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ECONOMIC COMMISSION FOR LATIN AMERICA  
Office for the Caribbean

GUYANA: BAUXITE DEEP-WATER HARBOUR

Background Note

by

The Secretariat



## GUYANA: BAUXITE DEEP-WATER HARBOUR

### A. Generalities

The Government of Guyana<sup>1/</sup> has requested United Nations technical assistance to design a facility which would permit ships that transport Guyana bauxite to be fully loaded on departure from the country. The facility should accommodate large-size ships, in order to reduce shipping costs.

Only a very brief outline of the request has been submitted to the Resident Representative of UNDP in Guyana, supported by a few technical notes and some statistical information. Additional material is still being assembled.

The government now expects that UNDP will provide a preparatory assistance mission<sup>2/</sup> to draw up the request. However, even for the terms of reference of the mission, there has been very little information made available. What has been received is far from sufficient to prepare even the terms of reference of the mission, or to suggest the duration of the mission, its composition, and costs involved.

This note has therefore been drafted for the purpose of assisting at least with the limited objective of mounting the preparatory assistance mission.

It is not possible at this moment to list systematically the various questions to be covered by the request. If the UNDP guide rules on preparation of requests have not been followed very closely, this is unavoidable, for lack of time.

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<sup>1/</sup> Letter by the Permanent Secretary, Ministry of Economic Development, to the UNDP Office in Guyana, October 1971.

<sup>2/</sup> Submitted by UNDP Resident Representative in November 1971.

## B. Background

It is urgent and indispensable to handle quite seriously the matter of background information. First, the usual expose of the economic situation and prospects should be done, and this can be readily compiled from various sources<sup>3/</sup>. Apart from that, three substantive issues should be documented in the background material:

- (a) the problem of port location in general and for the bauxite industry specifically;
- (b) the characteristics of bauxite mining in the country and its exports; and
- (c) the problems of bauxite shipping techniques and the resultant costs and rates.

The treatment should cover both enterprises - the GUYBAU and the Reynolds Guyana Mines Ltd. describing their location, reserves, production, export markets, transportation.

A few brief notes on the above topics are given below to indicate the order of importance of the project and to emphasise the complexity of the problems which confront the government technicians, and justify the resort to UNDP financed assistance.

### 1. Ports and inland navigation

Guyana has a 270-mile coast on the Atlantic Ocean and four large rivers flowing into it, Essequibo, Demerara, Berbice and Corentyne. With this endowment, the country nevertheless lacks a deep water harbour and only limited use can be made of navigable rivers. The coast is exposed to cycles of regression and transgression mainly due to tidal movement, equatorial current, and the flow of wind and silt in a westerly direction. Thus mud and silt bars form in river estuaries,

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<sup>3/</sup> For example: Annual economic surveys by the Ministry of Economic Development; Facts for investors on Guyana, Guyana Development Corporation; Annual reports by the Bank of Guyana; IBRD-IDA: Current Economic Position and Prospects of Guyana (October 1970).

which hinder navigation. This is particularly so for the Demerara River at the mouth of which the main port Georgetown is located and it is also the situation for the Berbice river with the second port of Guyana, New Amsterdam. The above mentioned rivers and some of their tributaries are very important for the economy of the country since they are the main means of access to the near interior. However, the shallow mud bars in the estuaries and sand bars and rapids on the rivers hinder the development of shipping.

Under the project, the alternatives would be to dredge one or other of the three rivers: Demerara, Berbice, Essequibo, in order to reduce the production cost of bauxite. Some investigations on the three alternatives have been done in the past and those results should be analysed in sufficient detail.

a) Demerara

The following are the main points:

- i. At the mouth of this river is the main port of the country, Georgetown. The bar which limits the access to the port is about five miles from the river mouth; it restricts the draft of vessels to 19 feet at high tide.
- ii. The harbour contains privately owned finger-type wharves with adjoining warehouses and some public facilities. The whole complex needs rebuilding.
- iii. The river is also used for transportation of bauxite and alumina from GUYBAU at Linden. Special ships are needed for this purpose, in addition to which transshipments outside Guyana are necessary.

With bi-lateral<sup>4/</sup> and United Nations technical assistance<sup>5/</sup> in the early 1960's the problems were studied in detail both in terms of dredging a navigable channel to facilitate bauxite shipments, and in terms of relocation and modernization of the harbour. These studies were done in the context of the developmental problems of the country, and the proposals were for the economic benefits of the improved bauxite facility to be combined with provision of a deep water harbour for general imports and exports. In the study of bauxite transportation the latter is a long term aspect that it is necessary to emphasise when reviewing the work done previously.

It would seem that these studies established the nature of the problem in the sense that it would be technically difficult to keep the channel clear; no specific solution was offered, and no recommendations were made. On the other hand, the 1970 World Bank Survey of Guyana refers to a conclusion that the Demerara route for bauxite ships is not suitable. However, observations from the Chief Pilot<sup>6/</sup> indicate that the channel could have a maximum depth of only 30 feet (otherwise with greater depths erosion would occur, and endanger the riverside structures and the river banks), and that the bends in the river would restrict the length of the ships to 525 feet.

b) Berbice

For this alternative, the following are some of the major considerations:

- i. At the mouth of the river lies the second main port, New Amsterdam. Its location is suitable for a major harbour construction, but the bar limits navigation to vessels of 16 feet maximum draft.

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<sup>4/</sup> Dutch consulting firm NEDECO and the Delft Hydraulics Laboratory.

<sup>5/</sup> B.J. Smodlaka, Transport and Communications Problems in British Guiana. United Nations TAO, March 1964.

<sup>6/</sup> Note transmitted to UNDP Office by the Ministry of Economic Development, January 1972.

- ii. A survey (with U.S. bi-lateral assistance) showed the technical feasibility to cut the bar, dredge the river to Everton, and build minimum harbour facilities, at an estimated cost of G\$7.8 million.
- iii. This project appears in the 1966-72 Plan<sup>7/</sup> with the corresponding earmarking but has not been implemented. It was to be initiated by a detailed feasibility study at a cost of G\$400 thousand. It is not clear whether the results were negative, or whether the dredging of the Demerara River and the construction of a public port at Georgetown was subsequently held as preferable.
- iv. Other data: According to some sources, the estuary of the Berbice River would provide an excellent location for building the main deep water harbour for the country. However, it would be many years before it could replace Georgetown, and very likely would result in over-capitalization which Guyana cannot accommodate. It has been also thought that cheap evacuation of bauxite of the Reynolds Guyana Mine could be done by a railway to Linden, and then on GUYBAU system whenever this system is improved, or even on the railway line as it exists today. On the other hand, the 1970 World Bank Report indicates that the dredging of the Berbice River might lead to an expansion of Reynolds' production of the calcined grades of bauxite and of alumina.

c. Essequibo

No information has been found so far on any hydraulics study of this river, which has an estuary some 20 miles wide. It is thought that the estuary bar may permit vessels of over 20 feet draft at high water, and that the cut would be less costly to maintain. The estuary now has a number of timber berths with 20-30 feet of water. The river is navigable by ocean-growing going freighters as far as Bartica at the confluence with the Mazaruni and Cuyuni rivers, some 50 miles from the open sea.

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<sup>7/</sup> Guyana Development Programme 1966-1972 Chapter XVIII  
Transport pages 19 to 21.

In December 1971, an ad hoc committee of government officials<sup>8/</sup> formulated tentative recommendations that (a) only the Essequibo estuary can be dredged for the depth required by the large-size ships (30 feet draft); (b) navigation on the Essequibo river might be practicable for such ships to a locality Lanaballi some 25 miles up river; (c) locating the GUYBAU loading station at that point could facilitate a later construction of the country's deep water harbour.

## 2. Bauxite

This mineral is the most important contributor to export revenue. It is mined by the Guyana Bauxite who operates bauxite dredging plant and alumina plant at Linden (formerly Mackenzie) on the Demerara River, and by the Reynolds Guyana Mines Ltd. at Kwakwani on the Berbice river. Three grades, metal-lurgical, calcined and chemical are exported, mainly to Canada and the United States.

### a) Production and export characteristics

The total exports of these two companies have been as follows (thousand long tons):

	1966	1968	1970	Estimate for 1971
bauxite, calcined	497	523	..	790
bauxite, other	1,531	1,778	..	2,570
alumina	297	266	..	330

The share of Guybau appears to be as follows:

	Average for 1963	Estimated average 1970-1971
bauxite, calcined	520	600
bauxite, other	1,500	1,400
alumina	220	...

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<sup>8/</sup> The composition of the committee has been stated as follows: I.N. Roman, Chief Pilot, Chairman; S. Naraiian, Technical Adviser, Ministry of Economic Development and A.D. Augustin, Chief Economist, Ministry of Trade, members.



It is not clear whether under the envisaged project the deep water facility for bauxite shipping is meant to serve Guybau only or both mining enterprises. The following data should be supplied separately for both enterprises:

i. Projected sales (by main markets) of

- alumina
- calcined bauxite
- metal grade bauxite

for the next 15 years. Account should be taken of steps that would facilitate a change-over to aluminum smelting in the country.

ii. Analysis of the effects which will be caused by supplying other markets than the traditional ones in Canada or U.S. on:

- a) need for stockpiling of reserves, to be done by the mine;
- b) kinds of shipping which will be available to serve the different markets.

iii. comments as to the actual shipping costs and how they affect sales prospects of products other than the metal grade bauxite. It seems that alumina and calcined bauxite are marketed in smaller quantities; and according to some sources the latter is shipped by smaller and special ships for which the present navigation conditions are on the whole adequate.

The above will be preliminary data, for the substantiation of the request, which would have to be elaborated in the course of the project by experts.

b) Special shipping techniques

The following outline may be suitable for a discussion of this question and elaborated upon in the request.

The Caribbean is an important supplier of the base mineral to the North American aluminium industry. The industrial groups are vertically integrated and transportation between bauxite beneficiating alumina processing and aluminium smelting process though often widely separated geographically from each other, remains as an internal part of their operations. An exception recently created, is Guybau, for other of its bauxite markets than the customary one in Canada.

i. Demba

Guybau's predecessor, the Demba, attacked the problem of Demerara navigation by building three bauxite ships of some 8,000 tons each. Other ships take about 4,000 tons of bauxite from Linden, 165 miles up river, per trip and complete loading in Trinidad. The ships must navigate so as to overcome the shallow sections during the high waters <sup>9/</sup>. Demba transshipment station is operated by the Chaguaramas Terminals. The St. Lawrence Seaway in Canada closes in winter for about four months and for this reason these Terminals serve also for stockpiling. Large size ships are employed to tranship bauxite from Trinidad to Canada. The alumina is transhipped in Jamaica.

ii. Reynolds

This firm ships bauxite from Everton, about 4 miles beyond New Amsterdam. Between Everton and Kwakwain mines the ores are moved by barges. Transshipment of bauxite is done in Trinidad and transshipment of alumina in Jamaica.

iii. Present facilities

The request should include information on inventory of the ores handling facilities which are owned by the Companies from the mine to the ships.

This inventory could be commented upon, in order to highlight what is needed, separately

- for optimum operation under present state of inland and short-sea navigation;
- in case the dredged rivers permit inland transfer points, though still at some distance from the mine;
- to establish an offshore transfer point.

For these alternatives account would have to be taken of any stockpiling requirements as may emerge from the information on the main markets to which the ores are shipped.

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<sup>9/</sup> Described in B.J. Smodlaka: Transport and Communications Processing in British Guiana. United Nations, 1964, pages 97 and 98.

3. Estimated costs and benefits

The different studies carried out so far indicate the order of costs and benefits. In the preparation of the request some up-dating might be desirable, for it can assist in a more precise costing of the project.

Recent data compiled by Guybau<sup>10/</sup> indicate the high shipping rates for Guyana bauxite, caused by the shallowness of Guyanese rivers and the existence of mud bars at the mouths which preclude the use of large size vessels. These data could be elaborated upon in the request and supplemented by source references. (It is not sufficient to simply list figures such as US\$1.65 per ton of bauxite from Jamaica compared to US\$9.0 from Guyana).

With regard to the Berbice River navigational channel, which was to cost G\$6.6 million, with annual costs of G\$1.84 to 2.2 million (depending whether "soft" financing was obtained or not), the Reynolds were reportedly prepared in 1962 to pay the government G\$1.73 per ton<sup>11/</sup>. At that time their annual production was 500 thousand tons, which more than doubled by 1969 to 1.1 million tons.

On the Demerara River apparently the dredging costs are substantially higher but so also would be the savings to the Company. At 1962 freight rates the estimates were quoted between G\$3.5 million to about 9.0 million savings per annum depending whether a 30 foot channel or a 25 foot channel were dredged, and whether only the port area was deepened and the bar cut, or whether also the river course was dredged.

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<sup>10/</sup> Note received by the UNDP Resident Representative in January 1972.

<sup>11/</sup> Smodlaka, op.cit. page 114.

C. The Project

A UNDP Special Fund project is envisaged, which would consist of two phases as follows:

Phase I: Examination of alternatives for installing a loading station to handle large-size ships.

- a) It is indicated that one alternative would be to dredge a navigation channel through the mud bars of the estuary and up-stream for a distance to be identified and which would offer a suitable location in the general proximity of the bauxite and alumina plants. There are three rivers that come into question.
- b) The second alternative would be the installation of the station as an off-shore facility within Guyana territorial waters.

Phase II: Detailed design of the selected alternative and elaboration of the economic and engineering studies required to negotiate financial assistance by a bilateral or multilateral lending agency.

Shipping

Apparently the government estimates that ships loading 40 thousand tons of bauxite are to be considered. This needs clarification and the ship design should be defined in proper relation to the markets which are to be served.

Apart from the bauxite transportation problem alone, it is likely that the processing of the ore may be taken at least to the stage of conversion into alumina in the near future. The value added would be about three times the value of bauxite output. Under the conditions of river transport in Guyana even if only alumina was exported, there would still be need to improve the access for ocean-going ships, though the characteristics of such ship may be different. This would also be clarified in the course of the project.

Engineering

It would be possible to determine the exact site for the loading or transshipment facility (and stockpile if necessary) only from the results of the hydraulic surveys. Those done so far should be reviewed and the lacking ones carried out expeditiously. Adequate time should be allowed for these operations and all other measures should be incorporated in the request, on the basis of the experience with the previous surveys. This note of caution is added for the reason that at least some parts of the studies based on those surveys apparently yielded inconclusive results.

D. Related projects

It seems that the government will seek technical assistance for two other projects which are related to the present one:

- a) transport survey and
- b) hydro-electric power survey.

Without unduly burdening the request, adequate detail should be provided, including the studies and other preparations which have been completed, whether by the government alone or with external technical assistance.

E. Costs

From projects on which information has been published, only the order of the cost of the project could be hazarded at this time.

A hydraulic survey of the Essequibo may cost US\$200,000. To this should be added the costs of revising the surveys for the Demerara, about US\$50,000, and a further US\$50,000 for the technical and economic studies. This would result in a total of US\$300,000, for Phase I.

The concentration on the selected alternative worked out in detail, including recommendations for the most appropriate methods of financing and recommendations on government policies may be budgeted at US\$50,000, as the cost of Phase II.

F. The preparatory assistance mission

The request of the Government might be best drafted in cooperation of the Ministry of Economic Development, and a Consultant could be invited to Guyana for about three weeks to carry out the assignment. There is no need to envisage a duration of the mission for any longer than such period though the consultant will then still require a week at UNDP Headquarters for debriefing. The Consultant could be a Port Development Engineer familiar with investment evaluation and of course, with hydraulic studies and hydraulic laboratory work. It would be useful but it is not indispensable if advice could be obtained through a visit to Guyana during the Consultant's assignment of an expert on chartering ships for bauxite. Duration of the visit could be about three days.



