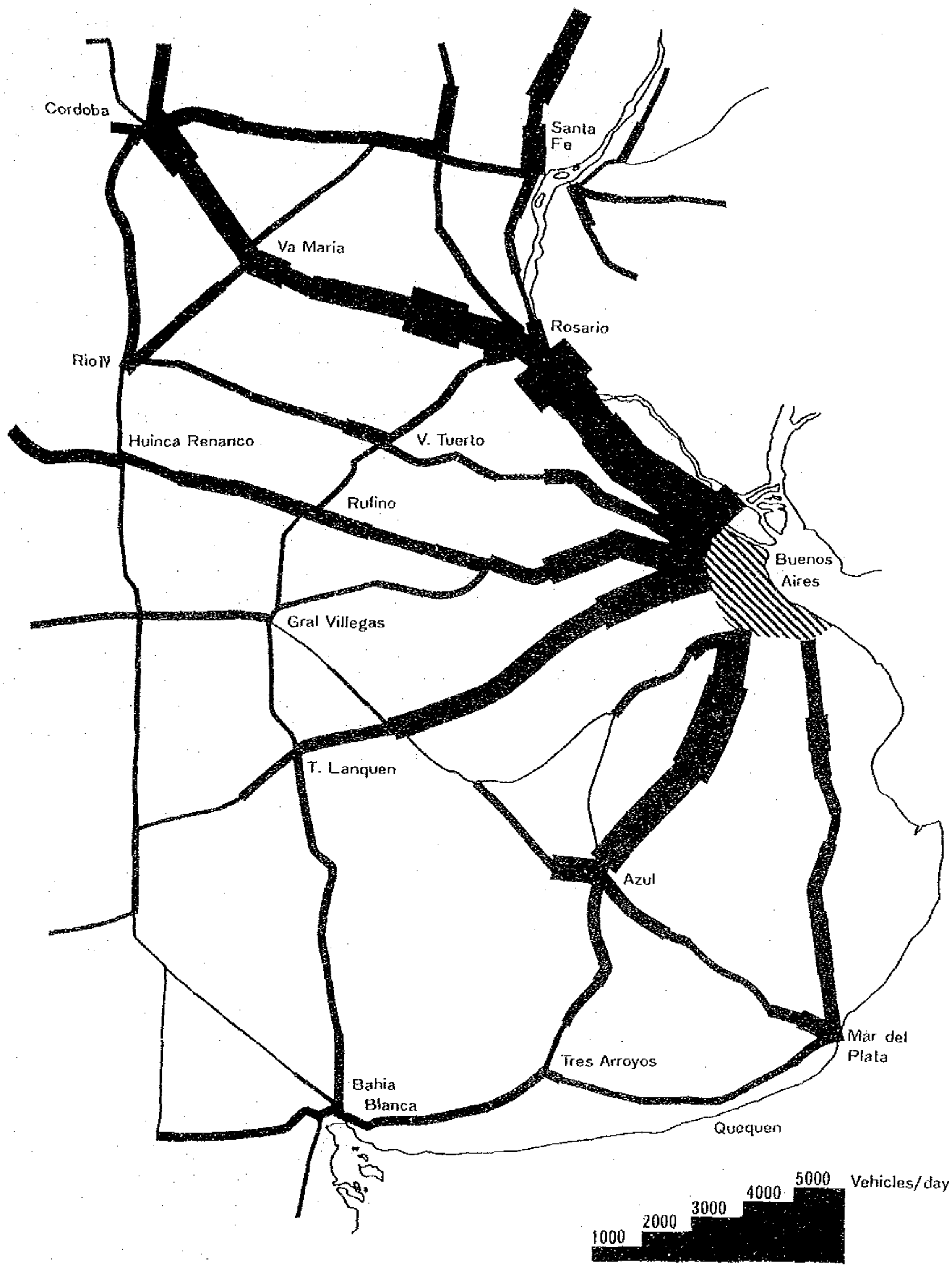
At present, no basic data is available that covers grain transportation by trucks, but the Grain Transport Coordination Committee is making preparations for producing data of grain transportation by trucks similar to that of grain transportation by railway. Specifically, a bill was introduced (and approved in November 1985) which obligates all grain truck drivers to present a transportation record by filling out a form which is to be distributed at the loading point and collected at the unloading point. The form contains a total of 65 items to be entered, including 1) origin and destination, 2) kind of cargo, 3) cargo weight measured at the loading point and the unloading point, 4) consignor information, 5) consignee information, and 6) data related to the departure and arrival of trucks. This new system is planned to be put into operation in two phases, beginning with wheat transportation in September 1986 after a two-month trial period (July and August 1986). In the first stage, only the drivers of export grain trucks will be required to present the report. In the second stage, the system will be applied to all trucks. Introduction of this system is aimed primarily at collecting unified data essential for management and planning of truck transportation service, but it is expected to produce the effect of controlling overloading of trucks.

The following are the problems in the present grain transportation service by trucks which is outlined above.

(a)Tariff system

In Argentina, truckage is determined under a free contract negotiated between the consignor and the transporter. Truckage for grain transportation is basically determined by negotiating such a free contract, although the JNG's tariff table is used for reference. At present, the truck transportation capacity is in excess of demand partly because of the dwindled export of grains in the 1984-1986 period, and this has caused a decline in the tariff. Since the prevailing tariff is not high enough to cover the transportation cost (for going and return trips), transporters are necessarily inclined to overload their trucks.

Figure IV-2-3 Annual Average Daily Traffic of Trucks in 1984



Source: Elaborated by Study Team based on DNV's data.

(b) Overloading

A survey conducted at Rosario Port disclosed that more than 60% of all trucks carrying grains to the port were overloaded. Overloading is not only a major hindrance to traffic safety, but also a primary cause of damage to the road surface. At present, it cannot be punished by law in the port area, but legal sanction will not be effective in solving this problem because it is closely related to the payability of trucking service. The Government has recently alleviated the load limit imposed on heavy trucks with 190 HP or more, but this will not serve as a workable solution for the problem.

(c) Aging of vehicles

As described earlier, more than 55% of all trucks were 10 or more years old in 1980, so that the percentage of superannuated trucks must be higher at present than it was in 1980. Continued use of superannuated trucks is certain to lead to lower operating rate, reduce the economic efficiency, and endanger traffic safety, but most transporters operating on a subsistance level under the prevailing non-paying conditions have no financial capability for purchasing a new truck.

(d) Shortage of unloading capacity at ports

Trucks awaiting their turn for unloading operation queue up at a number of ports when the grain traffic demand reaches its peak (1 - 2 weeks at Bahia Blanca, and 4 - 5 days at Buenos Aires). Expansion of truck unloading facilities at ports is therefore desirable to raise the turnover of trucks. If this is not feasible by reason of the overall capacity of port facilities such as elevators, silos and loading equipment, then it will be necessary to establish a suitable tariff of waiting charges and provide administrative guidance for its application.

(e) Transit of heavy trucks through urban areas

There are observed many cases where heavy trucks for grain transportation are forced to pass through the central part of local cities. As this is causing traffic and urban environmental problems, efforts should be made to formulate an interurban bypass route construction project.

(3) Inland water transport

As mentioned in 2-2-1 above, the inland water transport has little share in the transport of grains. It is now limited to the transport between inland river ports inaccessible to ocean-going grain carriers as Barranqueras on the Parana or Concepcion del Uruguay on the Uruguay and downstream ports as Buenos Aires or Escobar in Parana de Las Palmas (in some cases barges load at ports accessible to ocean-going carriers as Santa Fe or at Diamante and unload San Lorenzo).

The transportation is executed by convoys chaining usually 9 barges and pushed by a pusher boat. At Escobar, cargos are transshipped directly from the barge (separated from the convoy) into the oceangoing grain carrier by 2 floating elevators, while at Buenos Aires, they are usually landed and stocked once into onshore silos and loaded afterwards into the ocean-going grain carrier by onshore elevators (except when the elevators are out of operation, in which case cargos are transshipped directly from the barge into the grain carrier).

Currently freight rate is not fixed for these barge transports, but must be negociated every time (or for every long-term contract, form used more frequently) between the shipper and the barge transporter. The current freight rate for a transport between Barranqueras and Buenos Aires is around US$11/ton.

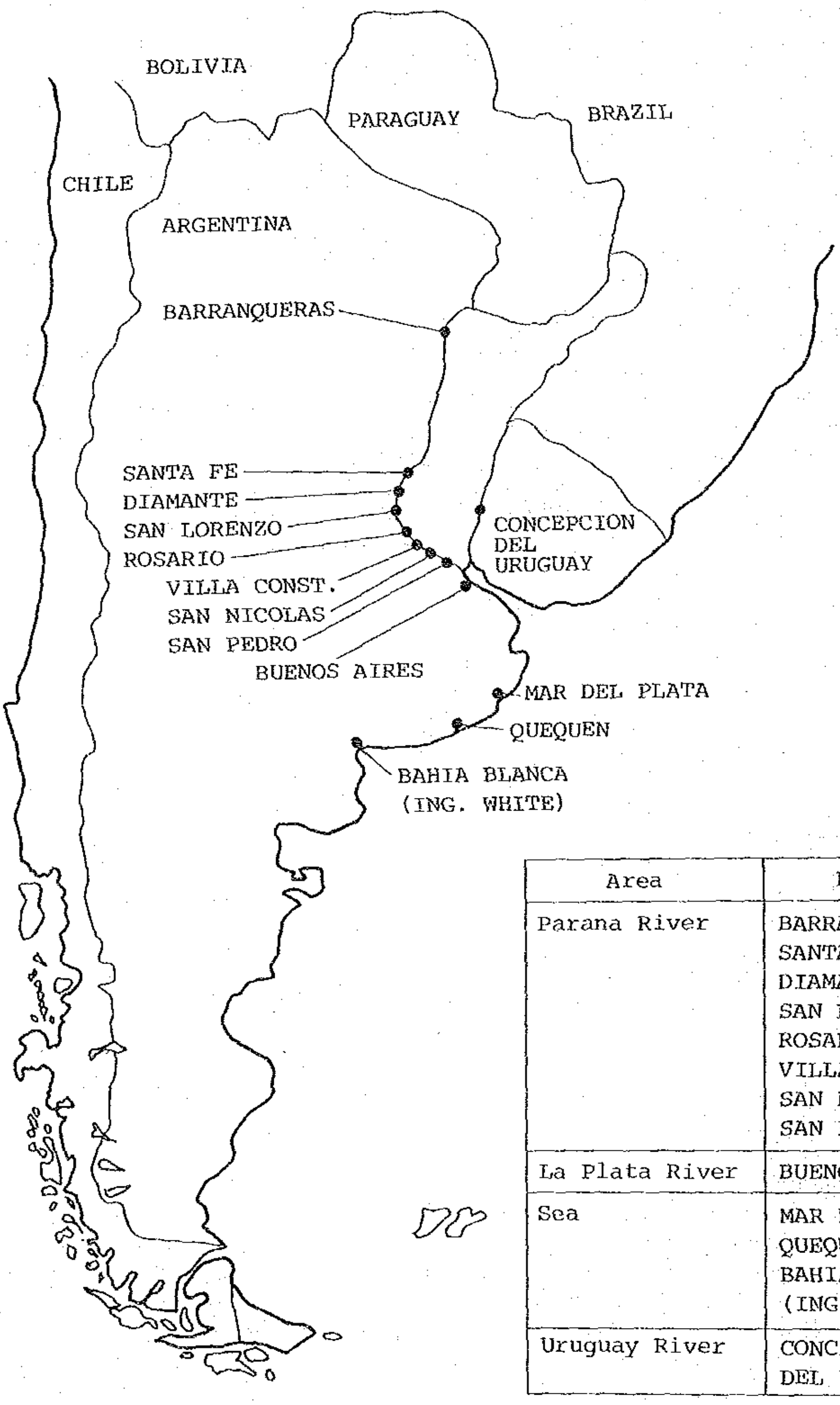
Several reasons make inland water transport unpopular for the transportation of grains: 1) the barge transport system is not systematized, 2) night service is not available, 3) convoys delay frequently, 4) the majority of barge transporters being members of CAFNE, there is no rate competition between them, and this allows them to keep their high price, 5) convoy's lengh is limited, and 6) unloading facilities from the barge to the onshore elevators are not well equipped. Barges suffer another problem: their operation efficiency is very low. It is low because their night service is restricted, and also because, in the current barge system which does not allow a convoy to navigate La Plata river, the convoy must split at Honda Canal into individual barges, which are then conducted down separately to the port of Buenos Aires through coastal canals. This not only creates idle time and raises costs consequently in the barge operation, but also causes congestion of ships in the port of Buenos Aires due to bad coordination between barge arrivals and ocean-going grain carrier loadings. The situation is further aggravated because of very low loading operation efficiency in the loading port of Barranqueras. Loading elevators are good, but the operation system is not: sometimes the tug boat disappears the same time the loaded barge leaves the pier, abandoning the next empty barge. The barge must be operated then manually. The loading capacity of the port is thus reduced from its nominal value of 900 tons/hour to its current average of 1,200 to 2,000 tons/day.

2-2-3 Port Facilities and Distribution of Port Elevators

(1) Distribution of ports and port elevators

At present, export grains are shipped from 14 of the 40 ports placed under the management of the General Port Administration (Administracion General de Puertos: AGP) (see Figure IV-2-4). There are two kinds of statistics showing grain exports from Argentine ports. One is the AGP's statistics of ports and harbors and the other is the JNG's export statistics. All major crops are shown in both statistics, but the AGP's statistics does not contain an item of byproducts, but has an item for products of the flour industry which seems to represent byproducts of grains. In general, the statistics

Figure IV-2-4 Major Grain Loading Ports



Area	Ports
Parana River	BARRANQUERAS SANTA FE DIAMANTE SAN LORENZO ROSARIO VILLA CONST. SAN NICOLAS SAN PEDRO
La Plata River	BUENOS AIRES
Sea	MAR DEL PLATA QUEQUEN BAHIA BLANCA (ING. WHITE)
Uruguay River	CONCEPCION DEL URUGUAY

Table IV-2-6 Export in 1984 excluding Patagonia Ports

(1,000 tons)

Name of Port	Wheat	Maize	Sorghum	Other cereals	Oil seeds & olig. fruit	Subtotal	Prod. of mill.indu	Total
< AGP data >								
Buenos Aires (Buenos Aires)	471	1.280	943	158	231	3.083	1.331	4.414
Rosario (Rosario)	1.055	1.696	1.190	56	1.780	5.777	2.178	7.955
San Martin (Rosario)	677	396	485		741	2.299	791	3.090
Villa Constitucion (Rosario)	357	601	109		160	1.227		1.227
Santa Fe (Parana Media)	23	13	361	1		398		398
Diamante (Parana Media)	23	14	262			299	2	301
San Nicolas (Parana Inferior)	362	615	136		172	1.285	74	1.359
San Pedro (Parana Inferior)	148	313	14	19	52	546		546
Barranqueras (Parana Superior)	20		321		19	360	2	362
Ramallo (Munucipality)								
Concepcion del Uruguay				45		45		45
Mar del Plata (Mar del Plata)	98			37		135		135
Quequen (Quequen)	1.288	92		82		1.462	306	1.768
Bia Blanca (Bia Blanca)	2.831	412	1.322	19		4.584	87	4.671
Total	7.353	5.432	5.143	417	3.155	21.500	4.771	26.271
< JNG data >								
Buenos Aires (Buenos Aires)	485	1.311	823	81	265	2.966	693	3.658
Rosario (Rosario)	1.066	1,709	1.180	53	1.767	5.775	1.998	7.795
San Martin (Rosario)	682	395	443		726	2.247	800	3.047
Villa Constitucion (Rosario)		563	83		135	1.166		1.166
Santa Fe (Parana Media)	23	6	122			150		150
Diamante (Parana Media)	36	12	238			287		287
San Nicolas (Parana Inferior)	303	712	63		267	1.345	20	1.365
San Pedro (Parana Inferior)	103	309	6		67	485		485
Barranqueras (Parana Superior)	20		1			21		21
Ramallo (Munucipality)	7					7		7
Concepcion del Uruguay				37		37		37
Mar del Plata (Mar del Plata)	103				16	117		117
Quequen (Quequen)	1.283	109		37	70	1.500	272	1.772
Bia Blanca (Bia Blanca)	2.782	432	1.278	14	7	4.512	16	4.529
Total	6.893	5.558	4.237	222	3.320	20.641	3.799	24.440

Source: AGP and JNG

show fair conformity with each other, though with minor individual differences (see Table IV-2-6).

The JNG's data indicates that in Argentina's total export volume of 24.4 million tons registered in 1984 (incl. byproducts), the 9 river ports along the Parana including Rosario held a share of 58.6% with 14.3 million tons, Buenos Aires occupied 15.0% with 3.7 million tons, and the 3 sea ports on the Atlantic coast including Bahia Blanca accounted for 26.3% with 6.4 million tons.

At all ports mentioned above, grain elevators run by the JNG and private enterprises such as ACA and FACA are installed, which are all equipped with cargo receiving facilities from trucks and railways, storage facilities, and ship loading facilities. A number of these elevators linked by belt conveyors form a unit to function as an elevator terminal. Table IV-2-7 shows the elevators established at each port as well as the allowable maximum draft of berthing facilities and access channel of each port. It can be seen in the table that the draft is regulated not by the berth water depth but by the access channel depth in almost all cases. It deserves attention the draft of navigating ships is regulated in Canal Principal (Punta Indio) and Mitre Channel of La Plata, and in the channel from San Pedro to Rosario of the Parana.

Regarding the share of the JNG and private enterprises in total export grain shipments, JNG accounted for about 70% of total shipments in 1984. When new terminal construction plans of private enterprises such as ACA and FACA are put into execution, however, it is probable that the share of export grain shipments from private facilities will increase.

Export grains are shipped not only from the above-mentioned elevators, but also by direct loading from the AGP's public berths. Direct loading from public berths is conducted at Buenos Aires, Rosario, Quequen and Bahia Blanca.

(2) Capacity of grain reception of port elevators

Port elevators receive grains transported by trains, trucks and barges. The elevator receiving capacity of grains carried by railway (tons/day) varies according to the number of freight cars per hour, freight car loading capacity, number of belt conveyors, and hourly capacity and operating hours of belt conveyors. The elevator capacity is expressed either in nominal capacity which is the storage capacity of the elevator itself or in effective capacity which is calculated by considering the time required for train operation and other preparations. Table IV-2-8 shows the receiving capacity of each elevator calculated on the basis of available data. In this table, the loading capacity of each freight car and truck is taken at 30 tons.

(3) Capacity of grain loading of port elevators

Table IV-2-9 shows the loading capacity of port elevators (tons/day). The elevator loading capacity is determined by the capacity (tons/hour), number and daily operating hours of belt

Table IV-2-7 Port Elevators, Mooring Facilities, and Allowable Keel Clearance

Port	Owner	Allowable clearance under keel 2) Port	Access channel 1)	Remarks
Buenos Aires				
(Darsena D)	JNG(Unit I)	31	31	
(" C)	EMCYM-ESTIBAJES	31	31	Completed in 1984
	ACA	19	31	
Escobar	Private	33	31	Floating Elevator
San Pedro	JNG	34.8	30	
Ramallo	JNG	23	29	
San Nicolas	JNG	33	29	
Villa Constitucion	JNG	33	29	
Punta Alvoar	Punta Alvear	40	28	
Rosario	JNG (II)	-	28	On sale
	(III)	34	28	
	(IV)	48	28	
	(VI)	31	28	
	(VII)	-	28	Under construction
	FACA	34	28	Buy-up of JNG (I)
	Genara Garcia	31	28	Between JNG(II) and (III)
San Martin	ACA	33	28	San Lorenzo
	TNDO	41	28	
	Bunge & Born SA	45	28	
	Nidern	41	28	
	Cargil	38	28	
	Terminal 6	-	28	Under construction
Diamante	JNG	37	28	
Santa Fe	JNG	30	28	There are silted areas in access channel
Barranqueras	JNG	18	15	
Con. del Urguay	JNG	21	-	
Mar del Plata	JNG	32	32	There are silted areas
Quequen	JNG	40	32	
	ACA, FACA	40	32	
	Private	-	32	In the planning stage
Bahia Blanca				
Ing. White (5/6-7/8)	JNG(III)	36.8	37	
" (9)	JNG(V)	40	37	Under improvement to 45'
Purito Resaros	FACA	-	37	In the planning stage
Ing.W-Galvan	ACA	-	37	"
	Cargil	-	37	"
Ing. White	-	45	45	In the planning stage (2 berths)

Source: AGP

Notes: (1) The allowable keel clearance is calculated by adjusting the tidal datum plane with the mean tidal level for tidal waters and by adjusting the reference water level with mean water level change for rivers.

(2) The access channels refer to all the channels leading from the open sea to respective ports. The allowable keel clearance is determined by taking into account the most shallow points. For those channels which are being dredged or for which dredging is planned, to attain a designed keel clearance, the allowable keel clearance is figured out based on the target water depths.

Mitre Santa Fe Access and Mar del Plata Access are short of the minimum water depth necessary for navigation.

Table IV-2-8 Capacity of Grain Reception

PORTS	Waggons WGN/D	Waggons tons/h	Waggons Conveyor, tons/h Nominal	Waggons Conveyor, tons/h Effective	Waggons Min. Cap. tons/h	Trucks TR/D	Trucks tons/h	Trucks Conveyor, tons/h Nominal	Trucks Conveyor, tons/h Effective	Trucks Min. Cap. tons/h	Total Effc. Cap. tons/h
Barranqueras											
JNG I	44	110	500	150	110	100	250	500	174	174	284
Santa Fe											
JNG I	50	125	} 1,200	} 300	} 175	100	250	} 400	} 300	} 300	475
JNG II	20	50				24	60				
JNG III											
Diamante											
JNG	60	150	800	150	150	140	350	800	500	350	500
San Lorenzo											
CARGILL	-	-	-	-	-	400	1,000	1,000	(800)	800	800
NIDERA		-	-	-	-	450	1,100	1,600	(1,300)	1,100	1,100
B. Y BORN	-	-	-	-	-	350	900	400	(300)	300	300
INDO	* 50	200	200	160	160	200	500	500	(400)	400	560
ACA	* 30	110	300	250	250	60	150	600	(500)	500	750
Rosario											
JNG III	* 120	450	1,000	400	400	110	275	600	400	275	675
JNG IV	* 120	450	1,300	400	400	-	-	-	-	-	400
JNG VI	* 120	450	1,200	350	350	330	825	1,200	900	825	1,175
JNG VII											
FACA	* 50	190	300	250	190	100	250	300	250	250	440
G. Garcia	* 100	375	500	400	375	420	1,085	1,200	960	960	1,335
F. Alvear			1,000	800	800	450	1,125	1,500	1,200	1,125	1,925
V. Constitucion											
JNG I	* 75	280	1,000	450	280	160	400	700	500	400	680
San Nicolas											
JNG III	* 20	75	220	100	75	320	800	800	620	620	695
Ramallo	-	-	-	-	-			250	200	200	200
San Pedro											
JNG IV	-	-	-	-	-	150	375	500	400	375	375
C. del Uruguay											
JNG I	80	200	500	300	200	120	300	500	400	300	500
Buenos Aires											
JNG I	* 160	600	1,000	300	300	} 320	800	1,000	400	400	700
JNG IV			1,000	300	300			1,000	400	400	700
										(BARGE)	300
ACA											
Mar del Plata											
JNG	* 40	150	400	200	150	120	300	400	300	300	450
Quequen											
JNG	140	350	800	400	350	300	750	1,400	600	600	950
ACA-FACA	-	-	-	-	-			600	500	500	500
Bahia Blanca											
JNG III	* 330	1,250	3,000	366	366	-	-	-	-	-	366
JNG IV	-	-	-	-	-	550	1,735	500	333	333	333
JNG V	-	-	-	-	-	-	-	7,200	-	-	-

Source: Secretaria de Transporte
Note : * 45 ton waggon

Table IV-2-9 Capacity of Grain Loading

Ports	Belt Conveyor (tons/h)			Tube No.	Loading Cap. (tons/h)		Loading Cap. (tons/day)	
	No.	Nominal	Effective		Nominal	Effective	Nominal	Effective
Barranqueras								
JNG I	2	500	250	2	1,000	500	12,000	6,000
Santa Fe								
JNG I	3	400	280	8	1,200	840	14,400	10,000
JNG II								
JNG III								
Diamante								
JNG	2	600	400	7	1,200	800	14,400	9,600
San Lorenzo								
Cargill	1	1,000	800	3	1,000	800	12,000	9,600
Nidera	2	600	480	4	1,200	960	14,400	11,500
B. y Born	2	800	640	2	1,600	1,280	19,200	15,400
Indo	1	500	400	1	500	400	6,000	4,800
ACA	2	900	720	3	1,800	1,440	21,600	17,300
Rosario								
JNG III	2	500	200	2	1,000	400	12,000	4,800
JNG IV	2	500	200	4	1,000	400	12,000	4,800
JNG VI	8	400	190	9	3,200	1,500	38,400	18,000
JNG VII								
FACA	3	330	260	3	1,000	800	12,000	9,600
G. GARCIA	2	550	440	5	1,100	880	13,200	10,600
P. ALVEAR	2	1,000	800	3	2,000	1,600	24,000	19,200
V. Constitucion								
JNG	2	500	350	7	1,000	700	12,000	8,400
San Nicolas								
JNG III	1	900+1,200	1,500	6	2,100	1,500	25,200	18,000
Ramallo								
JNG II	1	300	240	2	300	240	3,600	2,900
San pedro								
JNG IV	2	700	500	7	1,400	600	16,800	7,200 (Under construction)
Concepcion del Uruguay								
JNG I	2	500	500	5	1,000	650	12,000	7,800
Buenos Aires								
JNG I	2/2	1,200/800	900	29	4,000	1,800	48,000	21,600
JNG IV								
ACA								
Mar del Plata								
JNG	2	400	300		800	600	9,600	7,200
Quequen								
JNG	4/2	400/600	240/360	15	2,800	1,700	33,600	20,000
ACA-FACA	2	600	500		1,200	1,000	14,400	12,000
Bahia Blanca								
JNG III	8	500	220		4,000	1,750	48,000	21,000
JNG IV	-	-	-	-	-	-	-	-
JNG V	2	700			1,400			

Source: Secretaria de Transporte

conveyors leading from silos to the berth. In Table IV-2-9, the belt conveyors are assumed to be operated 12 hours a day.

2-2-4 Topping-Off Operation

(1) Existing state of topping-off operation

All ships entering the ports in the upper reaches of the Parana, such as Rosario and San Lorenzo, are required to have a draft of less than 28 ft owing to the small depth of port area and channels and also because of the small depth of Mitre Channel of La Plata. Ships entering Buenos Aires and Quequen are also subjected to a draft limit of less than 32 ft. For this reason, large-size ships whose full-load draft is larger than these limit drafts sail for destination after reaching completion by transshipment in Buenos Aires, Bahia Blanca, Zone Alpha and Zone Beta. In other words, they are required to complete the topping-off operation to sail from Argentine ports at full load. The modality of grain export from Argentine ports can thus be divided into two types, the direct transportation after full loading at the port (which is possible only for small-size ships with a tonnage of less than about 30,000 tons that can be loaded to capacity within the limit draft) and the transportation after multi-port loading that requires the topping-off operation.

The topping-off operation at Bahia Blanca and Buenos Aires is conducted using port facilities, so that it does not differ from normal loading operation. However, the transshipping operation in Zone Alpha and Zone Beta calls for special transshipping equipment shown in Table IV-2-10. Specifically, grains carried by the transport and feeder ship shown in the table from the upper reaches of the Parana are unloaded using the cargo handling equipment of transshipping vessels, and then loaded (topped-off) onto the ocean-going grain carrier.

At Escobar in Parana de Las Palmas, transshipping operation similar to the topping-off operation mentioned above is conducted. In this operation, grains carried by a barge convoy from Barranqueras, etc. are transshipped to the ocean-going carrier using 2 transshipping platforms equipped with pneumatic unloaders and belt-conveyor type loaders which are owned and operated by Del Bene Co.

(2) Problems in topping-off operation

(a) Topping-off operation at Buenos Aires Port

As all ships entering Buenos Aires Port are subjected to a draft limit of less than 32 ft, the PANAMAX size ships which are the most economical for grain transportation service cannot be loaded to capacity. Accordingly, they have no choice but to be loaded fully by the so-called multi-port loading method that requires transshipping operation in Bahia Blanca, Zone Alpha and Zone Beta, or sail for destination without a full load of grains. This naturally adds to the cost of grain transportation. The topping-off operation is not required for ships that can be loaded fully within the limit draft,

Table IV-2-10 Transshipping Facilities for Topping-off

Name of vessel	Purpose	Length (m)	Breadth (m)	Draft (m)	DWT	Hold Cap. (m^3)	Cargo weight at 45 ft^3/LT	Crane	Belt Conveyor	Owner
Alianza	Transship & Transport	243.84	37.79	12.66	77,220	41,166	32,820	25tx4	2	Transnave
Astrapat-ricia	Transship & Transport	187.45	25.76	10.11	28,840	22,465	17,910	18tx3	1	Transnave
Alianza G1, G2, G3 & G4	Feeder (Semi-inte-grated barge)	177.21	32.00	7.32	40,000	48,000	38,270	-	-	Transnave
Astrava-lentina & Astra Federico	Feeder	178.00	22.80	9.80	25,750	34,940	27,860	-	-	Transnave
Zonda I	Transship & Transport	230.10	31.85	12.76	62,091	33,865	27,000	30tx3 ($17m^3$)	-	Ultraocean
Karinas	Transship	222.90	32.26	12.17	62,090	59,159	47,170	15tx3	-	Del Bene

Source: Secretaria de Transporte

but it certainly causes port congestion by increasing the number of entering ships.

(b) Bahia Blanca Port

The topping-off operation at Bahia Blanca is required for ships that have completed the initial loading in the upper reaches of the Parana, Buenos Aires and Quequen. The navigation distance to be covered by these ships is much longer than is required by full loading at any of the above ports or by transshipping operation in Buenos Aires, Zone Alpha and Zone Beta. However, PANAMAX size ships cannot be loaded to capacity without the topping-off operation in Zone Alpha, Zone Beta or Bahia Blanca. The resultant port congestion causes a higher demurrage and consequently raises the transportation cost.

(c) Zone Alpha and Zone Beta

The two zones are situated in La Plata's estuary which is almost exposed to the outer sea and subjected to strong winds especially in winter.

Transshipping vessels used in these zones, such as "Alianza," "Astrapatricia" and "Zonda I" shown in Table IV-2-10), have their own hold, but they are usually operated for cargo transshiping purposes. These facts give rise to the following problems.

The number of working days is restricted owing to severe meteorological and sea conditions. For example, the semi-integrated tug/barge, which is a feeder boat, is technically difficult to operate when the wave height is larger than 1.5 m. Furthermore, if a floating terminal is located at the entrance of Bahia Blanca, its discharging operation from feeder vessels might become impossible when the wave height exceeds 1.0 m, and it is estimated that the annual number of non-working days resulting from high wave height will reach about 120 days. (Chapter X, Evaluacion Economica del Protecto de Ampliacion del Proyecto de Bahia Blanca (Fase II)) It is generally said that no cargo handling work can be performed when the wind velocity exceeds about 15 m/sec.

Transshipping vessels for topping-off operation have no storage capacity like silos and are used only for transshipment from feeder boat to ocean-going carrier. Accordingly, their operation must be adjusted to that of feeder boat and ocean-going carrier in both working time and volume. Efforts are made for synchronizing their operation with that of feeder boat and ocean-going carrier by prior arrangements, but it can hardly be conceived that feeder boat and ocean-going grain carrier will arrive at the place of transshipping operation in time with transshipping vessel because their operation schedules are liable to fluctuations due to changes in external conditions. This means that one of these ships must wait for the arrival of the other in most cases, which leads to a decline in efficiency and a rise in cost.

Unloading work is performed by the grab bucket using a crane, but its efficiency is low. When a small quantity of grains is left in the hold, it is necessary for the bulldozer to collect them in the center to scoop them up with the grab bucket. It cannot therefore be expected that the grab bucket will display its nominal capacity.

The hold length of ocean-going carriers is usually longer than turning radius of the transshipping loader, and this makes the irksome shifting in lengthwise direction inevitable during the transshipping operation at sea.

The semi-interaged tug/barge used as feeder boat becomes an idle facility in the off-season because it cannot be used as an ocean-going ship, and this leads to a rise in tariff.

Transshipping vessels and feeder boats can be used as ocean-going ships, but they are owned and operated by private enterprises. For this reason, they are used for services more profitable than the topping-off operation of grains, such as transportation and lightering of ores and coal, and this cuts down the grain topping-off capacity.

Transportation cost is certain to rise by a single additional loading and unloading operation, regardless of where the topping-off operation is conducted.

2-2-5 Channels

(1) Existing state of channels

The river system of the Parana and La Plata has a total basin area of 3,100,000 km^2, of which 130,000 km^2 is covered by La Plata river, 1,510,000 km^2 by the Parana river, 1,095,000 km^2 by the Paraguay river, and 365,000 km^2 by the Uruguay river. Main rivers used as channels for grain transportation are the Parana, the Uruguay and La Plata. The Parana is divided into 3 sections, the Lower Parana, the Mid-Parana and the Upper Parana. Given below is a detailed description of each of these rivers which are used for grain transportation (see Figure IV-2-1 in 2-1).

(a) La Plata river

La Plata has a length of about 290 km. Its width is 40 km in the narrowest section and 220 km in the estuary.

In former days, La Plata extended to as far as the present Diamante where the Parana rose and formed a delta. It is believed that La Plata will be filled with sediment carried by the Parana in the distant future, and the Parana will empty directly into the Atlantic Ocean. The changes currently taking place in La Plata are very slow, but they are systematic and conform to laws of nature. They are caused by a long period of interaction between the incessant sediment transportation by the river and the tidal current accompanied by waves.

When the tidal current reaches La Plata's estuary, it spreads in the entire estuary area without losing its force, and goes upstream to a point more than 200 km from the estuary of the Parana and the Uruguay, changing its form as it flows into inner areas.

The volume of water discharged into the La Plata does not change in the long run. Seen from a short range point of view, however, its water level is not stabilized, subjected to ups and downs caused by tide waves. The tide-induced waves change the river stage as well as its flow velocity and direction. As the tidal current changes its direction every 5 - 7 hours and also accelerates or slows down the river flow, it produces a stagnation point in certain places, causing the voluminous sediment carried by the river to settle there.

The tidal current from southeast passes by Punta Piedras, flows through the Punta Indio Channel, and advances deep into La Plata. At this time, the current forms the edge of the Ortiz Bank, then spreads in the entire inner part of the La Plata, with its strength on the Buenos Aires side twice as large as that on the east bank side. This serves to maintain the southern and western boundaries of the Ortiz Bank virtually intact and to keep the channel to Buenos Aires navigable. The Chico Bank partitioned by a lateral flow is situated by the side of the Ortiz Bank, and the deepest channel leading to Buenos Aires is formed between these two banks.

Other small banks such as Magdalena, Gaviota and Cuirassier show conformity to the western boundary sign of the Punta Indio Channel. In the innermost part of La Plata is found the Honda shoal which is constantly losing in water depth owing to sediment transportation and deposition caused by the Parana at ebb tide.

La Plata's estuary which is open to the outer sea has an extensive, internationally known shoal. This shoal was created because the delta, now being formed by sediment transportation by the Parana, is advancing toward the estuary under water. The depth contour of 18 m links Punta del Este in Uruguay and San Antonio Cape in Argentina, and can be considered the boundary line between La Plata river and the Atlantic Ocean. From this contour extends a mildly inclining continental shelf toward the Atlantic Ocean.

The Arquimedes Bank and the Ingles Bank separates main channels into southern and northern sections, and tidal current and waves pass between the two banks to propagate to the inner part of the river.

La Plata has an average depth of 2 m in its inner part, and becomes deeper by slow degrees toward the boundary with the Atlantic Ocean where the depth reaches as large as about 18 m (60 ft). This difference in depth is small in comparison with the length of 300 km, and makes the inclination of the river relatively small.

Considering La Plata's width and discharge, the waves generated by the tidal current in the outer sea propagate slowly into La Plata, spending about 12 hours to reach its inner part. This causes frequent sedimentation in the river course, making it necessary to carry out incessant, money-consuming maintenance dredging to a number of access channel navigable.

The Punta Indio Channel is the first channel to be passed by ships entering La Plata from the Atlantic Ocean. To navigate further upstream to enter Buenos Aires Port, they pass the Intermedio Channel, Paso Banco Chico, Rada Exterior, and the Norte or Sur Channel. The following 4 routes are used to navigate into the innermost part of La Plata.

1) Martin Garcia Channel

This channel permits the navigation of large-size launches, coasters and ocean-going ships up to the estuary of the Parana Bravo. Situated at a distance of about 35 km downstream of the Parana Bravo's estuary, it serves as an entrace to each river in the Delta area and to the Uruguay.

2) Costanero Norte Channel

This is the shortest channel linking Buenos Aires with the river ports along the Parana, but permits the navigation of only small-size ships because of its small water depth. It is unnavigable in rough weather, and wires connecting a convoy are occasionally broken even when the weather is fine, so that the navigation on this channel is possible only when the water surface is extremely calm.

3) Ing. E. Mitre Channel

This is one of the most important channels and connects to the Parana de Las Palmas. The Parana de Las Palmas has a number of bends, of which the one with surface eddy near San Antonio is needful of improvement for the safety of navigation.

4) Channels passing through Parana Delta

The north-south channel passing through the Delta is used by small-size ships navigating to the Uruguay. When a barge convoy wants to reach the Uruguay, it navigates to Ibicuy through the Parana de las Palmas, then takes the route that leads to the Uruguay through the Parana Bravo.

(b) Parana river

The Parana is the most important for securing the navigation on La Plata. It has a length of 2,570 km, and its width is 4,200 m in front of Corrientes, 2,600 m at Bella Vista, 2,300 m at Santa Fe, and 2,000 m at Rosario.

At time of a flood, it has a bed width of 12 km at Corrientes, and as large as 56 km in the Rosario-Victoria section. Accordingly, the Rosario-Victoria section can cope with the flooding of the Parana to a considerable extent. The river's delta, situated at a distance of 320 km from the estuary, has a width of 18 km and covers an area of 14,000 km^2. It is estimated that this delta advances toward the coastline at a rate of 70 - 80 m a year, which is indicative of the huge volume of sediment transported by the Parana.

The river calls for ceaseless dredging work to maintain the channel navigability because its water depth decreases in the order of 1 - 1.5 m owing to sediment deposition after heavy floods.

The 170-km section between Rosario and Santa Fe has a smaller depth than the section downstream of Rosario. Although its depth suffices for the navigation of river boats, dredging work is required to maintain a depth large enough for safe navigation of ocean-going ships.

A huge amount of capital input is required to assure all ocean-going ships of free, year-round access to Santa Fe Port. For this reason, there is a plan to use Santa Fe Port for grain transportation only in a certain, limited period of the year on the basis of statistical data of the changes in the river flow, stage, etc.

The river has a small depth upstream of Santa Fe and Parana and permits the navigation of only river boats and barges.

(c) Uruguay river

The Uruguay river is the next most important river after the Parana in the entire river system of La Plata. On this river, ocean-going ships can navigate up to Concepcion de Uruguay, and river boats up to Colon and Concordia.

(2) Problems in Channels

(a) La Plata river

La Plata river provides important access channels to a number of ports now accounting for more than half of Argentina's total export grain shipments, such as the river ports along the Parana and the Uruguay, and Buenos Aires which is the country's largest commercial port. Owing to the heavy sediment transportation by the Parana, however, La Plata is certain to lose its depth by degrees if no dredging work is continued. Maintenance dredging of channels did not incur a very heavy financial burden in the past when most of incoming ships were small in size. But it will entail enormous cost to maintain the channel depth large enough to meet the on-going tendency toward specialization and mammothization of all kinds of ships.

It is likely that the maximum draft that can be maintained by continued dredging operation will be 9.8 m (32 feet) for ships entering Buenos Aires and 8.5 m (28 feet) for ships navigating on the Ing. E. Mitre Channel. This means that fully loaded large-size ships will not be allowed to enter Buenos Aires, not to speak of the Parana river.

(b) Parana river

The Parana river has a large depth in certain places, but fully loaded large-size ships are prevented from navigating on it by the draft limit of 8.5 m (28 feet) applied to ships passing the Ing. E. Mitre Channel. Accordingly, channel maintenance efforts should be made to apply the same limit draft of 8.5 m (28 feet) to ocean-going ships that have navigated up to Rosario and San Lorenzo.

It is to be noted that the Parana de Las Palmas has many bends that not only endanger the safety of navigation of many ships but also impose restrictions on their length and beam.

(3) Dredging

The government office in charge of construction of channels and port facilities is Direccion Nacional de Construcciones Portuarias y Vias Navegables (CPVN) which is under the control of the Ministry of Public Works and Services. Construction of port facilities has been undertaken by the CPVN since about 20 years ago. At present, however, the greater part of construction work is performed by private enterprises by tender or contract. As a result of this change, the CPVN is now suffering from an acute shortage of experts. The CPVN once owned and operated a large number of important machines for various construction works, but it now owns a small number of deteriorated, low-capacity machines.

The number of its staff members, which reached its peak of 24,414 persons in 1948, decreased gradually thereafter to a total of only 3,743 persons (1984). The few construction works undertaken by the CPVN are actually performed on a contract basis, which indicates that the CPVN has no personnel to be assigned to actual field works. However, this does not constitute a justifiable reason for reduction in the number of its engineers and technicians because the CPVN is responsible for planning, investigating and financing any construction work as a national project, even if it is actually undertaken by a private enterprise under a contract. Regarding the size of dredger crew, the CPVN has a crew of only 1,716 (as of 1984), which is too small to run the dredgers it owns.

The CPVN's annual expenditure is appropriated in the national budget. With its dredging capacity having now dwindled from the former level, the CPVN is not performing its duties. The actual demand for dredging service required for the safety of navigation is not met by the present volume of dredging work along the coast and in rivers.

The shortage of machinery and low wages of staff members brought about a decline in the number of personnel resulting from their retirement. And at present, it appears extremely difficult to restore the CPNV to its former state of operation because the special nature of its service.

The CPNV formulates an annual dredging plan each year to maintain the required channel depth. Although this plan is worked out with consideration given to the number of dredgers that can be used and the time required for repair service, it is not implemented satisfactorily mainly for the following reasons.

1) Shortage of the crew, which often makes it impossible for the dredger to perform its duties.

2) Mechanical defects and other failures of dredging equipment not foreseen at the stage of formulating the dredging plan.

2-2-6 Navigation Control

(1) Navigation control on the Parana and La Plata rivers

Ships heading for ports on Parana river or on La Plata river enter into a river system controlled by Prefectura Naval Argentina (PNA) when they pass Recalada Lightship (pilot station). They receive aboard one La Plata river pilot at Recalada Lightship, and then two Parana river pilots at Intersection Lightship to continue their navigation to the upriver destinations, or to wait in Zone Comun in case of vessel congestion in the upriver port (the presence of the pilots is obligatory). Ships navigating to upriver ports must be equipped with very high frequency VHF in order to follow the river control instructions of PNA. Usually empty inbound ships pass by Martin Garcia Bar, while outbound ships or loaded inbound ships pass by Mitre Channel. On the Parana river, pilots are required to order water depth measurement with echo sounder when the ship passes through shallows, to record the results and to report by VHF to the authorities concerned. The information is communicated the next morning to other pilots and shipping agents. In the ports on Parana river, the draft allowance of ships is determined according to the water depth of the Mitre Channel, except in upriver ports beyond San Lorenzo, where the allowance depends on water depth of Taucari and Paracito channels.

Night navigation is possible except on the Parana de Las Parmas, through Brazo Largo Bridge, and on waterways beyond Rosario, but pilots tend to navigate only daytime. Ships loaded at upriver ports passes trough Mitre Channel to return to La Plata river. The Parana river pilots quit the ship at Zone Comun, leaving the La Plata river pilot conduct the ship afterwards through Intermedio Channel and Punta Indio Channel down to Recalada Pilot Station.

(2) Situation of navigation control and its problems

The most important in the missions of PNA which controls shipping traffic is to assure safety navigation and to prevent accidents. Navigation along these rivers is under severe restrictions (restriction against night navigation etc.,) because of particular conditions of these rivers (water depth variation due to silting, meanders etc.) compared to rather easy approach to foreign grain exporting ports. Regulations are especially strict for navigation through both Martin Garcia and Mitre channels, departure point for upriver ports, because once a vessel runs agrounded and closes the channel, it blocks passage of all the vessels upriver. In Mitre Channel, where draft allowance is often effected after silting, draft allowance is currently 8.5 m (28 feet) for vessels less longer than 220 m, and 7.9 m (26 feet) for vessels between 222 m to 225 m. The regulations require to give priority to down ships and ocean-going carriers in this channel, to respect the maximum navigation speed of 12 knots, and to maintain more than 1 km of distance between the ship and the ship ahead. In Martin Garcia Channel, regulations limit the draft allowance to 7.3 m (24 feet) but provides no limitation as for the ship length.

During exporting seasons of grains, special priority is given to grain carriers to avoid shipping traffic congestion. The entrance order between ships into the port is decided by JNG/AGP and the navigation permission is given by PNA, which besides determine the entrance order of ships other than grain carriers cargoships. As PNA is not yet equipped with rader facilities to control shipping traffic all along the Parana and La Plata areas, its control is limited to the control by VHF of ships in the river system only. It can not trace immediately and visually exact position of all the vessls under its control, nor offer to each ship the newest information it collected and examined through the whole river system.

2-2-7 Flow of Information Exchanged between Concerned Authorities

(1) Exchange of information and its method

Most of information exchanged between the concerned authorities about grain exportation and loading follows internationally standardized procedure established for grain trades as follows:

1) Information about grain exportation

a) The exporter must register oneself to JNG

b) The exporter must submit an exportation affidavit.

c) The exporter applies for a bank guarantee.

d) A shipping permission is issued by the custom office and visaed by JNG.

e) After the shipping inspection, JNG issues "Argentina Quality Certificate".

2) Information about arrival and departure of vessels to and from the port

a) The vessel's agent send an arrival notice to JNG.

b) PNA begins its concentrated control with E1 form "Control of ship entered" watching over the movement of the vessel within the river system.

c) JNG indicates the loading point, the PNA controls the vessel's movement, and AGP controls cargo's movement.

d) PNA controls pilot service.

e) JNG performs cargo stow inspection.

f) After loading, "Recibo de a bordo" is issued.

g) The custom office performs cargo inspection.

h) JNG establishes a shipping certificate for departure.

i) JNG orders departure from the place of loading.

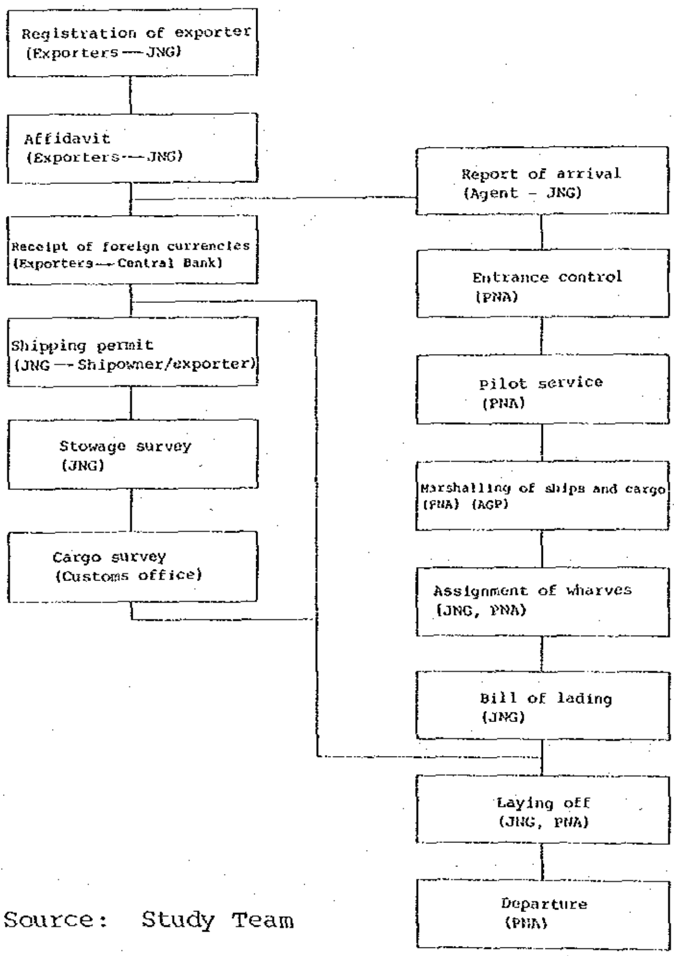
j) PNA controls departure of the ship and records in (SI) form.

Figure IV-2-5 indicates the flow of information exchanged in cereal exportation business.

(2) Information exchange method

The above mentioned information is exchanged generally by telephone or by documents, or by telex in some cases. Comite Coodinacion del Transporte de Granos (CCTG) studies at present use of computers to control grain exportation operations and, in order to standardize the data, the government has already decided to introduce into the trucking business "Carta de Porte", the document already in use in the railway business, which, established by the transporter of producing district, supplies necessary information for grain transport as category, weight, destination, shipper, addressee in the port, estimated day of arrival etc., of the freight.

Figure IV-2-5 Information Exchange System for Grain Export



Source: Study Team

2-3 Long-Range Grain Transportation Development Policy

2-3-1 Necessity for Formulating Long-Range Grain Transportation Development Policy

The study team's survey of infrastructure for grain transportation in Argentina disclosed that most of existing public sector facilities are not operated to capacity owing to the lack of suitable maintenance service, renewals and additional investments which have all been made impossible by the financial stringency of the Government.

The limited additional investments were made only for repairs and maintenance service essential for maintaining the grain transportation system at the existing level, not for the system's future development based on a long-range scheme.

However, the Government policy for increasing the grain export from 25 million tons to 40 million tons can never be materialized only by reinforcing the currently used facilities by removing the bottlenecks in the existing system. A long-range policy should therefore be formulated for the development of the country's grain transportation system toward the 21st century.

Individual short-term development projects will produce a notable investment effect if carried out under the said long-range policy framework by clarifying their position in the future grain transportation system.

What is most urgently required at the moment to augment Argentina's grain export to the 40 million-ton level is to establish a long-range development policy for the entire grain transportation system and formulate a master plan for improving the national grain transportation system to expedite the establishment of the long-range policy.

The CCTG's analysis indicates that 92% of all grain loading facilities in Argentina are used for initial loading to be followed by topping-off operation for full loading, and only 8% are used for topping-off operation or for loading down PANAMAX type carriers at a single port. Accordingly, the long-range development policy should be formulated primarily to straighten out this unbalanced situation by reinforcing the facilities capable of completing transshipping operation or loading carriers to capacity. These facilities should be developed on the Atlantic coast, not in the Parana-La Plata river system which is too small in water depth for transshipping operation or full loading of carriers. This means that the distribution of grain loading facilities should shift its center of gravity from the Parana-La Plata system to the Atlantic coast, which in turn calls for the development of land and river transportation systems to link them with the new loading facilities.

Port facilities, channels, railway and road transportation facilities are used not just for grain traffic but for transportation of other cargoes. For example, port facilities are used for international and domestic transportation of container cargoes, liquid bulk cargoes, dry bulk cargoes, etc. and also serve as bases of fishing operations. In formulating the long-range development policy, therefore, special care should be exercised to make it compatible and balanced with other facilities development projects aimed at smoother transportation of cargoes other than grains.

The following items to be considered in formulating the long-range development policy are discussed below.

1) Analysis of the transport method that can minimize total grain transportation cost, which is to be adopted in planning a desirable transportation system for the long-range development of national economy (Note that figures used in reviewing the analysis method include estimated ones to be subjected to a rigid examination in making a master plan study or feasibility study).

2) Plan for Quequen Port development to make it capable of loading down PANAMAX type grain carriers.

3) Plan for developing a floating elevator terminal near La Plata's estuary.

The idea for building a port island in the offing 7 - 8 km from the coast near Santa Teresita in the south of La Plata's estuary is also studied as a possibility for solving the problem of small water depth and high dredging cost encountered by all ports and channels in Argentina, although this plan cannot be realized at an early date because it requires by far the greater amount of initial capital input than plans 2) and 3) above.

The Bahia Blanca development project is one of the cores of Argentina's grain transportation system development scheme, but no specific reference is made to it here because it is considered an on-going project.

The two plans and one possibility mentioned above need positioned at the stage of master planning study for establishing the long-range grain transportation development policy. The two plans are proposed not as alternative plans. There might be the case that implementation of just one of them does not suffice for the overall grain transportation development, and it is certainly possible that the implementation of both at the same time or with a certain time lag will be found most adequate. In any event, it will be necessary to frame the grain transportation development policy from a long-range point of view with special efforts to make it compatible and balanced with the progress of the on-going Bahia Blanca development project as well as with other related short-term development projcts of river ports in the Parana-La Plata system, inland transportation system, and river transportation system, so that Argentina will be able to maintain its high competitiveness in the international grain market in the 21st century.

2-3-2 Forecast of Grain Production and Export

Forecasts for grain production in Argentina have been given by various government offices and research laboratories in the past, but few of them have provided detailed zone-wise forecasts that make it possible to estimate the grain traffic to ports, or predicted the production surplus after deducting the domestic consumption. However, this sort of forecast was made in the feasibility study[1] conducted recently by the MOPS for the Bahia Blanca Port development project.

In this study, the whole Argentina was divided into 40 zones and the Pampa region, the main grain producing area, was divided into 31 zones. In the report of this study, it is predicted that Argentina's grain production will increase to 50.1 million tons in 1990, 58.3 million tons in 1995 and 74.6 million tons in 2005, and its grain export will correspondingly increase to 29.0 million tons in 1990, 34.9 million tons in 1995 and 46.0 million tons in 2005. The Government has set up a target production of 60 million tons and a target export volume of 40 million tons, both to be attained by the end of the 1980s. According to the said report, however, the two targets are expected to be achieved at the end of this century.

The prediction that a period of more than 10 years will be required to achieve the said targets is warrantable because any phenomenal increase in grain production and export naturally presupposes a number of conditions, such as infrastructural development, establishment of incentive measures for farmers, and above all, development and securing stabilized international markets.

Table IV-2-11 shows the zone-wise forecast of grain production and exportable surplus in the Pampa region, and Figure IV-2-6 shows the grain production and exportable surplus by zone in the year 2000. The Pampas region accounts for about 80% of the country's total grain production, and about 58% of grains produced in this region are supplied to overseas markets.

In the feasibility study for the Bahia Blanca port development project, the exportable surplus of each zone is estimated to increase at a fixed rate (57% increment is added to it for the 1990 - 2005 period). To raise the accuracy of forecast, it would be necessary to consider characteristics of each zone, such as climate, the possibility of increasing the arable land area, competition from livestock products, and land productivity.

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1) Evaluacion Economica del Proyecto de Ampliacion del Puerto de Bahia Blanca (Fase II), December 1985.

Table IV-2-11 Forcast of Grain Production and Production Surplus

(1,000 tons)

Zone	Projection of Production by Zone						Production Surplus			
	Wheat			Others			1990	1995	2000	2005
	1990	1995	2005	1990	1995	2005				
1	0	0	0	0	0	0	0	0	0	0
2	508	601	760	1,557	1,875	2,604	875	1,046	1,213	1,380
3	357	422	542	901	1,048	1,337	525	627	728	828
4	479	567	730	2,367	2,729	3,413	1,225	1,464	1,698	1,932
5	0	0	0	0	0	0	0	0	0	0
6	75	90	123	2,060	2,406	3,062	1,459	1,743	2,021	2,299
7	91	107	137	1,647	1,862	2,288	934	1,116	1,294	1,472
8	0	0	0	0	0	0	0	0	0	0
9	218	258	346	2,582	2,900	3,424	1,995	2,336	2,709	3,082
10	1,183	1,401	1,713	4,984	5,898	7,913	2,889	3,451	4,003	4,554
11	530	629	810	1,986	2,288	2,658	1,079	1,290	1,496	1,702
12	706	836	1,057	961	1,097	1,344	934	1,116	1,294	1,472
13	629	746	938	1,785	2,059	2,575	1,779	2,127	2,466	2,805
14	165	196	244	877	986	1164	642	767	890	1,012
15	705	836	1,098	1,993	2,292	2,871	1,634	1,952	2,289	2,626
16	335	396	489	353	429	537	292	349	405	460
17	610	723	972	1,603	1,863	2,399	934	1,116	1,294	1,472
18	57	67	84	323	377	480	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21	360	427	528	254	297	377	0	0	0	0
22	167	223	384	551	652	872	171	302	430	558
23	1,253	1,483	1,872	588	709	984	1,371	1,638	1,900	2,162
24	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0
26	959	1,137	1,477	1,837	2,095	2,626	1,867	2,231	2,587	2,943
27	402	476	642	402	445	522	350	418	485	552
28	478	566	674	386	458	611	758	906	1051	1,196
29	573	678	869	293	348	460	642	767	890	1,012
30	525	622	789	174	199	253	354	662	768	874
31	0	0	0	0	0	0	0	0	0	0
Total	11,365	13,487	17,278	30,464	35,312	44,774	22,669	27,424	31,909	36,393

Source: Evaluacion Economica del Proyecto de Ampliacion del Puerto de Bahia Blanca (Fase II)

Figure IV-2-6 Production and Exportable Surplus of Grain by Zone in the Year 2000