

CHAPTER 4. FORECAST OF CARGO TRANSPORTATION/ SHIP TRAFFIC

The purpose of this section is to forecast the cargo throughput of the ports located in the study area up to the target year; 2020 and estimate the ship traffic. Future water transportation system of the Orinoco River in Matanzas– Atlantic Ocean section is studied based on the estimated ship traffic.

4.1 Methodology

Two methods, a macro forecast and a micro forecast are generally used to forecast the future cargo volume. The macro forecast is based on statistical correlation between economic indices such as GDP and the total cargo throughput of existing ports. On the other hand, the micro forecast estimates each commodity individually.

Almost all cargo handled in Puerto Ordaz is industrial cargo of enterprises such as iron ore, direct reduced iron, steel products, bauxite, alumina, aluminum, clinker, petroleum, while general cargo such as consumer products, agriculture products and foodstuff is seldom handled at present.

In this study, the micro (commodity-wise) forecast based on each enterprise's production/sales plan, demand-supply balance, market condition and past cargo throughput trend, is adopted considering above mentioned characteristics and function of ports. Furthermore, the future ship traffic is estimated taking into consideration the forecast result of the future cargo volume and the examination of future ship size.

4.2 Economics and Development Plans

Major socio-economic statistics of Venezuela in 1997 were as follows. Population; 22,800 thousand, GDP(at market exchange rate); US\$ 87,500 million, GDP per capita; US\$ 3,840.

Main multilateral trade agreements in Latin America are CARICOM, CACM, G3, CAN and MERCOSUR, of which Venezuela has joined G3 together with Colombia and Mexico, and CAN together with Colombia, Peru, Ecuador and Bolivia. These agreements are designed to promote trade in member countries by customs reduction/abolition and by removing trade barriers.

Development projects related to Orinoco River are "Orinoco Belt Tar Development Program", "Integrated Development Plan of the Orinoco/Meta River Basin" and "Free Trade Zone Program (provisional name)".

"Orinoco Belt Tar Development Program" is making progress due to the PDVSA-four consortium joint enterprise. Exploited Orinoco tar is transported to Hoces facing the Caribbean Sea by pipeline and exported by crude carrier after being chemically treated.

“Integrated Development Plan of the Orinoco/Meta River Basin” and “Free Trade Zone Program (provisional name)” are in a preliminary stage and require further study for realization.

4.3 Ports in the Study Area

There are about sixty ports along the Orinoco River, Caroni River and Apure, including Ferrominera (Palua) Port, Ferrominera (Puerto Ordaz) Port, SIDOR Port, El Jobal Port, INTERALUMINA Port, ALCASA Port, VENALUM Port, San Felix Port, Cementos Guayana Port and Corpoven Port in Bolivar State, and Veneston Port in Monagas State.

In 1997 total cargo throughput of ports in Puerto Ordaz was 24,957 thousand tons based on the port statistics of Ferrominera, SIDOR, Group of Aluminum Industry, San Felix Port and MTC-INC.

4.4 Production and Transportation Situation of Main Enterprises

Main enterprises in Puerto Ordaz are Ferrominera (iron ore), SIDOR (steel products), BAUXILUM (bauxite/alumina), ALCASA (aluminum ingot), VENALUM (aluminum ingot), CARBONORCA (anode), Corpoven (crude oil), FIOR (direct reduced iron), VENPRECAR (direct reduced iron) and OPCO (direct reduced iron). The cargo throughput share of above enterprises accounts for more than 95% of the total.

Ferrominera explored and produced 17,558 thousand tons of iron ore (fine/lump) and pellet in 1997 (its share of the world market was 1.9%), of which 9,320 thousand tons was exported (representing 2.0% of the world market). Almost all iron ore was exported before the direct reduced iron plant began operations and the share of exportation has increased gradually with the operation of direct reduced iron plants. Regional/country-wise destination in 1997 is as follows; Europe (54.5%), USA (23.2%), Japan (11.7%) and Latin America (7.5%).

In Puerto Ordaz five enterprises (twelve plants) produce direct reduced iron, namely SIDOR (8 units), FIOR (1 unit), VENPRECAR (1 unit), OPCO (1 unit) and COMSIGUA (1 unit started operation in 1998). In 1997 production volume was estimated to be 5,490 thousand tons, of which 1,810 thousand tons was exported. Venezuela is the largest producer of direct reduced iron in the world.

As to production/exportation volume of aluminum related industry in 1996, BAUXILUM explored 4,907 thousand tons of bauxite, of which 217 thousand tons was exported. Moreover it produced 1,173 thousand tons of alumina, of which 480 thousand tons was exported. VENALUM and ALCASA produced 604 thousand tons of aluminum ingot, of which 411 thousand tons was exported. Venezuelan production share in the world market in 1996 was 4.6% for bauxite, 4.0% for alumina and 3.0% for aluminum ingot.

4.5 Micro (commodity-wise) Forecast

Forecast result of cargo throughput was estimated taking into consideration future production/forwarding plan of enterprises in Puerto Ordaz. As to exportation of iron ore, Venezuela has a policy of value-adding to iron ore, namely producing direct reduced iron from iron ore. Accordingly, exportation volume of iron ore will decrease gradually with operation of direct reduced iron plant, COMSIGUA, POSVEN and ORINOCO IRON. Exportation volume is planned at 4 million tons in 2003.

On the other hand, Ferrominera plans to construct a concentration plant which will produce high grade concentrates from low grade mine (annual production volume; 8 million tons, total estimated investment; US\$ 300 million). Furthermore, Ferrominera and SIDOR plan to construct a slab plant using concentrates produced by concentration plant.

4.6 Assumption of Plant Schedule and Cargo Throughput Forecast

Future production/forwarding plan of enterprises in Puerto Ordaz up to 2005 is taken into the forecast as enterprise's schedule considering the progress of projects, forwarding trend and market condition of each commodities.

As to aluminum related industry, Stage I' start-up (aluminum ingot plant by ALCASA) is assumed to be 2010 considering present situation of ALCASA and market condition. As to steel related industry, there are three stages; Stage I (expansion plan of direct reduced iron plant by SIDOR), Stage II (concentration plant; 1 unit and slab plant; 1 unit), Stage III (concentration plant; 2 units and slab plant; 2 units). Three growth cases are assumed for each of the three stages as shown in Table S.4.1 taking into consideration present situation of these enterprises and progress of projects and present port facilities.

Table S.4.1 Assumption of Realization Year of Three Stages

	Stage I	Stage II	Stage III
Low Growth Case	2020	After 2020	After 2020
Medium Growth Case	2015	2020	After 2020
High Growth Case	2010	2015	2020

The cargo to/from Colombia and Brazil which is expected to be generated by "Integrated Development Plan of the Orinoco/Meta River Basin" and "Free Trade Zone Program (provisional name)" is not included in the forecast because both projects are in a preliminary stage and there is no analysis factor for cargo forecast.

Forecast result of cargo throughput is summarized in Table S.4.2, forecast result by industry is given in Fig. S-4-1. The cargo throughput trend is characterized by its non-linear increase in volume. This is the frequent tendency in case of typical industrial port serving several enterprises like Puerto Ordaz.

Table S.4.2 Forecast Result of Cargo Throughput (Unit; Thousand Tons)

	2000	2005	2010	2015	2020
Low Growth Case	21,100	22,200	22,200	22,200	23,400
Medium Growth Case	21,100	22,200	22,200	23,400	25,600
High Growth Case	21,100	22,200	23,400	25,600	27,900

Note; Downstream from Puerto Ordaz

4.7 Ship Traffic Volume Forecast

Average laden volume of ship by commodity is calculated based on the port statistics of SIDOR Port, San Felix Port, INTERALUMINA Port, ALCASA Port, VENALUM Port and MTC-INC. Considering future transportation volume and destination, average laden volume of ship i.e., ship size, is assumed to remain the same as at present excluding the ship for steel products. As to ship for steel products, average laden volume of ship is assumed to be 20 thousand tons in 2010 in the high growth case, up from 8 thousand tons at present.

Forecast result of ship traffic volume is summarized in Table S.4.3 based on above mentioned average laden volume of ship and cargo throughput forecast examined in section 4.6.

Table S.4.3 Forecast Result of Ship Traffic Volume (Unit; Vessels)

	2000	2005	2010	2015	2020
Low Growth Case	960	1,020	1,020	1,020	1,150
Medium Growth Case	960	1,020	1,020	1,150	1,170
High Growth Case	960	1,020	1,150	1,170	1,300

Note; Downstream from Puerto Ordaz

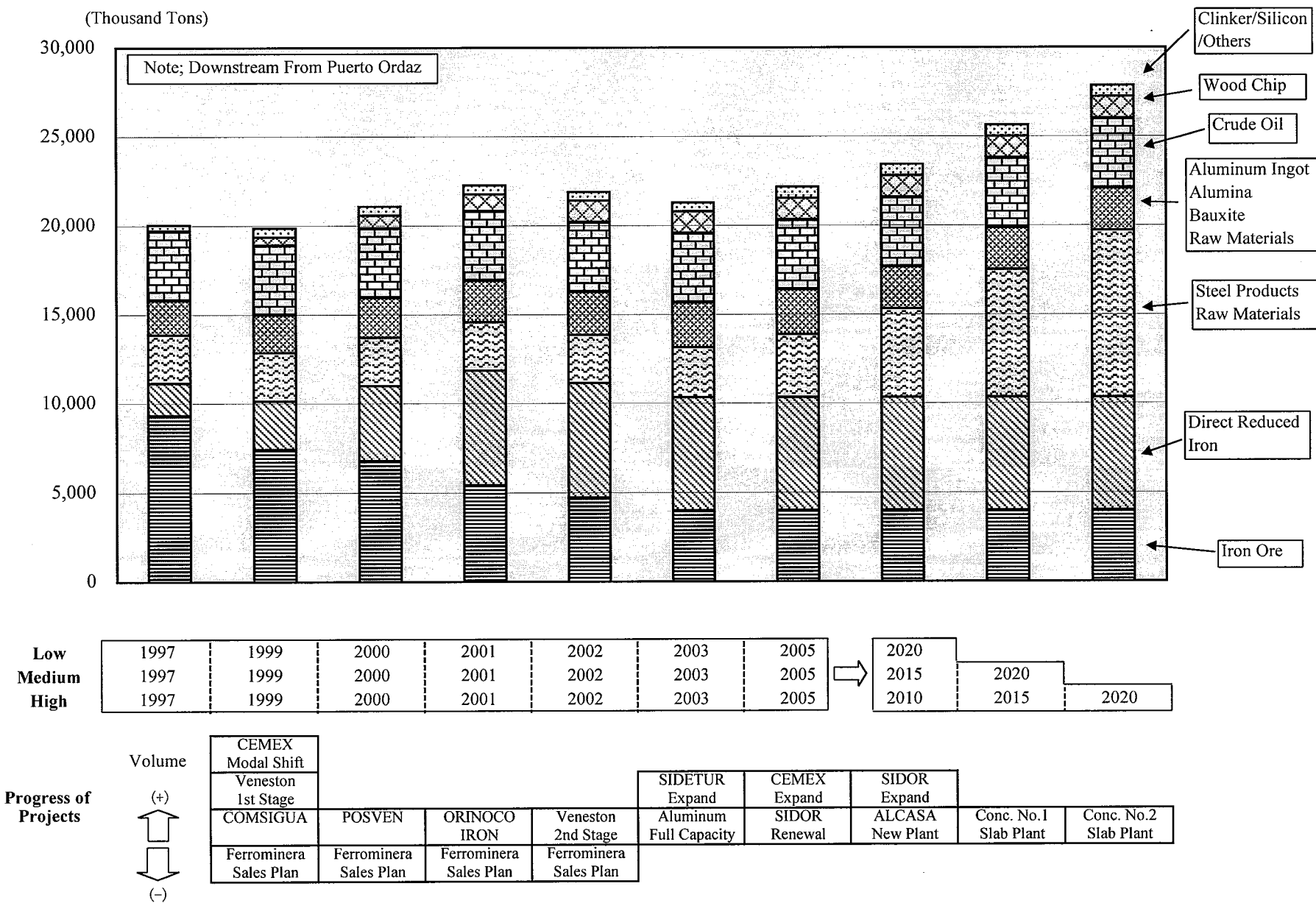


Fig. S-4-1 Cargo Throughput Forecast by Industry