

VENEZUELA MOVES ONTO THE WORLD'S IRON ORE MAP

C. LANGDON WHITE
Stanford University

A decade ago Venezuela was not even on the map of the world's ore-producing countries. By 1959, however, it was producing and exporting almost 15 million tons, and it possessed estimated reserves of 2 billion tons.¹ Today Venezuela is Latin America's largest exporter of iron ore and, though its total estimated reserves are much smaller than those of Brazil, it is Venezuela, not Brazil, that holds the greatest promise as a future producer and exporter.

The value of the iron ore to Venezuela positively cannot be overestimated, for the country has long been a victim of monoculture: in fact, not one of the 20 countries comprising Latin America, where monoculture is most serious, is so dependent upon a single product for its economic life as is Venezuela upon petroleum. Oil provides about 90 per cent of the exports by value and about 92 per cent of the foreign exchange; it is roughly the source of one-half the national budget. Iron ore gives Venezuela an additional important raw material.

DISCOVERY AND DEVELOPMENT OF IRON ORE

Iron ore was first discovered in the Orinoco Basin in 1926 when a native prospector stood atop a mountain known as El Florero (now the El Pao mine) and excitedly announced that he had found a large, rich, new source of iron ore. However, this discovery did not electrify the world. There was plenty of iron ore at the time which was much better located with respect to the world's important iron and steel manufacturing regions. Moreover, Venezuela had no iron and steel industry and gave little promise of having one for a long time (even in 1957 domestic consumption accounted for only 6,146 tons of iron ore). At the time of discovery in Venezuela, the American iron and steel industry rested on a solid foundation of Lake Superior ore.

Venezuela leaped onto the world iron ore map following the startling statement of an outstanding steel executive at the close of World War II that that war was the last which would be fought from the Mesabi Range. What he meant was that in two world wars, the United States had drawn so heavily upon the iron ores of the Lake Superior Region, and particularly of the Mesabi Range, that most of the high-grade ore had already been mined. When those enormous deposits were discovered more than a half century ago, they were the world's largest and it was believed that they were virtually inexhaustible: certainly it seemed that they would last the United States for centuries. What no one realized then was the phenomenal growth that the American iron and steel industry would chalk up (in 1956 the United States used 133 million tons of iron ore). Since 1900 the Lake Superior Region has supplied about 80 per cent of the domestic iron ore.

¹ U.S. Bureau of Mines, *Mineral Trade Notes*, XLVII (August, 1958) p. 11.

The large iron and steel companies and ore companies plan 50 or even 100 years ahead (with an investment exceeding \$5 billion, they cannot operate on a hand-to-mouth basis). Hence with dwindling deposits at home, the companies sent geologists and mining engineers into all parts of the world seeking new deposits.² After examining hundreds of areas, they concentrated on Canada, Liberia, Peru, and Venezuela.

The executives were well aware, however, that any nation that makes as much steel as the United States (113 million net tons in 1957, or 35 per cent of the world's total, contrasted with 57 million net tons for the Soviet Union, second largest producer) ought not to depend on distant lands for the greater portion of a natural resource employed in such enormous quantities as is iron ore and used to make the most widely adopted of all metals (American production of steel is 100 times that of copper, the second metal, and 20 times that of all other metals combined). Enemy submarines could exact a terrible toll as they did during World War II. Thus from the standpoint of national defense, full dependence on foreign ore is too dangerous. Yet foreign sources of ore should be developed by American companies to prolong in peacetime the life of the richer deposits in the Lake Superior Region. To lessen such dependence upon foreign ore, American companies invested almost \$1 billion on research and development of taconite, billions of tons of which lie in the Lake Superior Region. Taconite is low grade ore: it is about the hardest toughest rock known. The metallic iron is scattered through the rock in tiny particles, some so fine they can be concealed under a single grain of face powder. The problem was to separate those particles of iron from the rock and bundle them together by the millions into solid pellets that could be charged into blast furnaces. Obviously this entire operation is difficult and costly.³ The research however, has paid off and taconite (about 8 million tons in 1958) is now moving down the lakes, though in small quantity compared with the tonnage of better ore from that region or even with that of foreign ore.

In 1958 the United States imported 31 million tons of iron ore, the contributing countries being Venezuela, Canada, Chile, and Peru, in this order.

VENEZUELA'S NEW EL DORADO—IRON ORE

Venezuela's iron ore reserves are estimated at 2 billion tons. There is little doubt that this figure is too conservative. All the commercial ore is to be found in the northern part of the Guiana Highland Region south of the Orinoco. All the ore is now in a National Reserve — even the deposits held by foreign companies. However, in 1959 the Venezuelan government created a new 30-mile-wide national mineral reserve strip along the Orinoco from Tucupita, Delta Amacuro Territory, to the Rio Meta, on the border with Colombia. This strip it will be noted, lies north of the

² Actually, iron ore is not a scarce mineral. Large deposits are scattered throughout the world. See Mikami, Harry M., "World Iron Ore Map," *Economic Geology*, XXXIX (January-February, 1944), pp. 1-24.

³ An excellent *brief* treatment of taconite and the problems involved in its recovery by George Eckel appeared in the *New York Times*, January 3, 1951.

Orinoco. The purpose of this move appears to be to assure Venezuela that she reaps full economic advantage from the national heritage.⁴

Venezuela ore now and in the future seems destined for export. Though the government is constructing a national iron and steel plant near Puerto Ordaz, the mills will be unable to use more than a trickle of the country's ore output, for Venezuela had a population of only 5,034,838 in 1950 and 6,439,165 (estimated) in 1957. Aside from the petroleum industry, the nation uses very little steel.

As of 1959, exploitation is confined solely to El Pao and Cerro Bolivar, both in the State of Bolívar (Fig. 1).

One problem common to both mining ventures has to do with the rise and fall of the water level in the Orinoco — the level varying up to 42.7 feet. Obviously this initially posed a real problem for ore handling.

El Pao. El Pao, the iron mine of Bethlehem Steel Corporation, lies about 36 miles south of the port of Palua on the right bank of the Caroní just where it debouches into the Orinoco (Fig. 1). This deposit of ore

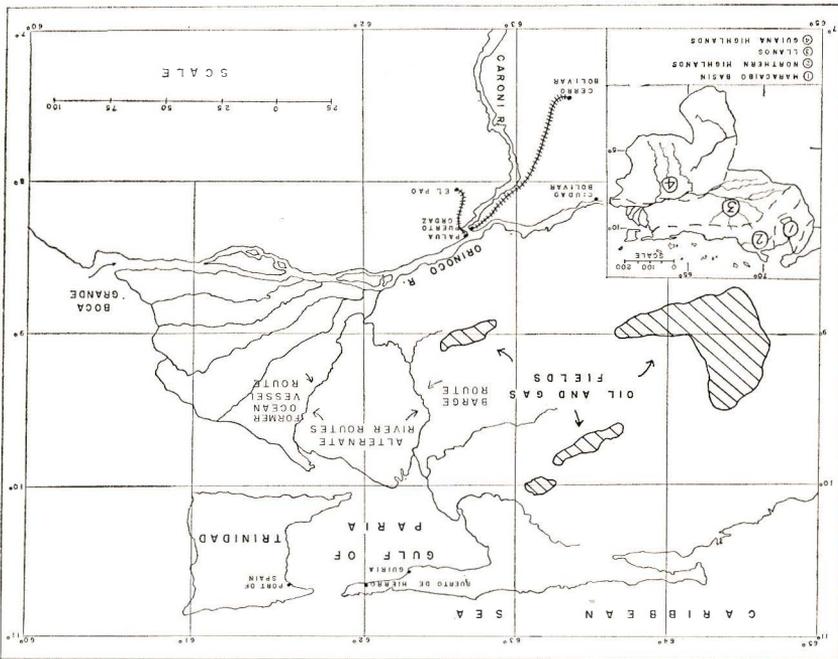


Fig. 1. Venezuela's geographic regions and iron ore complex. In the northern Guiana Highland Region is one of the largest, richest (metallic content of ore), and most accessible iron ore areas in the world.

was discovered by a native Venezuelan in 1926 but did not receive serious study until the 1930's. Development was delayed until 1950 because of the war. Bethlehem acquired concessions to 22 ore bodies but

⁴ *Hispanic American Report*, XII (September 1959), p. 388.

relinquished six. The remaining 16 include a total area of about 20,000 acres. It is significant that the mining rights east of the Caroní are limited to 40 years, whereas those on the west side extend to 100 years. The reason for this is that the ore on the east side was known some years before ore was even discovered on the west side.

Reserves at El Pao are placed at 100 million tons of ore running 61.55 to 65.0 per cent metallic iron. The main deposit which is bowl-shaped, is about 2,600 feet long and 1,700 feet wide and lies atop a hill that rises several hundred feet above the surrounding area. The ore body varies in thickness from a few feet to 400 feet, with an overburden of some 425 feet.

The method of mining is called the open pit but actually it is not: it is open pit in reverse and should be called strip mining. In this method ore is sliced off the top of the hill in benches of about 42 feet. The ore is picked up by power shovel and dropped into trucks which deliver it to a crusher located about a mile from the mine, whence it travels by rubber conveyor to a secondary crusher and again by belt conveyor to an ore-loading bench on the company-owned railroad. The ore then moves to Palua in trains of 30 to 33 cars, each car holding 70 tons. At Palua there is a stockpile capable of holding 800,000 tons of ore. At the outset, the ore was shipped either by barge or small river boats, depending upon whether it was the high- or low-water season. The barges traveled via the Cano Manamo (230 miles), the vessels with their greater draft through the main channel of Orinoco—the Boca Grande (395 miles). Both conveyances carried the ore to Puerto de Hierro on the southern shore of the Paria Peninsula. Here the ore was transferred to a stockpile, capable of holding 1,250,000 tons, preparatory to loading into specially designed ore-carrying vessels destined for Sparrows Point, Maryland. Today no barges are being used and all the ore goes to Puerto de Hierro via the Boca Grande.

When El Pao is fully developed, it will send 3 million tons of iron ore a year to the United States.

Cerro Bolívar. This great hill is 7½ miles long, 2½ miles wide, and 1,800 feet above the surrounding landscape. The ore body is four miles long with a maximum width of 4,000 feet. Average ore thickness is 230 feet, maximum proven thickness 585 feet. The ore is free of overburden. Standing in the northern Guiana Highland Region (Fig. 1,) the hill is regarded as the greatest iron ore discovery since the Mesabi Range in the Lake Superior Region. It is believed that Cerro Bolívar will equal, perhaps surpass, in tonnage the world-famous Hull-Rust Mine in the Mesabi. It will certainly surpass it in richness of the ore. The reserve is placed at a half billion tons.

Lying in a hitherto unexplored part of Venezuela, it was discovered in 1947 during the United States Steel Corporation's world-wide search. The States Army and the Venezuelan government during World War II gave some indication of a considerable outcrop of ore. The Steel Corporation then made a detailed aerial survey of the same area. Exploration by jeep and on foot followed. Magnetometer surveys left no doubt regarding the

presence of ore. Diamond drills were then put into operation to test the size of the deposit and an exploration tunnel was driven into the side of Cerro Bolívar. United States Steel's mining rights were for 100 years, because at the time it acquired them, the iron ore on the west side of the Caroní was yet undiscovered.

Cerro Bolívar lies about 90 miles south of the confluence of the Caroní and the Orinoco on the west or left side of the Caroní (Fig. 1). The mountain is capped with iron ore, a mixture of hematite, limonite, and magnetite, practically free from objectionable elements. The metallic content varies from 58 to 61.50 per cent. The ore is minable by blasting and with power shovels, and the top of the mountain is being sliced off in horizontal cuts of 35 to 50 feet. The shovels drop the ore into trucks which haul it downhill to loading ramps where it is dumped into hopper cars on the railroad. It is then hauled in trains of 125 cars of 90 tons each (five trains per day) to Puerto Ordaz (fig. 1), where it is crushed twice enroute to a storage yard having a capacity of more than 1,300,000 tons. From storage the ore travels by belt conveyor to the vessel holds at a rate of 100 tons per minute. Unlike the situation at Palua, these are ocean-going ships. In order for vessels capable of carrying 30,000 to 60,000 tons of ore to ascend the river for 178 miles, the Steel Corporation decided to dredge the lower Orinoco and the Orinoco's largest delta channel—the Caño Macareo, as this seemed most immediately feasible from an engineering and economic viewpoint. The Corporation preferred to use ocean-going ships on the Orinoco in order to eliminate construction of a transfer point at the mouth. This, of course, necessitated costly and time-consuming dredging.⁵ Maintenance of the Caño Macareo route proved to be costly beyond all estimates and navigation was limited to daylight hours. Accordingly the company made studies seeking an improved route. The Boca Grande is the route now used (Fig. 1.) It can accommodate large vessels drawing 30 feet of water that carry 40,000 tons of ore.⁶ This ore moves to Morrisville, Pennsylvania, where it is used at the Fairless Works, and to Mobile, from where it is sent to Birmingham for "sweetening" the low-grade Alabama ores.

SUMMARY AND CONCLUSIONS

The development of Venezuela's iron ore deposits is signaling a new era in the economic life of the country whose chief export for about 50 years has been petroleum. It is dangerous for any nation to depend overwhelmingly on a single commodity—particularly one that is so expendable as oil, one whose markets lie outside the country, and one whose price is determined on the international market.

All the mining to date being carried on by American corporations, though a Venezuelan company is soon to get under way. As an international producer of iron ore, Venezuela promises to have a very bright future, the following factors appearing favorable:

- (1) Proved reserves of at least 2 billion tons.

⁵ Gabagan, Walter H., "Memorable Dredging Operation Opens Orinoco-Macareo Waterway," *Civil Engineering*, XXIII (December, 1953), pp. 816-820.

⁶ Laird, O. B., Steel Corporation, personal communication, October 9, 1959.

- (2) Ore of exceptionally high quality—58 to 65 per cent iron.
- (3) Access by large ocean-going vessels into the heart of the country as a result of dredging of the Orinoco by the United States Steel Corporation.
- (4) Powerful steel corporations of the United States in need of high-grade ore and with ample financial reserves to exploit it.
- (5) Large world markets available because the reserves of high-grade ore in all the major iron and steel manufacturing countries are rapidly dwindling.
- (6) An ample supply of labor.
- (7) Tropical climate which permits year-round mining.
- (8) All signs pointing to a phenomenal increase in iron and steel-making in the years ahead in all parts of the world.
- (9) Venezuela's probable ability to compete in world markets because of the huge reserves, the high quality of the ore, the modern methods of mining, and water transportation.
- (10) An investment climate in Venezuela which has for years been the best in all Latin America for foreign capital.⁷

⁷ In 1958 the Provisional Government introduced some changes in the Income Tax Law that shook this confidence. *The main change applied to the surtax.* For a discussion of this tax see "Income Tax Rates Slightly Raised in Venezuela," *Venezuela Up-to-Date, IX (February, 1959)*, p. 5.