

17.2 Present Situation and Outlook of Regional Integration

Investments and exports in the North Zone will be largely determined by the degree to which the macro-region is physically and institutionally integrated. At present, it is highly important to facilitate physical integration through the improvement of infrastructure and the transport system of export corridors. Institutional integration, e.g., standardized customs procedures, foreign investment laws, taxation systems, etc., is no less important than physical integration. Such development will widen and strengthen relations among economies of the macro-region and increase the possibility of handling export and import cargo and receiving foreign investment in the North Zone. Enterprises in the zone may also benefit from economies of scale while consumers will enjoy increases in the variety of goods and services available due to an expansion of their market.

Cooperation between the private and public sectors and among central and local governments in the macro-region is indispensable for physical and institutional integration. This is because neither the private sector, nor the Chilean or regional governments of the North Zone, can carry out all necessary tasks alone. When the public sector renders support to improve physical and institutional infrastructure, particularly through international and inter-regional cooperation, the private sector's interest in investing in the macro-region will be significantly increased. This will happen because such a situation will help investors minimize economic and political risks and maximize profits.

17.2.1 Regional Integration Schemes

Institutional arrangements that can facilitate trade and investment in the macro-region include a customs union, a common market, a free trade agreement, a free trade zone, etc., but these schemes for regional economic integration are not new in South America. For example, Gran Colombia, an economic customs union of Colombia, Ecuador, Panama and Venezuela, was created in the 1940s. The Latin American Free Trade Association (LAFTA), later replaced by the Latin American Association Integration (LAIA or ALADI) and the Andean Pact, later re-named the Andean Community of Nations (CAN), both started in the 1960s to encourage freer trade and joint economic planning among member countries (Table 17.2.1). These schemes have helped the expansion of trade, as indicated by the export of Bolivian soybean to Colombia.

More recently created is the Southern Cone Common Market (MERCOSUR), established under the Treaty of Asuncion, signed in March 1991 by Argentina, Brazil, Paraguay and Uruguay. Although there are some limitations in its activity and effectiveness due to its nonobligatory decision-making system, MERCOSUR is oriented towards trade liberalization compatible with WTO provisions and has a simple and flexible institutional framework (for more detailed discussions, see Chapter 2 in Volume 1). When one examines the history of South American regional integration, MERCOSUR may be considered a remarkable development in this region, which traditionally has weak intra-regional economic relationships. Chile joined MERCOSUR as an associate member in 1996 and is expected to become a full member in the near future, as is Bolivia. Therefore, all countries of the macro-region are virtually associated by MERCOSUR, while its framework, existing and prospective, is deemed to have a significant influence on institutional aspects of macro-region integration.

Table 17.2.1 Selected Regional Integration Schemes in the Macro-region of North Zone

Scheme	Establishment	Objectives	Developments	Members
Latin American Free Trade Association (LAFTA) ↓ Latin American Integration Association (LAIA, or ALADI)	1960	Free trade association with joint industrial planning. Common list of products to be liberalized by 1972.	Partial implementation in the 1960s. Common list not liberalized on schedule. LAFTA was replaced by Latin American Integration Association (LAIA) in 1981. 1990: Announcement of renewed tariff reductions and trade liberalization.	Mexico and all South American countries, except Guyana, French Guiana, and Suriname.
Andean Pact (AP) ↓ Andean Community of Nations (CAN)	1969	Customs union and joint industrial planning.	The pact has been frequently postponed. It is not yet perfect as a customs union. 1989: AP targets 1995 for the establishment of a free-trade area and 1997 for the establishment of a common market. 1996: The Trujillo Act re-names it the Andean Community of Nations (CAN) and lays down proposals to strengthen the creation of a secretary general and a parliament.	Bolivia, Ecuador, Colombia, Peru, Venezuela. (Chile withdrew in 1976.)
The Southern Cone Common Market (MERCOSUR)	1991	Creation of a single market in goods, capital, and people by January 1995. However, the treaty was amended by the Protocol of Ouro Preto in December 1994 with the member countries agreeing on an imperfect customs union by January 1995.	1995: MERCOSUR agrees to a five-year program, hoping to perfect the customs union.	Argentina, Brazil, Paraguay, and Uruguay. (Chile and Bolivia are associate members.)
Central Western South America Integration Zone (ZICOSUR)	1995	Economic integration for the zone to become the gateway between Asia and the Pacific and Latin America through the Ports of Antofagasta and Mejillones.	Governors of member local governments are supposed to meet at least once a year. Salta hosted the meeting in 1997.	Chile (Tarapaca, Antofagasta, Atacama); Argentina (Salta, Jujuy, Catamarca, Tucuman, La Rioja, Santiago del Estero, Formosa, Chaco); Bolivia (La Paz, Oruro, Cochabamba, Potosi, Tarija, Chuquisaca, Santa Cruz); Paraguay; and Brazil (Mato Grosso, Mato Grosso do Sul).

Source: Elaborated by the JICA Study Team based on Jeffrey Frankel, *Regional Trading Blocs in the World Economic System*, Washington D.C.: Institute for International Economics, 1997; and information obtained from the regional government of Antofagasta (Region II).

In addition to international integration schemes as mentioned above, there are regional integration and cooperation schemes at the local government level (e.g., regions, provinces, etc.). Figure 17.2.1 illustrates the hierarchy of economic integration schemes. Among local-level integration schemes, the most relevant to the North Zone's macro-region is the Central Western South America Integration Zone (ZICOSUR), formed in 1995 by some regions/provinces/departments of Chile, Bolivia,

Argentina, Brazil, and Paraguay. Some local governments such as Antofagasta of Chile and Salta of Argentina have been playing leading roles to further advance ZICOSUR. At present, the central governments of these countries have not recognized this as being their official regional integration scheme, while the levels of expectations vary according to region/ province/department.

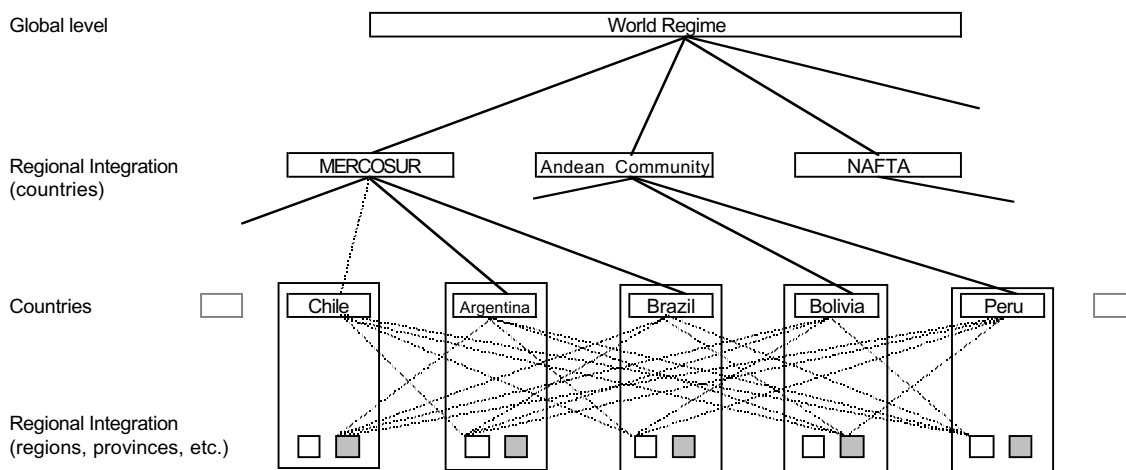


Figure 17.2.1 Hierarchy of Economic Integration Schemes

Source: Elaborated by the JICA Study Team.

There are two disadvantages in ZICOSUR as a scheme for regional integration. First, ZICOSUR is not recognized officially by any of the central governments. Second, the southern part of Peru is not included in this scheme. The second is particularly disadvantageous to the North Zone, or more precisely to Arica, which historically has close social and economic relations with the southern part of Peru. The less positive positions of some government, e.g., Region I (Tarapacá) and the Department of La Paz, can be explained by the absence of Peru's southern departments (provinces). Non-recognition by the central governments means that ZICOSUR cannot make a final decision about legal and institutional matters, though it depends on the situation of decentralization in respective countries (e.g., Brazilian states have a greater degree of autonomy). Non-recognition also makes it difficult to obtain government budget for physical integration (i.e., infrastructure development) in the framework of ZICOSUR as public works are still highly centralized in most of the countries.

Despite its potential to strengthen the regional integration schemes at the central government level, such as MERCOSUR and the Andean Pact, ZICOSUR does not seem to be so realistic and promising as emphasized by certain concerned people. The concept of the macro-region, though not a scheme, does not limit the area to be covered and is therefore more convenient and beneficial to every part of the macro-region in accelerating both physical and institutional integration. In fact, one of the areas prioritized by the Montevideo Plan of Action in December 2000 is the Brazil-Bolivia-Peru-Chile inter-oceanic hub, which exactly corresponds to the main export corridor designated by this study based on the macro-region concept. The macro-region can also be extended as far as to San Paulo, Buenos Aires, Santiago, and Lima, all major cities in South America, which implies infinite market opportunities in the long run, increasing the possibility to attract foreign investment.

17.2.2 International Cooperation for Infrastructure Development

(1) Treaties between Chile and Bolivia/Peru

There are two important, historical but still valid, international treaties that must be taken into consideration in the planning of infrastructure development in the North Zone. The first is the Treaty of Peace, Friendship and Trade signed in 1904 by Chile and Bolivia, according to which Bolivia can claim a right to free commercial transit through the Chilean territory to the Pacific Ocean by using Arica and Antofagasta as designated ports. This treaty also sets forth Bolivia's right to establish customs agencies at these ports to facilitate export/import procedures of Bolivian cargo.

Based on the Treaty of 1904, the two countries signed an additional treaty in 1929 on the free use of warehouses by Bolivians up to 60 days for export cargo and 365 days for import cargo at the Ports of Arica and Antofagasta. To intensify customs services at the ports, the Bolivian government established the Autonomous Administration of Bolivian Custom Warehouses (AADAA) in 1965, which was reorganized to the Bolivian Port Administration Services (ASPB) in 1996. ASPB is an official customhouse agency accredited by the Bolivian government to execute all customs procedures for transit cargo from/into Bolivia.

Chile also signed a peace agreement, the Ancon Treaty, with Peru in 1883. In order to realize the execution act of 1929, both governments have reached an agreement for the exclusive usage of Berth No.7 at the Port of Arica by Peruvian cargo in November 1999. These treaties are further discussed in Appendix 1A, "Why Is It So Difficult to Grant a Concession in the Port of Arica? – Analysis of Present Situation and Proposal for Development Strategy."

(2) MERCOSUR Meetings for Transport and Infrastructure Development

During the past decade, MERCOSUR countries, including associate member countries, have frequently discussed international transport issues and effectively contributed to the improvement of infrastructure as well as international transport formalities such as customs, the quarantine of plants and animals (phytozoosanitary control) and border security control. For a long time, these issues have been the main causes for dispute in terms of cargo transport in the macro-region. The incompatibility of various systems among countries in the macro-region has often resulted in informality and discrimination against foreign operators (additional laws, transit security checks, technical norms for vehicles, etc.).

The customs procedures have been considerably simplified by applying the standardized forms to MERCOSUR countries, including Chile and Bolivia, as a result of a series of meetings, particularly for transit cargo. At a Working Sub-Group (WSG) meeting concerning the transport systems of MERCOSUR during 2000, however, it was pointed out that there were still many problems in procedures for the international transport of both cargo and passengers and that their improvement should be given high priority. Procedures that must be improved include: the length of time (many days) required to obtain an international cargo transport permit, lack of coordination of travel documentation, inefficient document checking system, customs service office hours that differ from one country to another, etc.

It was also emphasized at the meeting that the development of an integrated transport system including multi-modal operations should be accelerated for further regional integration. Consequently, these issues on infrastructure development and formal procedures for international transport have been incorporated into the 2000-2005 WSG agenda and become a basis for the 5 year action program, encompassing global and regional integration visions.

(3) South American Regional Infrastructure Plan¹

The Inter-American Development Bank (IDB) has been actively supporting the South American Regional Infrastructure Plan. At a meeting in Brasilia in September 2000, the presidents of the 12 South American countries emphasized the importance of infrastructure in promoting economic integration and development. Infrastructure was one of five areas selected as high priority (together with democracy, trade, drug prevention, and information technology.) The presidents requested IDB, the Andean Development Corporation (CAF), and the Fund for the Development of the La Plata River Basin (FONPLATA) to coordinate their effort to promote socially and environmentally sustainable infrastructure projects. This effort will complement the Western Hemisphere Transport Initiative (WHTI).

In an effort of earlier implementation, IDB prepared a technical study of flows of trade, energy, and telecommunications among countries of South America and identified the main problems in infrastructure and in institutional frameworks. Based on this analysis, IDB, together with CAF and FONPLATA, prepared the Plan of Action for the Integration of Regional Infrastructure in South America. This plan was approved by the ministers of transport, energy, and telecommunications at a meeting in Montevideo in December 2000 (thus, also called the Montevideo Plan of Action). The plan sets forth an approach, both conceptually and organizationally, for the entire initiative.

First of all, the plan suggests an integral and multisectoral approach to the development of transport, energy, and telecommunications along the main corridors linking the countries of the continent, e.g., the Andean, MERCOSUR, and inter-oceanic corridors across Brazil, Bolivia, Peru and Chile. The plan has identified 12 such corridors as highest priority projects. Second, the plan also indicates several integration processes that transcend the corridors and involve all countries, such as regulatory frameworks in the energy sector and multi-modal transport. Third, the plan recognizes the serious budget constraints faced by most countries of South America and therefore will encourage the active participation of the private sector in project development and financing.

Three levels of coordination have been established for the implementation of the plan. The first is at the ministerial level, which will provide overall guidance and supervision

¹ This section is based on the Inter-American Development Bank (IDB), *Summit of the Americas: Strategic Programs, the Agenda of the IDB*, April 2001, Quebec, Canada, pp. 35-36; and Technical Coordinating Committee (TCC), Inter-American Development Bank (IDB), Andean Development Corporation (CAF), and Financial Fund for the Development of the River Plate Basin (FONPLATA), "Action Plan for Regional Infrastructure Integration in South America," Montevideo, Uruguay, 4-5 December 2000.

through an executive committee (CDE). The second level is a technical level committee (CCT), which is composed of representatives of IDB, CAF, and FONPLATA, functions as the Secretariat of the CDE, and will coordinate the preparation of technical studies for the investment projects. The third level is the Executive Working Groups (GTEs), which will conduct the studies for each corridor and integration process. GTEs consist of technical personnel from each participating country and are coordinated by a consultant to be financed by the three supporting organizations (IDB, CAF, and FONPLATA).

The first meeting of the ministerial level executive committee (CDE) was held in April 2001 in Santa Cruz, Bolivia. Such meetings are scheduled to take place every six months, followed by a meeting to provide the private sector with information on the status of the initiative. The tripartite secretariat formed by IDB, CAF, and FONPLATA is to be based at IDB-INTAL in Buenos Aires.

17.2.3 Distribution between the North Zone and Macro-region

To realize the full development of the macro-region, various problems concerning logistics in the existing distribution system should be solved. While investment in infrastructure is not sufficient, it is also necessary to improve the institutional aspects of transportation routes among Brazil, Bolivia, and Chile. Only with such improvement, the zone could obtain more cargo from Mato Grosso and Mato Grosso do Sul, Brazil, the eastern part of Bolivia, the northwestern part of Argentina, and the northern part of Paraguay.

Problem areas in logistics in the macro-region include import regulations, taxation, documentation, bonding system, communications, electric power, container delivery, truck transportation, railway transportation, etc. (Figure 17.2.2). Brazilian exporters and industrial associations have also pointed out these problems and crucial factors for them are reliability, creditability, safety and responsibility for cargo transportation.

Measures to solve these problems include:

- 1) Establish a consistent transportation system, for example, by encouraging logistics joint ventures with the participation of investors from neighboring countries.
- 2) Provide a “one-stop-service” (one-write system) like the European Documentation System.
- 3) Improve the information system, such as EDI, GPS, etc.

As CAN and MERCOSUR are scheduled to be integrated in 2002, it is necessary to make an agreement regarding these systems in each department committee of MERCOSUR among Chile, Bolivia, Brazil, Argentina, Paraguay, and Peru. A distribution control center may be established at the Port of Arica for services related to trade and distribution under such an agreement. Figure 17.2.3 delineates a logistics system to be established for better access to Arica from inland areas of the macro-region.

17.2.4 Outlook of Regional Integration

The macro-region is being rapidly integrated by both public and private efforts to promote physical and institutional integration. Yet, many people in the North Zone express concern about existing problems such as political instability and poverty in neighboring countries, particularly Bolivia and Peru. Chile's historical relationships with these countries are indeed characterized by war and conflict, which directly and indirectly affect the everyday life and business of the people in the zone. However, the tide of regional integration is on the flow. An encouraging sign is the recent initiative implemented among the countries in the macro-region, as manifested by the Montevideo Plan of Action for infrastructure development, which is not merely conceptual but real and solid. There are numerous other signs of this tide. The creation of MERCOSUR is itself an epochal development towards regional integration. The people working for the common market scheme are making every effort to overcome its weaknesses and to solve problems that may arise from integration in each member country.

The tide of regional integration is strongly in favor of the North Zone's economic development. This tide will bring about various kinds of new opportunities to the zone. The opportunities are closely linked with the zone's position and functions as a gateway between South America and Asia and the Pacific, i.e., *the gateway of the macro-region*. An increase in exports to and investments from the Asian market will be more likely to occur in the zone only when the macro-region is fully integrated. Therefore, it is crucial to start taking action immediately rather than later. Among them, probably the most important area is transport infrastructure since it requires a large amount of investment for a long period of time and thus a consensus between the government and the private sector. The next section analyzes the situation of infrastructure development in the zone and neighboring countries from the perspective of developing the zone into the main gateway in the macro-region to the Pacific Ocean.

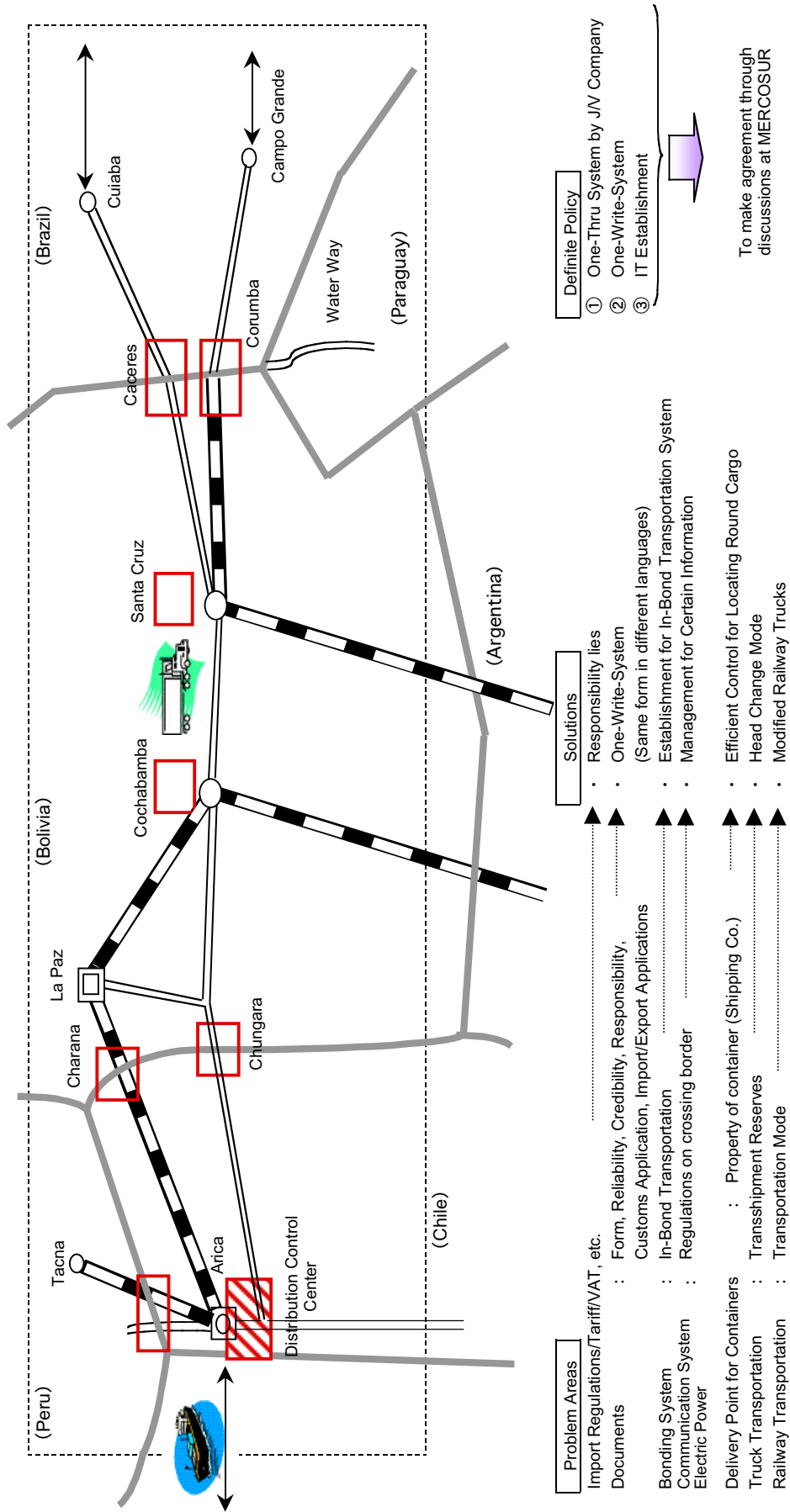


Figure 17.2.2 Arica's Logistics Problems and Possible Solutions

Source: Elaborated by the JICA Study Team.

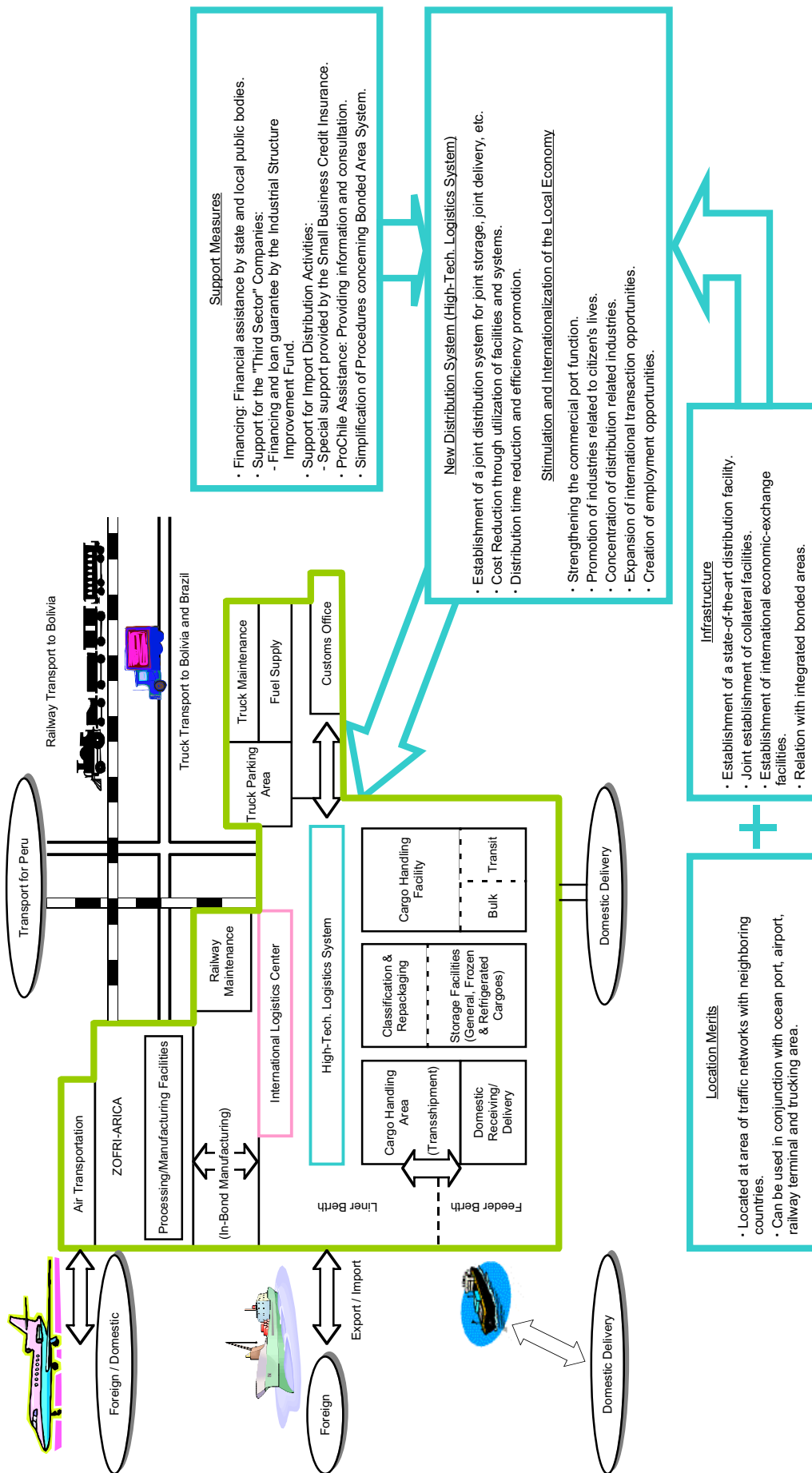


Figure 17.2.3 Arica's International Access and Logistics in the Macro-region

Source: Elaborated by the JICA Study Team.

17.3 Infrastructure Development

17.3.1 Transport System of the Macro-Region

(1) Main Issues on Physical Transport Conditions

a. North Zone of Chile

When considering the strategy to strengthen the gateway function in the North Region, the main issues, among others, are as follows:

1) Insufficient conditions of international roads crossing the Andes Mountains
Owing to the intensive investment over the past several years, the major roads in the North Zone have been developed to function as the basic network connecting major cities, ports and the main mining production areas. The trans-Andes routes, however, have not been sufficiently improved. This is mainly due to the existing topographic conditions. With the exception of Tambo Quemado, located between Arica and La Paz, all the other routes do not have the adequate conditions to act as an international transport corridor. Even the Colchane and Sico routes, which have been classified as high priority by the Government of Chile, there are many sections that have still not been paved.

2) Major ports

In the North Zone, there are three major ports, which are owned and administered by the corresponding public enterprises, Empresa Portuaria de Chile; Arica, Iquique and Antofagasta. According to Law 19542, issued in December 1997, all investments for developing facilities at the major ports should be done in principle by employing concession schemes aimed at saving public investment and increasing operation efficiency. Among them, the port operation by a private company has been started only at Iquique under a concession scheme since July 2000. The Port of Mejillones, where construction is scheduled to start in 2001 by the concessionaire as well, will take over the role of a major commercial port of Antofagasta.

However, the first bidding, which took place in April 2000, for the port of Arica failed: there were no bidding proposals in spite of the Port's intention of concession. The reasons for the failure of the first bidding are considered below:

- The initial investment was too high compared to expected revenue.
- The storage areas have been excluded from the concession. However, storage area for Bolivian cargo can be used free of charge for a certain period, as mentioned above, which is compensated by the central government at a later date.
- Since Berth No. 7 has been handed over to Peru, the unstable relationship between Chile and Peru could be a risk factor for the concessionaire.

The following physical problems have been identified at the Port of Arica:

- The infrastructure of the wharves and breakwaters is superannuated and not strong enough to install heavy equipment for cargo handling.
- There is neither sufficient space for container yards nor warehouses to accommodate bulk and general cargo.
- The water depth is insufficient for large sized vessels such as a Panamax.
- The deposit facilities for mineral products have not been adequately improved to prevent contamination problems.

Table 17.3.1 Present Conditions of Major Ports

	Arica	Iquique	Antofagasta
Port Operation	Mono-operation By the Port Company	Multi-operation By ENPORI and ITI	Mono-operation By the Port Company
Concession	Failure in the 1 st bidding	Started in July 2000	Not scheduled
Total tonnage 1) In 1999 (1000 ton)	1,352	1,172	2,937
Present Capacity (ton/year) 2)	2.0 million	1.5 million	5.0 million
Handling Efficiency (ton/hour-nave) 2)	150	192	145
Main Cargo	- Soybean, wheat, and corn - Mineral products	- Manufacturing goods - Copper, chemicals	- Copper, Zinc - Chemical products
Max. Draft (m) 1)	9.75	9.20	11.28
Road Access 3)	- Four-lane road - Transport demand in 1999 : 1 million ton - The railway crossing should be improved.	- Two-lane road - Transport demand in 1999 : 1.2 million ton - Congested with heavy vehicles accessing ZOFRI.	- Two-lane roads - Transport demand in 1999 : 1.4 million ton - Congested with mixed vehicles and urban traffic.
Rail Access 4)	- FCALP(Arica – La Paz Railway) - Transport demand in 1999: 280,000 tons - Transport capacity: 500,000 ton	- FERRONOR - Railway exists but not used as a port access.	- FCAB - Transport demand in 1999: 1.5 million tons - Transport Capacity: 6.0 million
Main Issues	- Low port operation efficiency - Superannuated infrastructure	- Shortage of container yard and parking space for trucks. - Congested port access road	- Reinforcement of the wharf damaged by the earthquake. - Congested port access road

Source: 1) The Port Companies of Arica, Iquique and Antofagasta.
 2) The Ministry of Public Works (MOP) and the Port Companies of Arica and Iquique (The figures correspond to 1998 and have possibly increased by today).
 3) Serviu and the JICA Study Team.
 4) FCALP, FCAB, etc.

- According to information provided by the Port Company of Arica and the Ministry of Public Works (MOP), the operation efficiency at the port of Arica is relatively low compared to Iquique, where efficiency has increased through concession (Table 17.3.1). This is partly due to the variety of cargoes that must be handled at the same berth, since operation rights of Berth No. 7 were handed over to Peru in November 1999. Considering low efficiency and higher tariffs, some of the Bolivian cargoes seem to have moved from Arica port to Matarani port in Peru, where higher efficiency has been attained through the recent concession scheme.

Another issue related to port development is the lack of coordination among ports. Since the development plan and the implementation schedule are individually prepared by each port, investment plans tend to be excessive for making the port more competitive. An organization should be established to coordinate and adjust the development plans among the ports.

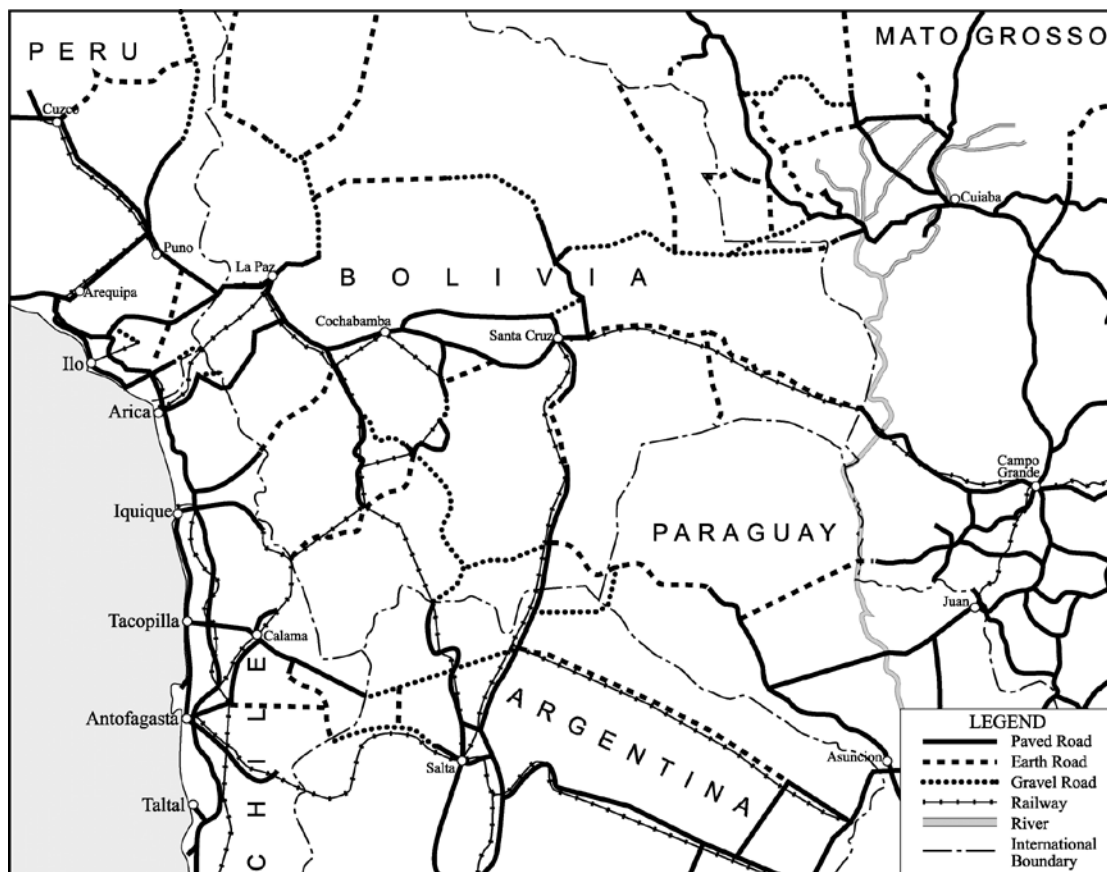


Figure 17.3.1 Transport Network in the Macro-region of the North Zone of Chile

Source: FIEMT (Federacao das Industrias no Estado de Mato Grosso) et al, Projecto Logistica de Transportes no Centro Oeste Sul-America, Cuiaba, July 2000.

3) Port Access

In Chile, urban areas have been developed around the ports and therefore, the ports are faced with significant congestion problems on access roads. Since port access roads cut through the built-up areas, they are not only used by trucks travelling to/from the port but also by urban traffic. In the case of Iquique, for example, the access roads are occupied by parked trucks accessing ZOFRI and by trucks waiting for overseas cargoes. Furthermore, in Antofagasta, the access roads are located in urban areas, resulting in traffic congestion caused by heavy port vehicles as well as environmental problems.

Although there are railway port accesses, these seem to be underutilized, with the exception of FCAB, which links Antofagasta to copper mines. In the case of Iquique, the reason may be the fact that the major transport demands correspond to imported merchandises, which are not suitable for railway. For Arica, it is mainly attributed to the severe competition with Bolivian truck operators, described in subsequent sections.

b. Bolivia

1) Poor Road Conditions

In general, most of the roads in Bolivia are unpaved and not well maintained. Therefore, these are not sufficient to function as international transport corridors.

There are four international routes in Bolivia:

- Arica/Antofagasta/Ilo – La Paz – Santa Cruz – Corumba – Santos (Bi-Oceanic)
- Lima – La Paz – Oruro – Potosi – Bermejo – Buenos Aires (Panam Highway)
- Trinidad – Santa Cruz – Yacuiba – Salta – Cordoba (Mercosur Highway)
- La Paz – Yucunmo – Guayamerin – Manaus (North – South Highway)

The first route directly connects the North Zone of Chile with Bolivia and with the Mato Grosso Region in Brazil. The section between Arica and La Paz is paved with asphalt and is well maintained. The section between La Paz and Pailon, about 40 km East of Santa Cruz, has also been mostly paved, though there are some problems due to flooding or landslides during the rainy season. The worst section is between Pailon and Puerto Suarez near Corumba, where the road has not been treated, even with gravel and, therefore, is not passable at all during the rainy season because of the wetland conditions. There is an alternative route for Mato Grosso from Santa Cruz, the parallel road via San Ramon, San Ignacio de Velasco and San Matias running along the Brazilian Border. According to Bolivia's Ministry of Public Works, this route is also unpaved but soil conditions are much better than the other.

The section in Brazil is already paved. However, traffic is sometimes forced to take a long detour to Santos during the rainy season as it is located upstream of the Parana River.

Regarding Bolivia's other international routes, mentioned above, these roads are generally in poor condition. The sections closer to the international borders are particularly worse. The only exception is the road leading to Peru. The route leading to Matarani Port in Peru has been significantly improved over the last several years due to its importance in securing an export corridor for Bolivian products. All the trunk roads in Bolivia are administered and maintained by the National Highway Public Corporation. However, the toll income is insufficient even for operation/maintenance and, therefore, finance for new construction depends mainly on foreign aid.

2) Missing Railway Link

In Bolivia, the railway is separated into two networks, the West and the East. Private companies operate both networks under a concession scheme: Ferrocarril Andina operates the west and Ferrocarril Oriental the east. The western network is connected to Arica as well as to Antofagasta and the eastern network is linked to Corumba and Santos with the Brazilian Railway. As shown in Figure 17.3.1, there is a missing link of about 388 km in length between Aiquire and Santa Cruz. The construction plan of this missing link has been discussed many times over the past decade when the development of the bioceanic corridor is contemplated. However, since the section is located on a steep mountainous area, the construction costs seems to be too high. In addition, the operation of several sections near the Oruro/Potosi area (the section between Oruro and Aiquire, the section between Potosi and Sucre) had been stopped due to flooding problems and was finally returned to the state from the concessionaire. Accordingly, in order to initiate the rail operations connecting the two separated railway networks, it is necessary to construct the missing link as well as to rehabilitate or improve the Oruro – Aiquire section.

c. Northwest Region of Argentina (NOA)

1) Trans-Andes Roads

In general, the major inter-regional roads in the Northwest region of Argentina are mostly paved with asphalt-concrete and well maintained. Linkages between major cities such as Jujuy, Salta, Tucuman, Resistencia, Cordoba, etc. are particularly in good condition. However, the roads in the mountainous areas are generally unpaved. Regarding the international roads to Chile, there are four major passes: Jama, Sico, San Francisco, and Pircas Negras. Among them, the Jama pass should be given the highest priority, but the section between Purmamarca and the Chilean border, stretching about 240 km, is still unpaved. At present, the conditions of the other three passes are much more inferior than Jama in terms of width, alignment and road surface. Therefore, they are regarded as a long term project.

2) International Railways

There are three international rail routes in the NOA region, described below:

- Salta – Socompa – Antofagasta
- Salta – Yacuiba – Santa Cruz
- Salta – Jujuy – Villazon – Uyuni – Potosi

The operation of the last one between Jujuy and Villazon has been terminated for seven years due to serious damage to the railway track caused by a flood. The first route between Argentina and Antofagasta also has several infrastructure problems; since it crosses the Andes, the operation requires switch back systems due to the zigzag alignment, which makes the operation speed very slow and sometimes derailment is caused. Transport demand is not so high totalling 55,000 tons in 1999. Transport capacity is limited to 300 tons / train and to only one trip per day due to the steep gradient. Accordingly, it will be important to improve the alignment and to increase transport capacity by introducing higher power locomotives.

(2) Transport Demand and Operation

a. Export and Import

Total exports and imports at the major ports in the North Zone are summarized in Table 17.3.2, which indicates the following characteristics.

Table 17.3.2 Export and Import at Major Ports in 1999

(1000 tons/year)

Port	Export		Import		Total
	1000 tons	Main Commodities	1000 tons	Main Commodities	1000 tons
Arica	812	Fishmeal, Soya	544	Wheat, Industrial products	1,356
Iquique	376	Copper, Fishmeal	610	Manufacturing products	986
Antofagasta	2,196	Copper, Mineral products	507	Fuel, Chemical, Fertilizer	2,703
Mejillones	21	Miscellaneous	1,344	Coal, Chemical	1,365
Total	3,405		3,005		6,410

Note: Tonnage includes the transit cargo.

Source: Camara Maritimo de Portuaria 1999.

- Although exports and imports are almost balanced considering port totals, they are not well balanced by port. In the case of Arica and Antofagasta, exports are

predominant, however, at the port of Iquique, imports are more prominent. This trade imbalance is not preferable from the viewpoint of the transport economy because there is a one-way demand for ocean shipping as well as for inland transport.

- The major commodities handled at the ports are mineral products for export and chemical products for the mining industry or manufacturing products for import, with the exception of Arica, where transit cargo to and from Bolivia is predominant. This suggests that the export industry has not been well developed other than the mining industry in the North Zone.

b. Transit Cargo

The transit cargo through the ports in the North Zone is mostly related to either Bolivia, Peru or Argentina as shown in Table 17.3.3. The following points are noted.

- The Port of Arica depends on the transit cargo to and from Bolivia, which represents about two thirds of the total cargo. Bolivia has several exporting ports: Matarani and Ilo in Peru, Santos in Brazil, Rosario and Buenos Aires in Argentina, in addition to Arica and Antofagasta. In this sense, Arica should be highly competitive compared to these ports for Bolivian cargo.
- Although one berth at Arica Port is used exclusively by Peru, the total volume is only 20,000 tons per year.
- The transit cargo related to Argentina is also relatively small: less than 0.5 % of the total cargo at Antofagasta. Transit cargo related to other countries, such as Brazil, Paraguay, etc., is also negligible. This implies that the gateway function of Chilean ports remains at a limited level.

Table 17.3.3 Transit Cargo in the North Zone by Country in 1999

(1000 tons/year)

		Arica		Iquique		Antofagasta	
Transit Countries			Main Commodity		Main Commodity		Main Commodity
Bolivia	Export	488	mineral, soybean, timber	35	mineral prod.	231	mineral products
	Import	340	wheat, industrial, chem.	5	manufacturing	34	cereal/flour meal
	Total	828		40		265	
Peru	Export	9	fishmeal, miscellaneous				
	Import	11	vehicles, manufacturing				
	Total	20					
Argentina	Export					10	mineral products
	Import			1	manufacturing	2	chemical prod.
	Total			1		12	
Total	Export	497	mineral, soybean, timber	35	mineral prod.	241	mineral products
	Import	351	wheat, industrial, chem.	6	manufacturing	36	cereal/flour meal
	Total	848		41		277	

Source: Camara Maritimo de Portuaria 1999; and Port Companies of Arica, Iquique, and Antofagasta.

With regard to the potential demand, the following factors are important:

- 1) Bolivian Cargo
 - Soybean production in Bolivia has experienced a high growth rate in recent years,

reflecting the expansion of the cultivated area. Further expansion is expected, at least over the next several years.

- There is a large mining exploration project at San Cristobal, near Uyuni, with investments made by a U.S. company. Large volumes of zinc, lead and silver are mainly transported to Antofagasta.
- Industrial products, particularly those related to the agro-industry and forestry, also seem to be promising exportable goods.

2) Argentine Cargo

- At present, mineral products such as lead, lithium, borax, etc, are transported to Chilean ports mainly by railway. The exports of mineral products are likely to increase in the future, based on the new agreement between Chile and Argentina in mid 1999. This agreement intends to facilitate the exploration of potential mines in Argentina, mainly located near the border, which may cause a sensitive border problem. As a matter of fact, there are several on-going projects including investments made by CODELCO in the Salta-Jujuy region for mineral product exploration including silver, tin, copper, etc.
- Other potential export products are fresh fruit and agro-industrial products. Chile is so sensitive to sanitary problems concerning fruit and vegetables that exports from Argentina have been refused, even for transit cargo. According to the provincial government of Jujuy, products from the NOA region are free from any sanitary problems. Once approved, fruits, particularly citrus, can be exported to the West Coast of South America.

3) Mato Grosso

Mato Grosso has a large amount of agricultural products, such as soybean, sugar, corn, cattle meat, etc. They are mostly transported either to Rosario via the Parana River or to Santos by truck and railway. There is a possibility that products from Mato Grosso, especially those with higher value added, may use the Chilean ports to reach North America or Asia if transport costs are reduced. This can be achieved by improving infrastructure and the transport system between Mato Grosso and the Chilean ports.

c. Overall Future Transport Demand in the North Zone

According to a study, *Plan Director de Infraestructura 2000*, prepared by the Ministry of Public Works, Transport and Telecommunications (MOPTT), the future road transport demand in the North Zone is forecasted as shown in Table 17.3.4 (See Chapter 12 in Volume 1). The passenger-km by automobile and bus will grow about 1.7 times and 2.5 times the present demand, respectively, this decade. On the other hand, cargo transport in terms of ton-km is forecasted to almost double the present demand.

As shown in Table 17.3.5, the transport demand for the ports in the North Zone will grow from 21 million tons in 1999 to 40 million tons in 2012. The share of the three main ports, Arica, Iquique and Antofagasta, in terms of total port cargo, in the North Zone is only about one quarter, as of the end of 1999. The rest of the cargo in the zone was handled at other many small ports such as Patillos, Patache, Huasco, Caleta Coloso and Caldera. These small ports mostly specialize in cargoes, such as iron, salt and coal.

Table 17.3.4 Road Transport Demand in North Zone Forecasted by MOPT

Region	Automobile (passenger-km)			Bus (passenger-km)			Truck (ton-km)		
	2000	2005	2010	2000	2005	2010	2000	2005	2010
I	4,560	5,849	8,901	3,626	5,999	10,011	21,472	27,903	41,922
II	5,266	6,258	9,397	4,959	8,298	12,479	49,908	71,827	95,714
III	3,078	3,211	4,516	3,394	5,256	7,439	33,806	48,456	71,445
Total	12,904	15,318	22,814	11,979	19,553	29,929	105,186	148,186	209,081

Source: The Ministry of Public Works, Transport and Telecommunications (MOPTT), *Plan Director de Infraestructura 2000*.

Table 17.3.5 Port Cargo Demand in North Zone

	(1000 tons/year)					
	Export Cargo		Import Cargo		Total	
	1999	2012	1999	2012	1999	2012
Chilean cargo through ports	13,632	25,317	5,701	11,218	19,333	36,535
Transit Cargo through Chilean ports	890	2,453	520	917	1,410	3,370
Total	14,522	27,770	6,221	12,135	20,743	39,905

Source: JICA Study Team.

Accordingly, these ports will not be able to handle general cargo, particularly container cargo. Hence, the three main ports will play a more important role in the future and will have to be expanded in terms of handling capacity to accommodate future port cargo demand. In the case of the ports of Antofagasta, Mejillones, these will be able to absorb the demand increase. However, as for the Ports of Arica and Iquique, the capacity should be increased by two to three times the present level by the year 2012. This can be achieved by improving handling efficiency and/or developing port facilities and equipment.

d. Selected Issues on Transport Operation

1) Port operation system

Law 19542, concerning the Modernization of State Port, issued in December 1997, sets forth that the state of port facilities should be improved by using a concession scheme and that the port should have at least one berth that is operated by a different concessionaire. The multi-operator system aims at creating competition among the operators even within one port, in terms of efficiency as well as of port charges. The objectives of the law appear to have been successfully achieved in the ports where concessions have been granted. However, two important issues should be pointed out below concerning the law.

Special case like Arica Port

There is a special condition at the Port of Arica. As the eastern wharf was handed over to the Peruvian government in 1999, there are only three functional berths for commercial use and they are concentrated at the western wharf. According to the numbering system by the port, there are four berths, but the length of each berth is too short for recent vessel sizes. Since the backyard of each berth is not sufficiently wide, unloaded cargo should be transported to the storage area by passing through other berths. If berth operations are made simultaneously, this may cause a disordered situation,

resulting in an unexpectedly low efficient operation. Accordingly, a mono-operator system seems to be more appropriate for Arica Port.

In the case of Arica Port however, there is another constraint: Based on the Treaty of Peace signed by Chile and Bolivia in 1904, Bolivia's right to free selection of port operators should be secured. To apply a mono-operator system to Arica Port, negotiations with the Bolivian government may be required.

Higher operation efficiency

As long as the handling volume at a port is not so large, the multi-operator system may not be so inefficient. As the handling cargo increases, however, the port operation becomes less efficient since it requires double investment to compete for various types of cargo. For example, each operator has to have various kinds of facilities and equipment to accommodate containers, bulk and general cargo, etc. As a result, even the competitive operator may have an excessive capacity. There are daily or monthly variations in the occupancy rate of facilities as well as of labor force. There is a possibility that these variations may be absorbed if a mono-operation system is applied rather than a multi-operator system. In order to make the Chilean port a gateway for the macro-region, the port operation system should be reviewed to make it more competitive compared to other ports.

2) Inter-modal transport

The current transport system involves a connection by different transport modes. For example, some of the export cargoes from Santa Cruz to Arica are first transported to Oruro by truck and then transferred to the railway system and taken to Arica. At Arica Port, they are again unloaded and loaded to ocean vessels. Another example concerns mineral products from the Province of Salta, Argentina. These are first transported from the mines to the nearest railway station by truck. The products are then transported by rail to a refinery plant and subsequently transported to Antofagasta by rail. At the border, the locomotives have to be changed because different railway companies operate between the two countries.

There are many linkage points along the transport chain due to the different operators and different transport modes. Because of the lack of coordination among them, cargoes generally remain stationary for a long period of time, waiting for connecting services. One reason for this is that most truck companies are small and individually operated, on average, with only one or two trucks. This lack of coordination causes not only delays but also increases transport cost, in terms of storage, etc. In the case of Matarani Port in Peru, it is reported that port cargoes have increased, due partly to improved coordinations with the connecting railway company, compared to the period before privatization.

3) Containerization

In general, the handling of container cargo at Chilean ports is rapidly increasing. Table 17.3.6 shows the past trend of containers handled at the Ports of Arica and Iquique. In general, container cargo is increasing, accounting for more than half of the total tonnage for both the ports. With regard to the containerization, the following issues are noted.

Lack of container handling equipment

The container handling equipment at the ports, mainly forklift-truck systems, is generally old. With no cranes at the wharves, vessels cranes are used for loading and unloading the containers. Accordingly, the efficiency of container handling at these ports is quite low: 10 to 15 TEU/hour, while it is about 50 TEU/hour in San Antonio.

Table 17.3.6 Container Cargo

	1991	1992	1993	1994	1995	1996	1997	1998	1999
Arica									
Container (Export)	139,695	145,387	163,090	187,454	249,722	301,160	338,963	304,344	299,023
Container (Import)	152,105	202,657	188,482	202,612	284,355	321,325	407,693	451,745	407,537
Total container (tons)	291,800	348,044	351,572	390,066	534,077	622,483	746,656	756,089	706,560
Total tonnage	861,035	966,054	838,920	1,024,708	1,008,679	1,087,178	1,244,527	1,305,960	1,352,308
% of container cargo	34%	36%	42%	38%	53%	57%	60%	58%	52%
Iquique									
Container (Export)	79,223	90,475	113,414	151,714	192,385	217,274	263,435	139,826	198,015
Container (Import)	235,471	254,524	288,103	363,456	432,462	393,541	463,212	351,949.5	493,866.7
Total container (tons)	314,694	344,999	401,517	515,170	624,847	610,815	726,647	708,555	691,882
Total tonnage	638,031	798,405	785,073	1,035,825	1,259,801	1,064,370	1,227,084	1,251,486	1,172,234
% of container cargo	49%	43%	51%	50%	50%	57%	59%	57%	59%

Source: Port Companies of Iquique and Arica and Camara Maritima y Portuaria de Chile.

Imbalance of export and import

Import cargo is mainly transported by container and much less is containerized export. This causes inefficiency in the transport system, since vessels have to return with many vacant containers. This imbalance also has negative impacts on inland transport. The imported containers are also returned without cargo to the container deposit areas near the port. On the other hand, the exporting cargoes are mainly transported by box type vehicles, which cannot be used for container transport.

Slow progress of containerization in Bolivia

Transit cargo to/from Bolivia is largely transported in Bolivian trucks. Due to slow progress in containerization, containers handling equipment is insufficient in Bolivia.

4) Truck operation in Bolivia

International truck transport to Bolivia is mostly operated by Bolivian companies. This is due to a notoriously strong syndicate. Chilean trucks can also operate within Bolivian territory, but it may not be profitable as a business due to the lack of return cargo and the longer waiting time at Bolivian customs offices. This causes a hindrance for free competition in the market and, therefore, transport charges are maintained at a relatively high level. In addition to poor road conditions, the closed market system in Bolivia may be a discouraging factor for the transit cargo, especially from Mato Grosso, Brazil.

5) Customs procedures

In general, transport operators complain about slack or bureaucratic customs procedures. Although procedures have been improved, particularly at international borders, through a number of multi-lateral discussions and agreements regarding international transport in the last decade, there still remain several points to be improved.

Chile/Argentina

- There is a discrepancy in working hours for customs services between Chile and Argentina. More specifically, official working hours in Argentina are short, resulting in additional waiting time or additional overtime work payments for the service.
- The efficiency and quality of the customs service reportedly depend on the officer in charge. Sometimes an unreasonable fine is charged on the cargo document.
- Unreliability is also pointed out about SAG's phytosanitary inspection. An example is that one truck was rejected for some problem, while other trucks carrying the same kind of cargo were allowed to pass.
- The documents for transit cargo are sent by facsimile from the border to the port or, sometimes, delivered by the driver. There is a project for improving the communication system by using e-mail.

Chile/Bolivia

According to Chilean truck operators, there is discrimination against Chilean trucks regarding customs procedures at the border. This results in slower services, unreasonable claims on documents, etc. Transit cargo documents are delivered by the drivers themselves to the exporting port. If the customs office at the port is informed beforehand, the procedure may be speeded up.

Arica Port

- The main cargo handled at Arica Port is transit cargo to/from Bolivia. In the case of Bolivian cargo, additional documents from the Bolivian Port Administration Services (ASPB) are required as well as normal transit documents. This procedure requires additional time.
- The customs inspection system is controlled by the customs office of Valparaiso. Therefore, all documents for export/import cargo must be sent to Valparaiso, where the necessity of detailed inspection is decided. Since most of the documents are processed manually, transporters often have to wait for a long time to clear the customs requirements.

17.3.2 Development of Major Ports

(1) Arica and Iquique

The development plans for the ports of Arica and Iquique are summarized in Table 17.3.7. The main function expected for Arica is to be the main exit point for Bolivian cargo. Concerning Iquique, the main function is to be a container specialized port for manufacturing products, particularly related to ZOFRI. Although the two ports are in competition, it is important to establish a complementary relationship (port alliance) between them in the medium/long term. The following port alliance can be envisaged:

- Exchange of information for navigation safety such as meteorological, wave, port operation system, navigation and cargo handling records for common data stock
- A common training system of skilled operators of handling equipment and warehouse administrators
- Effective use of existing facilities as a supplementary or an alternative port to avoid excessive concentration
- More effective use of the coastal shipping system
- Emergency port use

Through the port alliance, their overall competitiveness relative to other ports including those in Peru and those on the Atlantic coast is expected to increase.

As stated in the previous section, the operation of Iquique Port is carried out by the concessionaire, ITI, started in July 2000. As a result of the concession, the handling efficiency of Iquique has increased by as much as 27% (from 151 to 192 ton/hr) for the concession terminal, and by about 10% (from 135 to 148 ton/hr) for the state company. The handling capacity of Iquique has to be further expanded to more than double the current capacity in the coming decade.

On the other hand, the first bidding for the Port of Arica failed. According to the Port Company of Arica, the conditions for the next bidding scheme are now under study by SAE, a subordinate organization of CORFO. Although the actual project may differ depending on the results of the analysis, the development plan of Arica Port consists of investments by both public and private sectors following components.

a. Infrastructure development invested by the public sector

In order to reduce the initial investment by the concessionaire, an investment of US\$15 million by the public sector is under study for:

- Reinforcement of the wharf and breakwater for higher resistibility to earthquakes
- Relocation of warehouse and expansion of container yard, etc.

b. Infrastructure development by concession

The area to be intended for the concession comprises Berths No. 1 - No. 5 including the back-up areas. The concessionaire will be obliged to invest in the following projects:

- Deepening of the draft to accommodate large vessels like Panamax by extending the wharf area toward the ocean either at Berth No. 3 or Berth No. 4.
- In conjunction with the above construction, the cargo handling area as well as the container yard will be expanded.
- Improvement of the operating efficiency by introducing new handling equipment

such as mobile cranes, straddles carriers, etc.

Table 17.3.7 Port Development for Arica and Iquique

Description	Arica	Iquique
Development Plan By Public Sector	<ul style="list-style-type: none"> - The following is now under study: - Reinforcement of the wharf and breakwater for higher resistibility to earthquakes - Relocation of warehouse and expansion of container yard, etc. - Total investment of US\$15 million is expected from the Central Government. 	<ul style="list-style-type: none"> - Re-pavement of wharf and renovation of lightening system by the Port Company of Iquique - Study on port access roads by the Ministry of Housing. - Total investment of US\$15 million will be made by EMPORI
Development Plan By Concessionaire	Not yet determined.	<ul style="list-style-type: none"> - Widening of the Espigon wharf by as long as 25 m for Berth No.4, 200 m in length. Regarding widening, water depth of 12.5 m will be secured, which enables the receiving of post-Panamax vessels. - Purchase of two mobile cranes (RTG by Goodwill) - Development/renovation of warehouse, office building and parking spaces. - Total investment of US\$30million will be made by the concessionaire, ITI.
Hinterland including future potential	<ul style="list-style-type: none"> - Arica area - South area of Peru - Bolivia including Santa Cruz - Mato Grosso 	<ul style="list-style-type: none"> - Iquique area - Bolivia, particularly Oruro, Potosi, and La Paz - Peru
Functions to be expected	<ul style="list-style-type: none"> - Major exporting port for bulk and general cargo 	<ul style="list-style-type: none"> - Container specialized port for manufacturing products
Competitive ports	<ul style="list-style-type: none"> - Matarani (Ilo) - Iquique - Antofagasta (Mejillones) 	<ul style="list-style-type: none"> - Arica - Antofagasta (Mejillones) - (Tocopilla)
Major Issues	<ul style="list-style-type: none"> - Development/renovation of port facilities through concession. 	<ul style="list-style-type: none"> - Expansion of container yard and parking area is an urgent matter. - Improvement of port access road

Note: 1) The Port of Ilo is not well developed at present. However, it could be competitive to a certain extent if privatized, since it is located at the closest point to become an exit from La Paz.

2) The Port of Mejillones is considered to take over the current function of Antofagasta Port in the near future.

3) The Port of Tocopilla is currently used as a specialized port for importing carbon and exporting nitrate. If it is operated as a commercial port, it can be competitive particularly for bulk cargo.

According to the Port Company of Arica, the concession conditions will be improved considering the following points, reflecting the first bidding failure.

- By employing public investment for common infrastructure, the initial investment by the concessionaire may be reduced.
- The storage area will also be included in the concession area. It implies that additional revenue can be expected, as long as the current compensation system continues.

The second bidding is tentatively scheduled for September 2001.

As for Berth No. 7, though it exclusively handles Peruvian cargo based on the agreement between Chile and Peru, it may be an uncertain risk for the concessionaire when considering the sensitive relationship between the two countries, considering it can be easily improved as a competitive berth. Accordingly, the following condition is also worth taking into account. A conditional concession system can be introduced to reduce uncertain risks concerning unexpected policy changes by the Peruvian Government. For instance,

- Some guarantees for minimum handling volume
- Guarantee for the purchase by the Port Company of Arica

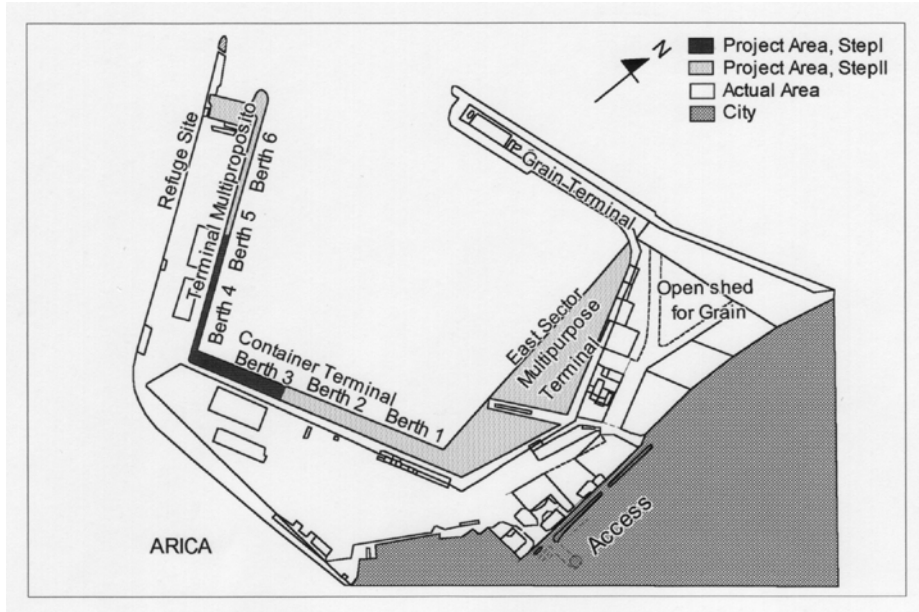


Figure 17.3.2 Development Plan of Arica Port

Source: The Port Company of Arica.

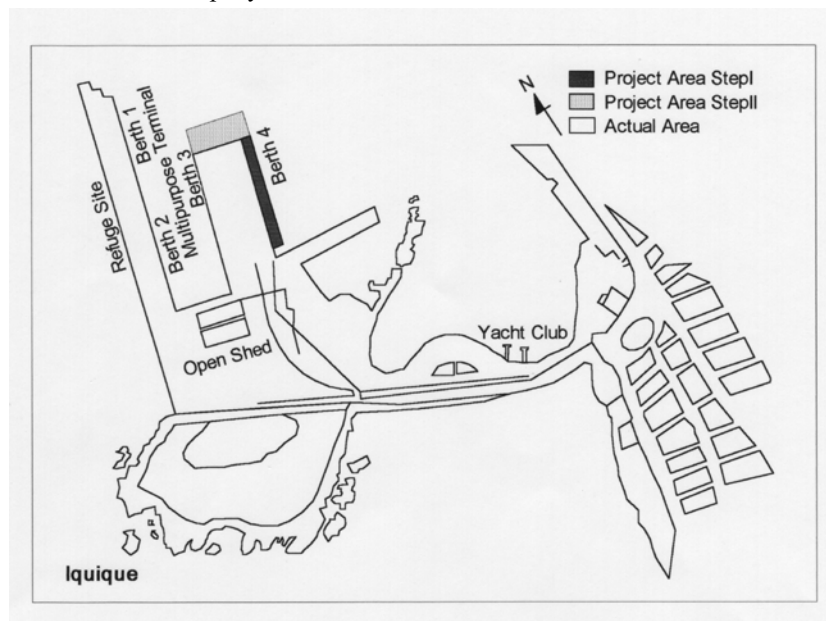


Figure 17.3.3 Development Plan of Iquique Port

Source: The Port Company of Iquique.

(2) Mejillones and Antofagasta

The development plans for the Ports of Mejillones and Antofagasta are summarized in Table 17.3.8. Both ports have the same hinterland, however, Mejillones may have higher potential in the long term. CODELCO, Antofagasta's most important client at present, has decided to move all related cargo to Mejillones, equivalent to 1.3 million ton/yr. Therefore, cargo handled at Antofagasta will be reduced to almost half the current demand when port operations commence at Mejillones. It is also important for the two ports to create a relationship of competition on the one hand and of cooperation on the other, as in the case of Arica and Iquique.

For the Mejillones port construction and operation, the concession contract for Terminal One was made between the port administration company (Complejo Portuaria Mejillones) and the concessionaire (Compania Portuaria Mejillones) in November 1999. According to the CPM, the total investment cost will be US\$110 million, of which 40% will be financed by their own capital, but the rest will be provided by a syndicated loan including IDB. The financial resources have not been settled yet. Other issues related to Mejillones are:

- Implementation timing of the developments of access road, railway and common utilities, including water supply, a scarce resource in Region II. Coordination among the responsible entities is therefore important to program the development schedules.
- There are several plant development projects in the chemical or energy sector around the port. Land use in the surrounding area is also an uncertain factor. This may affect port development schemes as well as common infrastructure.

On the basis of the port master plan, a new concession for Terminal 2 is scheduled within 10 years. Since Terminal 2 is planned to have more berths than Terminal 1, the Port of Mejillones may become the largest port in Chile when this takes place.

The first stage of Terminal 1 is expected to be completed by the end of 2002. The port will have three berths with a handling capacity of 2.5 million tons per year once completed. Terminal 1 is scheduled to reach a capacity of 3.5 million tons/year in total by constructing an additional berth in stage two. Since Terminal 2, comprised of 6 to 7 berths, is planned after Terminal 1's completion, Mejillones Port will have sufficient capacity for future cargo demand.

On the other hand, the Port of Antofagasta is expected to function partly as a supplementary or as a competitive port for Mejillones and partly as a passenger port for tourism and recreation when Mejillones Port starts its operations. Berths No. 1 to No. 3 in Figure 17.3.4 will be converted into tourism sites for citizens. In order to make the port more efficient, the reinforcement of the wharf and breakwater, modernization of the handling equipment, etc. are urgently required.

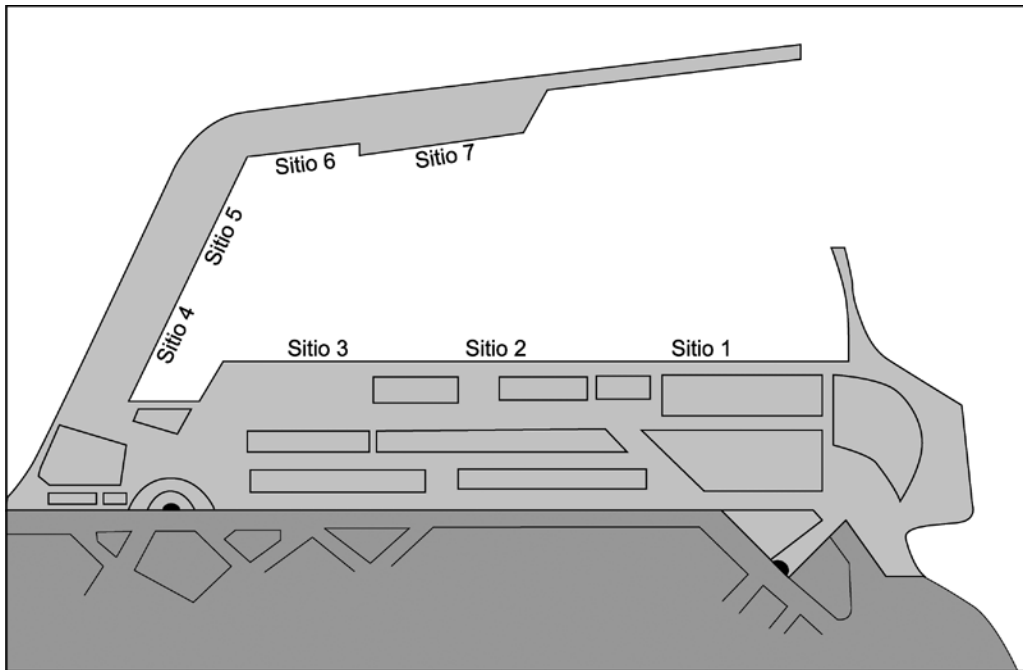


Figure 17.3.4 Antofagasta Port

Source: The Port Company of Antofagasta.

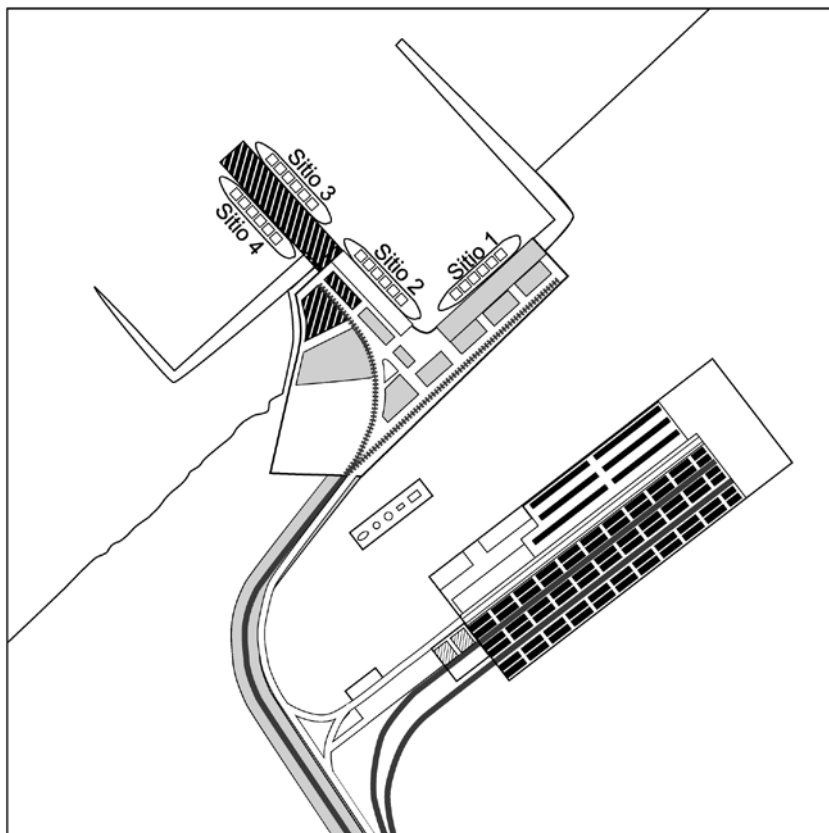


Figure 17.3.5 Development Plan of Mejillones Port

Source: Elaborated by the JICA Study Team based on information obtained from <http://www.mejillones.com/english/proyecto.html>

Table 17.3.8 Port Development for Mejillones and Antofagasta

Description	Mejillones	Antofagasta
Development Plan By Public Sector	<ul style="list-style-type: none"> - Construction of access road and railway - Development of common utilities such as water supply, energy and other common facilities. - The total cost is estimated at US\$20.5 million, which is expected to be financed by the Central Government. 	<ul style="list-style-type: none"> - Rehabilitation and protection work for the wharf and breakwater. - Renovation of handling equipment - The above investment may be made by the Port Company, however, the project is still at the stage of studying.
Development Plan By Concessionaire	<ul style="list-style-type: none"> - Construction of Terminal one with four berths. - Purchase of cargo handling equipment - Total investment cost will be US\$110 million - Construction will start in April 2001, completed by the end of 2002. 	Not yet determined.
Hinterland including future potential	<ul style="list-style-type: none"> - Regions II and III - Potosi and Tarija, Bolivia - Rest area of Bolivia - Northwest region (NOA) of Argentina - Catamarca, etc., Argentina 	<ul style="list-style-type: none"> - Region II - Potosi and Tarija, Bolivia - Northwest region (NOA) of Argentina
Functions to be expected	<ul style="list-style-type: none"> - Major hub port of the North Zone for general cargo and container cargo. 	<ul style="list-style-type: none"> - Supplementary port for Mejillones but more specialized for container and general cargo. - Tourism and recreational port for residents as well as visitors.
Competitive ports on the Pacific coast	<ul style="list-style-type: none"> - Antofagasta - Iquique - Arica - Tocopilla 	<ul style="list-style-type: none"> - Mejillones - Iquique - Arica
Major Issues	<ul style="list-style-type: none"> - There are some uncertain factors such as implementation of supporting facilities, financial resources, undetermined land use as well as investment plans in the surrounding area. 	<ul style="list-style-type: none"> - Possibility of involvement of private sector in tourism development. - Modernization of the port operation

Note: Tocopilla is included for the same reason as noted in Table 17.3.7.

Source: Portuario Mejillones Port Complex and the Port Company of Antofagasta

17.3.3 Development of Export/Import Corridors

(1) Route for Bolivia and Mato Grosso

a. Transport Demand for the Corridor

Transport demand for Bolivia/Mato Grosso is estimated to increase from 1.5 million tons in 1999 to 3.8 million tons in 2012 at an average growth rate of 7.4% per annum. Assuming the current modal share is maintained in the future, the trans-Andes transport demands in 2012 for roads and railways are estimated at 2.5 million tons and 1.2 million tons respectively, as shown in Table 17.3.9.

Table 17.3.9 Cargo Transport Demand for Bolivia/Mato Grosso

Trans-Andes Roads	Origin / Destination	Cargo (1000 tons/yr)		Traffic (1999) (pcu/day)	Capacity (pcu/day)
		1999	2012		
Tambo Quemado	Arica - La Paz	956	2,544	1050	6,000
Colchane	Iquique - Oruro	72		70	-
Total		1,028	2,544	1,120	6,000
Trans-Andes Railways	Origin / Destination	Cargo (1000 tons/yr)		Capacity (1000 tons/yr)	
		1999	2012		
Arica - La Paz	Arica - La Paz	259	1,230	500	
Ollague - FF.CC.	Antofagasta -Oruro/Potosi	259		400	
Total		518	1,230	900	

Source: Customs Services of Valparaiso, Chile, *Trafico Terrestre Avanzadas Fronterizas, Enero a Diciembre 1999*; and JICA Study Team.

As road traffic also includes passenger cars and buses, demand can be compared with capacity by converting the cargo volume into vehicle traffic volume. As far as traffic capacity is concerned, the Tambo Quemado has sufficient capacity to accommodate the transport demand along the corridor in 2012, the Colchane route is not even taken into account. On the other hand, the railway capacity will be insufficient for demand in 2012. Accordingly, both railways, Arica-La Paz and FCAB, should be developed to cope with the future demand growth in the long term.

b. Arica – La Paz – Santa Cruz – Mato Grosso

As stated in the previous section, there are several development issues for the Arica – Santa Cruz – Mato Grosso corridor, particularly the sections in the Bolivian territory

1) Road Development

As the sections of Arica – La Paz and La Paz – Santa Cruz have been generally developed with paved roads, the main issue is how to link Santa Cruz with the eastern region of Bolivia as well as with the Mato Grosso region, where large volumes of agricultural crops are produced. There are two alternative routes:

- Santa Cruz – Puerto Suarez – Corumba – Mato Grosso
- Santa Cruz -San Ignacio de Velasco -San Matias – Caceres – Mato Grosso

According to the same study implemented by IDB, construction costs of route two are estimated to be US\$240 million for a double treatment surface. As apparent, the latter is much less expensive than the former due principally to better soil conditions. Although the Bolivian government gives higher priority to route one no definite financing plan is available. Judging from the following aspects, route two seems to have more advantages compared to route one.

- Route one passes the upstream damp land of the Paraná River, which is one of the areas with the worst soil conditions for infrastructure development. Therefore, it is anticipated that the road will be costly in terms of construction as well as daily maintenance.
- On the other hand, route two has several advantages:
 - Lower construction and maintenance costs
 - Direct access to Cuiaba of the Mato Grosso region
 - Direct connection to the northern route between Santa Cruz and Cochabamba, which has better road conditions compared to the southern route in terms of the pavement ratio.

As there is no bridge crossing the Rio Grande between Okinawa and Los Troncos, traffic must use the only bridge between Pailas and Pailon. However, the bridge is too narrow for two-way traffic to pass simultaneously. Furthermore, road traffic is interrupted when a train passes as it is used as both a road and railway. Therefore, the construction of a new bridge will be required to cope with the traffic demand when the road link between Santa Cruz and Mato Grosso is completed.

2) Railway Development

There is a railway development project for the missing link between Aiquire and Santa Cruz. According to a feasibility study undertaken by a U.S. company, the total project cost will be US\$600 million. If the project is realized, transport demand towards the Pacific Ocean is estimated to include about 20% of the products from the Mato Grosso region, equivalent to 10 million ton/yr. Applying water control measures, costing approximately US\$80 million, would allow for the repair of the section between Aiquire and Oruro. Tennessee Wyoming Co., the main investor of the railway between Santa Cruz and Puerto Suarez, is interested in the concession of the rail connection project mentioned above. However, the project does not seem to be easily implemented due to heavy initial investment as well as a highly anticipated maintenance cost.

As for the railway from Arica to La Paz, transport capacity should be further expanded for future demand until 2012, which may be achieved by improving the railway alignment and purchasing new locomotives. In the short term, however, transport capability is sufficient and, therefore, efforts should be focused on improving the inter-modal connection with trucks at Oruro to increase railway cargo.

c. Iquique – Oruro/Potosi

Iquique is directly connected with the Oruro/Potosi area by the Corchane route. At present, the road condition is extremely poor, particularly the section in Bolivian territory. The total length of the unpaved section stretches more than 250 km. Therefore, most of the traffic between Bolivia and Iquique, particularly that related to ZOFRI estimated at about 400,000 tons per year, utilizes the route via Tambo

Quemado.

Current transport demand for this corridor leading to the Port of Iquique is not so high. This is because mineral products in the Oruro/Potosi region are primarily transported to Antofagasta by railway. According to the Iquique Port Company, there is interest in the mineral development project at San Cristóbal in Bolivia as well as in the agro-industries in Bolivia such as soybean, sugar and timber. According to MOP, the development of the Colchane route is given high priority and there is an investment plan of about US\$30 million to be realized in the next five years. However, progress does not exist on the Bolivian side, due principally to one of the greatest challenges concerning the preparation of financial resources for road development.

d. Antofagasta – Oruro/Potosi

Railway is utilized to connect Antofagasta and the Oruro/Potosi area via Ollague, operated by the concessionaires FCAB on the Chilean side and Andino on the Bolivian side. It is important that railway companies have a cooperative relationship with truck companies for terminal transport between railway stations and mines or processing plants. Railway development projects are as follows:

- Purchase of new locomotives with higher traction power.
- Widening of the clearance gauge through the cutting of the side wall and reclamation along the corridor for accommodating larger size wagons

(2) Routes for North Argentina

a. Transport Demand for the Corridor

The transport demand of North Argentina is estimated to grow from about 140,000 tons in 1999 to 300,000 tons in 2012. As far as transport capacity is concerned, future demand will not even reach the current capacity, as shown in Table 17.3.10. The railway capacity in Table 17.3.10 includes the effects of the Chilean railway penetration project into Argentina, elaborated on at a later point. Transport capacity expansion, therefore, may not be the main issue for this corridor, but rather trouble free Andes-crossing will be a most important issue for both the roads and railways.

Table 17.3.10 Cargo Transport Demand for North Argentina

Trans-Andes Roads	Origin / Destination	Cargo (1000 tons/yr)		Traffic (1999) (pcu/day)	Capacity (pcu/day)
		1999	2012		
Jama	Antofagasta - Jujui	79	177	70	1,000
Sico	Antofagasta - Salta	2		-	
Total		81	177	70	1,000
		Cargo (1000 tons/yr)		Capacity (1000 tons/yr)	
Trans-Andes Railways		1999	2012		
Socompa - FF.CC.	Antofagasta -Salta	55	123	200	

Source: Customs Services of Valparaiso, Chile, *Trafico Terrestre Avanzadas Fronterizas, Enero a Diciembre 1999*; and JICA Study Team.

b. Antofagasta/Mejillones – NOA

1) Road development

There are two trans-Andes road projects connecting Antofagasta/Mejillones with the

northwest region of Argentina via Calama: Paso Jama and Sico. Based on the agreement between Chile and Argentina, which designates the road development of Jama as having priority, pavement on the Chilean side has been completed to the border. Due to a financial problem, construction on the Argentine side has been slightly delayed and about 238 km remains unpaved. However, construction began with finance from the central government in September 2000 and is scheduled to complete in 2002. The Jama route connects Antofagasta and Jujuy. According to the Jujuy provincial government, in spite of a high altitude of about 4,200 m, the Jama pass does not have the problem of heavy snowfall in winter, owing to the flat geographical condition and the climate of comparatively less rainfall.

The Sico route is parallel to the Jama route, connecting Antofagasta and Salta in the northwest region of Argentina. The trans-Andes section of Sico is in extremely poor condition. At present, it is characterized by a narrow width, a steep gradient and more than 400 km of unpaved road. Nevertheless, the intention of the Salta provincial government to develop the corridor is so strong that construction was initiated using its own funds; financing that will be refunded by the central government at a later stage.

As the development of Sico is also included in the agreement between Chile and Argentina, the Chilean side has an investment schedule for the next five years. Chile's MOP has a road development plan for a direct connection from Mejillones to Baquedano and further through the Sico path, without passing through Calama. This route will be significantly shorter between Salta and Mejillones, when completed.

2) Railway Development

There is a trans-Andes railway from Antofagasta to Salta via Socompa. The locomotive has to be changed at the border since two companies are responsible for its operation, FCAB on the Chilean side and Belgrano on the Argentine side. Salta is connected with major cities in Argentina such as Cordoba and Buenos Aires through the Belgrano railway system. At present, transport demand is not so high, accounting to less than 100,000 tons per year. Due to the zigzag alignment of the track, the operation is made by way of switchback, causing both operation speed and transport capacity to be low.

Taking into account high potential transport demand in the mining sector, Belgrano has a development plan to increase transport capacity. This includes the penetration of Chilean locomotives north to Guemes in Argentina, located near Salta. By introducing Chilean locomotives utilized in trans-Andes crossings, traction power doubles the current level, i.e., the number of wagons per train increases from 10 to 20. Such a penetration project requires agreements between the two companies and between the two countries.

If this is realized, the Guema station may be an international, inter-modal transport center, because it is also a starting point of the train for Santa Cruz and falls on the bioceanic road from Antofagasta to Resistencia via Jama.

Another plan is to improve the railway alignment, which will further contribute to increasing the operating speed and transport capacity.