OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

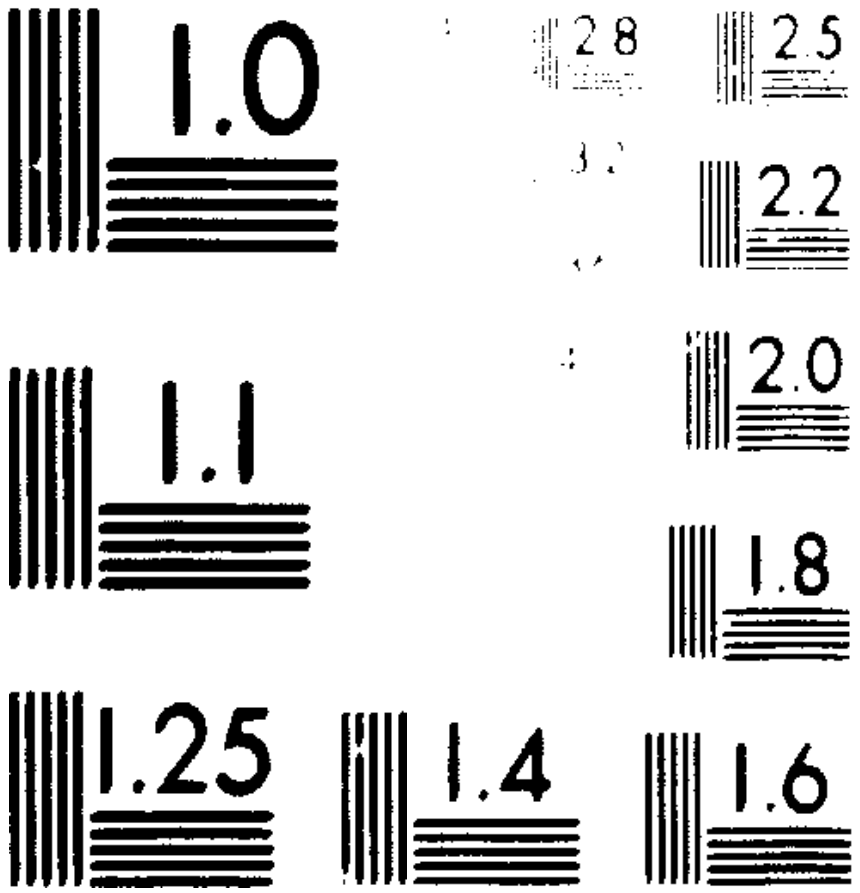
FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org


1.0
2.8
2.5
2.2
1.1
2.0
1.8
1.25
1.4
1.6

RESTRICTED

15 October 1981
ENGLISH

11490

SURINAM.

PRODUCTION OF KAOLIN AND NON-METALLIC MINERALS.

TF/SUR/81/001

SURINAME

Terminal Report *

Prepared for the Government of Suriname by
the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Zdenek A. Engelthaler
UNIDO Technical Assistance Expert
and
Chief Executive of the UNIDO/CSSR Joint Programme in Pilsen

United Nations Industrial Development Organization
Vienna

* This document has been reproduced without formal editing.

Acknowledgement

The UNIDO expert would like to underline that the success of his mission was possible due to very well conducted preparatory activities and supports of UNIDO Headquarters in Vienna and the UNDP Office in Port of Spain. Furthermore, the Suriname Government extended to the expert all possible help in arranging high level meetings, field trips, counterpart assistance and secretarial facilities needed for the successful implementation of the mission.

The UNIDO expert would like to express his thanks especially to

His Excellency Dr. E.H. Dahlberg, Minister of Development
Mr. W. Lim A Po, Chairman of the Steering Committee
Mr. Drs. L. de Rooy, Director, Government Geological and Mining Service
Mr. Ir. R.H. Goossen, Director, Dpt of Industry Development
Mr. Leter, Director, Index
Mr. K.S.A. Ng A Tham, Deputy Director, Dpt of Industry Development
Mr. R. Mahabir, UNDP Liaison Officer, Planning Bureau
Mr. E. Kasimbeg, Process Engineer, Government Geological and Mining Service

During the field trips to kaolin deposits, the UNIDO expert would like to appreciate the positive co-operation of Directors and technical staff of Messrs. Billiton and Messrs. Suralco.

Abstract

The mission was realized as the UNIDO project No TF/SUR/81/001. The purpose of the project was to provide technical assistance to the Suriname Government in the exploitation of non-metallic mineral resources and in the planning of the related industries in the country.

All objectives of the project were fulfilled.

The Government appreciated the tests of selected Suriname non-metallics, carried out by the UNIDO-Czechoslovakia Joint Programme for International Co-operation in the Field of Ceramics, Building Materials and Non-metallic Minerals Based Industries in Pilsen. More tests are being requested. In order to accelerate the industrial development, the Government will require the twinning arrangement to be established between the Suriname Government Geological and Mining Service in Paramaribo and the UNIDO-Czechoslovakia Joint Programme in Pilsen.

The Suriname Government is interested in investments based on the exploitation of local non-metallic raw materials, such as kaolins, clays and silica sands. Therefore, in 1981, the Government will apply to the United Nations Industrial Development Organization in Vienna, through the United Nations Development Programme, Port of Spain, to establish two UNIDO projects for Suriname. The first project for 1982 will deal with the establishing of a ceramic tile plant in Suriname. The second, larger 4 year project to be started in 1982, will deal with the industrial exploitation of non-metallics in Suriname.

The training programmes of Suriname technicians will be a part of both foregoing projects.

There are other non-metallic raw materials in Suriname which will be studied during the forthcoming period, such as kyanites, vermicullites, graphites, clays and sands.

Table of Contents

INTRODUCTION

The Suriname Government requested the United Nations Industrial Development Organization, Vienna - the executing agency for the United Nations Development Programme, in 1979 and 1980 to conduct tests of selected local non-metallic raw materials. The UNIDO-Czechoslovakia Joint Programme for International Co-operation in the Field of Ceramics, Building Materials and Non-metallic Minerals Based Industries in Pilsen was authorized by the Joint Committee to carry out the tests. The report on laboratory tests of Suriname clays, glass sands and kaolins showed encouraging results. Therefore, the Geological and Mining Service, Suriname, shipped additional 5,000 kg of Suriname kaolins as 3 samples from the Onverdacht mine and asked to conduct semi-industrial tests of kaolin washing and upgrading, including their evaluation on possible industrial exploitation. Partial Reports and Summary Report were submitted to Suriname. The Suriname Government then requested the UNIDO-Czechoslovakia Joint Programme's Chief Executive to come to Suriname in order to negotiate all conclusions and recommendations and to assist the local authorities in preparing other projects for the implementation of other possible ventures based on the exploitation of locally available non-metallic natural resources. The UNIDO-Czechoslovakia Joint Programme reports were evaluated positively. The Suriname authorities requested to carry out tests of other raw materials, such as kyanites, silica sands and clays as the result of joint activities during the UNIDO mission to Suriname. The twinning arrangement between the Government Geological and Mining Service, Paramaribo, and the UNIDO-Czechoslovakia Joint Programme, Pilsen was requested as the mean for the acceleration of industrialization in Suriname.

The Kaolin Steering Committee decided that the first priority was the establishing of a ceramic tile plant (producing wall and floor tiles) with the annual capacity of 200,000 m^2 which should cover local demand. The UNIDO assistance was requested in the project "Establishment of the Ceramic Tile Plant" in 1982, total estimated costs amounted to US $ 35,000. This project was composed of two missions to Suriname of an industrial economist and an expert in production and technology. Provisions for training of Suriname technicians abroad and for raw material testing were included.

To follow the comprehensive evaluation of local kaolins, sands, kyanites, clays and other non-metallics and to implement their industrial exploitation, the Suriname Government decided to request the UNIDO assistance in the 4 year project "Industrial Exploitation of Non-metallics" started on 1 July 1982. Total estimated costs amounted to US $ 639,000, US $ 150,000 of which should be covered by the Suriname authorities for the purchase of necessary laboratory equipment.

The Suriname Government was interested in the development of training programmes as a part of both foregoing projects.

Two of main kaolin deposits were visited. In the locality of Onverdacht, bauxite mining rights belonged to the Billiton Company. With the existing mining equipment, the company could extract yearly, jointly with bauxites, another 350,000 tons of kaolins. In Moengo, bauxite mining rights were issued for the Suralco Company. Large deposits of kaolin

reserves are opened and the company conducted the evaluation of kaolin deposits. Messrs. Huber, U.S.A. also visited these deposits.

Laboratories of the Geological and Mining Service were visited and available equipment evaluated. The list of equipment, necessary for the accomplishing of existing facilities, was handed over to the Geological and Mining Service as the basis for the extension necessary for the evaluation of non-metallics. The basic system for evaluating technological properties of locally available clays was introduced.

Very important negotiations were held with the governmental officials in connection with the future industrial exploitation of Suriname natural non-metallic resources, such as with

- INDEX,
- Ministry of Development,
- Kaolin Steering Committee,
- Government Geological and Mining Service.

The positive results of the mission were achieved as joint efforts of all interested representatives of the Suriname Government, UNDP assistance during the expert's mission to Suriname and the UNIDO expert's activities in Paramaribo and in kaolin mines.

I. FINDINGS AND RECOMMENDATIONS

1. The Suriname Government is interested in investments based on the exploitation of local non-metallic raw materials, such as kaolins, clays and glass sands.

2. The Suriname Government has appreciated the results obtained by the UNIDO-Czechoslovakia Joint Programme in Pilsen in conducting the tests of Suriname raw materials.

3. In order to speed up further development, the Suriname Government is requesting to establish the twinning arrangement between the Suriname Government Geological and Mining Service in Paramaribo and the UNIDO-Czechoslovakia Joint Programme in Pilsen.

4. The Suriname Government will apply to UNIDO Vienna, through UNDP Port of Spain, to authorize the UNIDO-Czechoslovakia Joint Programme in Pilsen to carry out further necessary tests of crystal glass manufactured from Suriname glass sands, of Suriname kyanites and kaolins.

5. In 1981, the Suriname Government will apply to UNIDO Vienna, through UNDP Port of Spain, to establish two UNIDO projects in Suriname in order to accelerate the industrial development based on the exploitation of locally available non-metallics:
   (a) Establishing of a Ceramic Tile Plant
   1982, estimated total costs amount to
   US $ 35,000

(b) Industrial Exploitation of Non-metallics
1982 through 1986, estimated total costs amount to US $ 639,000 allocated for the four year project

6. The Suriname Government has requested that a training programme may be realized for local nominees in the UNIDO-Czechoslovakia Joint Programme and the Research Institute for Ceramics, Refractories and Non-metallic Raw Materials in Pilsen, Czechoslovakia, as a part of both foregoing UNIDO projects.

7. The Suriname Government is interested in the following industrial activities based on existing local non-metallic raw materials:

(a) Development of ceramic industry
(b) Exploitation of existing extensive kaolin deposits directly in the ceramic and refractory industries or after washing and refining as fillers and/or pigments in the paper, rubber and cable industries
(c) Establishment of the glass manufacture for the exploitation of locally available extensive geological reserves of high purity silica sands
(d) Exploitation of other non-metallics available in the country, such as clays, graphites, vermiculites, pegmatites and kyanites
(e) Completion of existing laboratories of the Government Geological and Mining Service, for technological evaluation of available non-metallics

II. SUBSTANTIVE SECTIONS

1. Kaolin Steering Committee
2. Suriname Government Geological and Mining Service, Paramaribo
3. Kaolin deposits in Suriname
4. Building Brick Manufacture KERAM in Suriname
5. Index, Paramaribo
6. Requests of the Suriname Government for the UNIDO-Czechoslovakia Joint Programme
7. Cost estimates of the required UNIDO project "Establishing of a Ceramic Tile Plant" including two Job Descriptions
8. Cost estimates of the required UNIDO project "Industrial Exploitation of Non-metallics" including Job Description for the Adviser in the Industrial Exploitation of Non-metallics
9. Memorandum to H. E. Minister for Development, Dr. E. H. Dahlberg, dated 9 November 1961

1. Kaolin Steering Committee

(30 October 1981)

The Kaolin Steering Committee of the Ministry of Development was represented by the following persons

Mr. W. Lim A Po, Chairman of the Kaolin Steering Committee
Mr. Ir. K.S.A. Ng A Tham, Deputy Director, Ministry of Development
Mr. E. Kasimbeg, B.Sc., Process Engineer, Government Geological and Mining Service

and

Mr. Z. A. Engelthaler, UNIDO Technical Assistance Expert and Chief Executive of the UNIDO-Czechoslovakia Joint Programme in Pilsen

Mr. Z. A. Engelthaler briefed the Steering Committee on the results of the raw material tests carried out by the UNIDO-Czechoslovakia Joint Programme in Pilsen.

The following subjects were negotiated afterwards:

(a) Following the encouraging test results of Suriname kaolins and clays, the Steering Committee decided that a UNIDO project on establishing the ceramic tile manufacture (wall and floor tiles) would be the first priority. Local annual consumption amounted in average to 200,000 m^2 of ceramic tiles imported mostly from Brazil. It was expected that the starting capacity could be then extended

to cover the need of selected neighbouring countries' markets. To review all important questions, the Feasibility Study is to be made by the Industrial Economist during a 2-month mission to Suriname and the assistance of the UNIDO Expert in production and technology of ceramic tiles is to be extended to the Suriname authorities during a 3-week mission to Paramaribo in April 1982. Individual training of 2 Suriname nominees during 4-week period will be requested through UNDP Port of Spain by the UNIDO Training Section Vienna.

(b) The tests of Suriname kaolins made by the Joint Programme in Pilsen indicated different industrial exploitation possibilities. Messrs. Billiton and Messrs. Suralco (subsidiary of Alcoa) are doing their own exploration work. Messrs. Huber, U.S.A. were also interested in Suriname kaolin deposits in Moengo. The following directions were discussed:

1) Fillers for paper making
2) Fillers for rubber and cable manufacture; the local authorities have not yet studied the world market potentiality.
3) Refractory grog and fireclay making; again, the new way of commercial exploitation has not yet been considered but the UNIDO expert was requested to conduct round table discussion with the Billiton and Suralco Companies.
4) Ceramic manufacture based on the exploitation of local raw materials should be developed in Suriname. The first step was the ceramic tile project. A 4-year UNIDO project proposal should be drafted by the

UNIDO expert as to create the basis for co-ordination, assisting a further development based on local natural resources.

(c) The Suriname Government was interested in establishing crystal glass manufacture based on locally available first-class sands provided that a partner is found who would be able and willing to participate in the joint venture as far as technology and marketing is concerned. This partner should preferably be from Czechoslovakia.

(d) The Government expected that laboratory facilities, available locally after being completed, should be exploited for conducting all necessary tests of non-metallics in the future.

(e) The Suriname Government expected that the twinning arrangement should be made with the UNIDO-Czechoslovakia Joint Programme in Pilsen.

2. Government Geological and Mining Service of Suriname

Visit and negotiations were held on Saturday, 31 October 1981.

Present:

Drs. L. de Rooy, Director, Suriname Geological and Mining Service

Mr. Ir. R. H. Goossen, Director, Dpt of Development

Mr. W. Lim A Po, Chairman of the Kaolin Steering Committee

Mr. E. Kasimbeg, B.Sc., Process Engineer, Geological and Mining Service

Mr. D. Bradley, Acting Chief of Laboratories

and

Mr. Z. A. Engelthaler, UNIDO Technical Assistance Expert and Chief Executive of the UNIDO-Czechoslovakia Joint Programme in Pilsen

Mr. K. E. Burke, Chief of the laboratory (UNDP) was on leave

1) The existing laboratory facilities were inspected. The Geological and Mining Service is equipped with well functioning laboratories in which all chemical, microscopy and mineralogical analyses are made. Laboratories are managed very well. Samples sent from the fields, such as rocks, ores, sands, salts and clays get their numbers and then are processed by grinding, crushing, pulverizing, drying, fusion, etc. Average samples are then analyzed by the X-ray flourescence, atomic absorption or X-ray diffraction methods.

Laboratories are equipped with a 2 cubic meter drier (up to 110°C) with a small laboratory kiln (up to 1,200°C) dimensions 25 x 15 x 30 cm, other 2 small laboratory ovens for fusion of samples and with a small laboratory press for tablet pressing.

2) To enable the Geological and Mining Service to conduct testing and researching in ceramic and non-metallic minerals, the present laboratories will be expanded. The UNIDO adviser handed over the list of equipment to be purchased for technological tests of non-metallics.

3) The UNIDO-Czechoslovakia Joint Programme Report on Washing Tests and Technological Evaluation of Suriname Kaolins was appreciated as a very good one. Different ways of industrial and commercial exploitation of Suriname kaolins and other non-metallics can be applied. Therefore, the Suriname Government will apply to UNDP for a 4-year project in which all ways might be realized. Project costs are estimated to be US $ 639.000.

4) The Suriname Government will submit the official request for twinning arrangement with the Joint Programme in Pilsen. The governmental requests towards the UNIDO-Czechoslovakia Joint Programme are specified.

5) Laboratories of the Geological and Mining Service have elaborated the technology of red brick making applying 3 local red clays; semi-industrial tests

conducted in Guyana showed very promising results and, therefore, a modernization of brick industry is expected.

The UNIDO adviser submitted all requested information related to the brick industry to the local authorities.

6) The basic system of evaluating technological properties of locally available clays was introduced.

3. Kaolin deposits in Suriname

There are more than 10 kaolin deposits in Suriname /Annex 1/. The best quality of kaolins refers to those which occur under a layer of bauxite. Those deposits are

1. Moengo - bauxite mining rights of which belong to the Suralco Company
2. Onverdacht - bauxite mining rights of which belong to the Billiton Company
3. Several localities inside the country; no mining rights have yet been established.

As far as geological reserves are concerned, their evaluation is being carried out. In general, there is no doubt that kaolin reserves in Suriname are very extensive. People from the Geological and Mining Service, Paramaribo, speak of millions of tons. It can be taken for granted that the quality of kaolins in each locality is considerable.

The contact between the bauxite and the underlying kaolin is in general rather sharp but the plane of contacts is irregular and locally the bauxite forms deep pockets in the kaolin. The genesis of bauxite as well as kaolin deposits has not yet been defined. The untill now made analyses indicate that the kaolins were formed of different types of rocks and under different conditions.

The Billiton Company (Mr. A. R. Goede, Finance Manager and other technical staff) . The Company owns mining rights in one bauxite mining area in Onverdacht, a part of which has already been extracted. They mine in a 1,700 m wide stripe

excavating 120,000 m^2 of area with bauxite annually. With the present mining capacity, they have evaluated prooven reserves for other 12 years but the deposit has net yet been limited.

Company's geologists believe that the kaolin deposits are sedimented ones in Suriname. With the present equipment the Company is able to extract additional 350,000 tons of raw kaolin yearly, otherwise the excavated pits with underlying kaolins are being filled with the overburden so that kaolin reserves dissappeare under a disordered layer of overburden, which creates big economic losses for the future extraction of kaolin.

The Company dries excavated bauxite in a rotary drier at the temperature of 160°C and ships it directly by sea transport.

In the mine, a stripe of about 2 - 3 m of overburden is created by a plastic grey clay which gives the impression to be a swampy clay. A sample of 5 kg will be taken by the Geological and Mining Service, Paramaribo, and sent for testing to the UNIDO-Czechoslovakia Joint Programme in Pilsen as such a clay might be needed for the development of local ceramic manufacture.

The Suralco Company, Suriname Aluminium Company (Mr. A. A. Meijer, Works Manager, Moengo, and Mr. Wong, Company's geologist). Suralco initiated a geological exploration programme to evaluate the commercial potential of kaolins which underlie the bauxite deposits in the Moengo area /Annex 2/. The drilling programme was devided into

3 phases, the third part of which was started on 28 August 1981 and will be finished in the same year. The most promising results, as far as the quality of kaolins is concerned, were achieved from the Rikanau hill which, therefore, was drilled in all three phases /Annex 3/. Preliminary results show the kaolin brightness to be up to 83 which, after chemical bleaching, can go up to 90 what will be the first-class raw material for coating pigments. Messrs. Huber, U.S.A., visited the Moengo area some time ago and took samples from the Rikanau mine.

There is a very little overburden above the bauxite deposits in Moengo. Therefore, excavated high area of bauxite shows kaolin on the surface which, after a certain time, is replanted with needle or leave trees. Hence, the kaolin reserves are very extensive and accessible in all areas from which bauxite was mined out. Therefore, kaolin extraction costs will be rather low.

The mined out bauxite is then delivered by railway to a plant in the Moengo city where it is crushed in a hammer mill and dried and/or calcined in 5 rotary kilns at the temperature of about 1,000°C.

The geology of kaolin deposits in Moengo is an interesting one. The layer of kaolin, undergoing bauxite deposits, is created as the secondary sedimented deposit, which can be visually seen in different horizontal layers. Its thickness amounts to 12 - 15 meters. But under this sedimented kaolin, there is another thick primary layer of partly kaolinized granites which shows lower yield of extraction of pure

kaolinite and is more contaminated with colouring oxides. Therefore, for industrial exploitation of Moengo kaolins in the paper industry, the upper layer of kaolin is to be taken into consideration.

4. Building Brick Manufacture KERAM in Suriname

About 26 km far from Paramaribo in the direction to the International Airport, there is a private factory, owned by Messrs. Abdulhak, Ramdihal and Andhoe, producing plain bricks, perforated bricks, roofing tiles and paving blocks which, beside the concrete block manufacture, is supplying local market with building materials.

As raw materials, two basic components are blended

1 volume of red sand excavated near the plant,
2 volumes of plastic clay which is brought from the overburden of a Suralco bauxite mine.

The mass preparation hall is equipped quite well. In the established ratio, both raw materials are blended on a belt which carries them into the single cylinder mill from where the green mixture falls into the double shaft mixer, it is watered, deaired in the vacuum chamber and extruded through the appropriate mouth. Extruded green products are then cut off. They are of a good appearance. Roofing tiles are repressed on a hand operated device.

Drying is made in open air driers. Dry bricks are sent into the provisional kilns wood fired from the bottom. To have all bricks fired, the cycle of one kiln amounts to 8 days. Fired bricks show good appearance, good mechanical properties and high porosity.

The daily output of 40,000 bricks is only a part of the total capacity of the factory. The limiting part of the processing are kilns. As we were informed, the owner intends

to build up normal wood-fired kilns to cover existing demand. There is no doubt that the quality of products will go up, especially that of paving blocks which should be more vitrified for their application.

5. Index

Negotiations with the Director of Index were held on Wednesday, 4 November 1981 in Paramaribo.

Present:

Mr. Leter, Director, Index
Mr. W. Lim A Po, Chairman of the Kaolin Steering Committee
Mr. E. Kasimbeg, Process Engineer, Geological and Mining Service, Paramaribo

and

Mr. Z. A. Engelthaler, UNIDO Technical Assistance Expert and Chief Executive of the UNIDO-Czechoslovakia Joint Programme in Pilsen

The following conclusions were made during the meeting:

1) The Suriname Government is interested in investments based on local non-metallic raw materials.

2) The Government has appreciated the results obtained by the UNIDO-Czechoslovakia Joint Programme in Pilsen in conducting tests of Suriname raw materials. In order to speed up further development, the Government will apply to UNIDO Vienna, through UNDP Port of Spain, for establishing the twinning arrangement between the Geological and Mining Service, Paramaribo and the UNIDO-Czechoslovakia Joint Programme, Pilsen.

3) The Government will apply for conducting further tests of Suriname raw materials in the UNIDO-Czechoslovakia Joint

Programme, namely

(a) glass sands - semi-industrial tests to produce crystal glass table ware

(b) kyanites - basic laboratory tests as kyanites have not yet been tested

(c) clays - basic laboratory tests of newly discovered clays

4) The Government will apply, in 1981, to UNIDO Vienna, through UNDP Port of Spain, to establish 2 UNIDO projects for Suriname:

(a) Establishment of a Ceramic Tile Plant, 1982
estimated total project costs - US $ 35,000, composed of 2 missions to Suriname (industrial economist and expert in production and technology), training of 2 nominees in Europe and raw material testing

(b) Industrial Exploitation of Non-metallics, 1982 - 1986
estimated total project costs - US $ 639.000 for the 4-year project started 1 July 1982, terminated 30 June 1986, composed of project co-ordinator, short term consultant missions, expert travel, subcontractor activities, including tests abroad, training of local staff abroad and purchase of laboratory equipment

5) The training programmes for Suriname technicians will be defined as the parts of both UNIDO projects.

6) The Suriname Government requests UNIDO Headquarters to be supplied with more copies of the UNIDO-Czechoslovakia Joint Programme test reports on Suriname raw materials.

6. Requests of the Suriname Government to the UNIDO-Czechoslovakia Joint Programme in Pilsen

The Suriname Government requests the UNIDO-Czechoslovakia Joint Programme in Pilsen to extend its assistance in the following steps:

1) To conduct laboratory tests of Suriname kyanites.
2) To carry out semi-industrial tests for crystal glass table ware manufacture with Suriname glass sands taken from 2 localities. The shipping costs of raw materials will be covered by the Suriname Government.
3) To assist in finding out a possible glass company, preferably from Czechoslovakia, which might be interested in the joint establishing of crystal glass manufacture in Suriname.
4) To recommend potential suppliers of laboratory equipment for establishing a technological laboratory as a Division of the Geological and Mining Service Laboratories in Suriname.
5) To assist the Government in collecting estimated prices of technological equipment for a ceramic tile making plant, 200,000 m^2 annual capacity, electrically heated kilns, from potential European suppliers.
6) To agree with the establishing of the twinning arrangement between the Geological and Mining Service, Paramaribo and the UNIDO-Czechoslovakia Joint Programme, Pilsen.
7) To send a copy of the Report on Washing Tests of Suriname Kaolins to the Government.
8) To supply the Government with the UN publication on Feasibility Study preparation.
9) To conduct tests of swampy clays from a Billiton bauxite mine.

10) To provide the Government with the publication on Art of Composing Wall Tile Bodies".

7. Cost Estimates and Job Descriptions for the required UNIDO project "Establishment of the Ceramic Tile Plant"

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Establishment of the Ceramic Tile Plant

/Estimated Costs - US $ /

		US $
1. Industrial Economist, 2 month mission to Suriname to conduct the Feasibility Study		
	Expert costs 2 m/m	10,800
	Travel	2,000
	Total	12,800
2. Expert in Production and Technology 3 week mission to Suriname to provide technical assistance		
	Expert costs 3 m/w	4,050
	Travel	2,000
	Total	6,050
3. Training; 2 Surinamese, 1 month each		
	Training costs 2 m/m	2,000
	Travel	4,000
	Total	6,000
4. Raw material testing;		
	Testing fees	4,500
	Shipping costs	500
	Total	5,000
Total 1+2+3+4		29,850
	say	30,000
5. 14 per cent Overheads		4,200
6. Unforeseen		800
Grand total 1+2+3+4+5+6	**US $**	**35,000**

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

JOB DESCRIPTION

Post title: Economic Adviser in Establishing Ceramic Tile Plant

Duration: 2 months

Date required: First quarter of 1982

Duty station: Paramaribo, with travel within the country

Purpose of project: To carry out Feasibility Study on establishing ceramic tile manufacture and to advise local Government in the planning for the establishing of related industries in the country.

Duties: The expert during his assignment will be attached to the Ministry of Development of the Suriname Government and to the Steering Committee established for the implementation and establishment of the Ceramic Tile Plant, and will be expected to

1) study all former available reports on raw materials and technologies for wall and floor tile manifacture

2) collect data necessary for the Feasibility Study such as

   (a) to review all available suitable raw materials
   (b) to evaluate the market potentiality for ceramic tiles, dinnerware, sanitary ware and artistic ceramics and to forcast the possible neighbouring countries needs
   (c) to collect all engineering data necessary for the establishing of the ceramic tile plant in Suriname

3) conduct the Feasibility Study for the establishment of the ceramic tile plant

4) assist the Government in preparing request for quotation of the manufacturing equipment for the new plant

5) assist the Government in recommending other ceramic manufactures to be established in Suriname

6) train the counterparts in conducting Feasibility Studies

The expert will also be expected to prepare a final version of the Feasibility Study and his Final Report setting out the findings of his mission and his recommendations to the Government for further actions which might be taken.

Qualifications: An industrial economist experienced in the establishing of tile and ceramic manufactures

Language: English

Background information: The UNIDO-Czechoslovakia Joint Programme in Pilsen, carried out tests for the evaluation of Suriname clays, glass sands and kaolins. The results obtained indicated the technical feasibility of industrial exploitation of Suriname non-metallic raw materials. During the mission of UNIDO expert (TF/SUR/81/001) in 1981, the Government decided that the first priority would be given to the establishing of the wall and floor tile plant with the annual capacity of 200,000 m^2 of tiles 100 x 200 mm, 100 x 100 mm, 150 x 150 mm and 200 x 200 mm. The future extension for possible export to neighbouring countries is to be taken into consideration as well as possible completion of the production assortment by dinnerware, sanitary ware and artistic souvenirs.

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

JOB DESCRIPTION

Post title: Expert in Production and Technology of Ceramic Tiles (wall and floor tiles)

Duration: 21 days

Date required: April 1982

Duty station: Paramaribo, with travel within the country

Purpose of project: To provide technical assistance to the Suriname Government in testing, researching, evaluation and industrial exploitation of selected ceramic raw materials and in the planning for the establishment of ceramic industry in Suriname.

Duties: The expert during his assignment will be attached to the Ministry of Development of the Suriname Government and to the Steering Committee established for the implementation of new industrial activities based on the exploitation of locally available non-metallics, and will be expected to

1) brief the Government on the results of raw material tests carried out by the UNIDO-Czechoslovakia Joint Programme in Pilsen (ceramic clays, kyanites, crystal table ware manufacture)

2) recommend potential world suppliers of ceramic laboratory equipment and assist the Government in selecting the best ones

3) assist the Government in preparing request for quotation of the ceramic laboratory equipment

4) recommend potential world suppliers of manufacturing equipment for the ceramic tile plant, equipped with electrically heated kilns

5) train local counterparts in preparing ceramic blends of local raw materials for different ceramic manufactures

6) deliver lectures on ceramic technologies in the University of Suriname

7) evaluate locally made tests based on the UNIDO-Czechoslovakia Joint Programme reports and recommendations and suggest further steps for technology preparation

8) identify training needs and recommend programmes for training of local personnel

The expert will also be expected to prepare his Final Report setting out the findings of his mission and his recommendations to the Government and for further actions which might be taken.

Qualifications: A technologist experienced in testing, researching and production of ceramic wall and floor tiles

Language: English

Background information: The UNIDO-Czechoslovakia Joint Programme in Pilsen, CSSR, carried out tests for the evaluation of Suriname clays, glass sands, kaolins, kyanites and other non-metallics. The results obtained indicated the feasibility of exploration of Suriname non-metallic raw materials. During the mission of UNIDO expert (TF/SUR/81/001) in 1981, the Suriname Government decided the first priority to be in establishing the wall and floor tile plant with the annual capacity of 200,000 m^2 of tiles 100 x 200 mm, 100 x 100 mm, 150 x 150 mm and 200 x 200 mm. The future extension of the plant for possible export to neighbouring countries is to be taken into consideration as well as possible completion of the production assortment by dinnerware, sanitary ware and artistic souvenirs.

8. Cost Estimates and Job Description for the required UNIDO project "Industrial Exploitation of Non-metallics"

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Industrial Exploitation of Non-metallics

/Estimated costs - US $ /

	1982 6 months	1983	1984	1985	1986 6 months
I.					
Project co-ordinator	32,400	64,800	64,800	64,800	32,400
Short-term consultants	6,200	12,400	12,400	12,400	6,200
Expert travel	2,000	6,000	6,000	6,000	2,000
Subtotal I	40,600	83,200	83,200	83,200	40,600
II.					
Subcon-tractors	-	25,000	25,000	-	-
Training	-	8,000	8,000	4,000	-
Laboratory equipment	-	60,000	60,000	30,000	-
Subtotal I+II	40,600	176,200	176,200	117,200	40,600

Project costs 1982 through 1986	US $ 550,800
14 per cent Overheads	US $ 77,100
Unforeseen	US $ 11,000 +/
Total project costs 1982 through 1986	US $ 638,900
says	US $ 639,000

+/ Including the purchase of the project car needed for field trips.

Note: Laboratory equipment value of 150,000 US $ to be supplied by the Suriname Government

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

JOB DESCRIPTION

Post title: Adviser in the Industrial Exploitation of Non-metallics

Duration: 4 years

Date required: 1 July 1982

Duty station: Paramaribo, with travel within the country and possible international travel

Porpose of project: To advise the Suriname Government in the industrial utilization of local non-metallics, such as in dressing of kaolin, application of kaolins in the paper, rubber and ceramic and refractory industries, utilization of clays in the ceramic and brick industries, exploitation of glass sands, kyanites and others.

Duties: The expert will be attached to the Ministry of Development of the Suriname Government and to the Steering Committee established for the development of new industrial activities based on locally available non-metallic raw materials, and will be expected to

1) study previously elaborated reports on Suriname non-metallics
2) advise and guide all additional exploration work necessary for the verification of the quantity and quality of kaolins, clays, glass sands and kyanites
3) define additional equipment for the Geological and Mining Service necessary for the commercial and technical evaluation of local non-metallic raw materials as well as for testing ceramic and refractory product
4) prepare a test manual for testing and training of local staff of the Geological and Mining Service in conducting all tests
5) co-operate with the assigned consulting companies abroad; determine with them all details for the exploitation method to be adopted for local conditions and develop with them the best

manufacturing process to be applied for up-grading, dressing and industrial utilization of selected Suriname non-metallics

6) advise energy inputs for different manufacturing processes and select the most economic ones
7) determine and test the necessary water resources available for processing selected non-metallics
8) conduct feasibility studies for different opportunities of commercial exploitation of locally available non-metallics
9) prepare request for quotation for evaluated industrial ventures, including specification of process machinery and equipment for international bidding
10) study and advise the most economic way to transport and ship products locally as well as abroad
11) advise other possibilities of industrial exploitation of presently known but also newly discovered non-metallics
12) define the necessary terms of reference for additional short term assistance for particular advice in the establishment of plants
13) maintain connections with the UNIDO-Czechoslovakia Joint Programme in Pilsen in questions of raw material testing, energy consumption and industrial processing
14) prepare the programme for training Suriname staff in different industrial processings of non-metallics
15) deliver lectures on kaolin refining and on ceramic and refractory technologies in the University of Suriname
16) advise in further international assistance

Language: English

Qualifications: Chemical or Silicate Chemistry Engineer or equivalent with extensive knowledge and experience in non-metallic raw material dressing, up-grading, in researching manufacturing technologies and in applications of non-metallic raw materials and ceramic and refractory products. Experience in Feasibility Study making and in training is essential.

Background information: The Government of Suriname requested the United Nations Industrial Development Organization, the executing agency for the United Nations Development Programme, to carry out tests of selected non-metallic raw materials. The UNIDO-Czechoslovakia Joint Programme for International Co-operation in the Field of Ceramics, Building

Materials and Non-metallic Minerals Based Industries in Pilsen was authorized to carry out tests of Suriname clays, glass sands, kaolins and kyanites. Performed tests were encouraging and the Suriname authorities sent another shipment for semi-industrial tests of local kaolins which showed that Suriname kaolins coulb be utilized in the paper, rubber, cable, refractory and ceramic industries. Glass sands of Suriname show very high purity and their main composition is favourable for glass making. Kyanites can be exploited in the refractory industries. The expert will advise the Government in co-ordinating activities in the field of non-metallics and carry out jointly specific duties as mentioned above.

9. Memorandum

To: H. E. Minister for Development, Dr. E. H. Dahlberg

From: Z. A. Engelthaler, UNIDO Technical Assistance Expert and Chief Executive of the UNIDO-Czechoslovakia Joint Programme in Pilsen

Subject: Industrial exploitation of Suriname kaolins

I have been pleased to have the opportunity to brief your officials on the results obtained during the testing of Suriname non-metallics in the UNIDO-Czechoslovakia Joint Programme in Pilsen, to analyze the situation in Paramaribo and to assist your Government in further steps to be taken. I would like to draw your attention to the following facts:

1. The present technology of extracting bauxites in the Onverdacht area is based on the fact that excavated bauxite pits with underlying kaolins are being filled again with overburden so that big economic losses are created for the future extraction of kaolin from these pits.

2. Kaolin deposits in Moengo show higher brightness and are very well accessible in all extracted bauxite mines.

3. Aside the paper industry, Suriname kaolins also show very good properties for the application in the rubber, cable and refractory industries.

   The rubber poisons, contaminating Suriname kaolins, are up to 10 times lower than requested by European Standards.

   Refractoriness of Suriname kaolins exceeds P.C.E. 35, i.e. 1,770°C and kaolins show white and off-white colour after firing as their content of colouring oxides is very low.

Since Suriname kaolins in the raw position contain over 97 per cent of Kaolinite and are compact, they are suitable, after extracting, to be crushed, screened, dried and fired for a first-class refractory grog for the manufacture of high grade fireclays.

4. I recommend to pay attention also to the marketing questions of commercial exploitation of Suriname kaolins in the refractory industries as refractory and ceramic manufactures can successfully utilize Suriname kaolins without any washing and refining as they are pure enough to be exploited directly.

5. The first step might be to export extracted kaolins to refractory grog making plants, as low content of fluxing oxides in your kaolins predetermined them for the refractory fireclay technologies with the high resistance to corrosion. The second step might be in firing refractory grog locally in Suriname in a rotary kiln with the firing temperature up to 1,400°C.

6. All industrial and commercial possibilities of exploitation of local non-metallics will be then elaborated in the 4-year UNIDO project requested by your authorities to be opened 1 July 1982.

7. The first priority is being given to the Ceramic Tile UNIDO project, which should be completed during 1982 with the presence of an industrial economist and of an expert in production and technology.

Being extremely sorry that my mission came across your obligations abroad,

I remain,

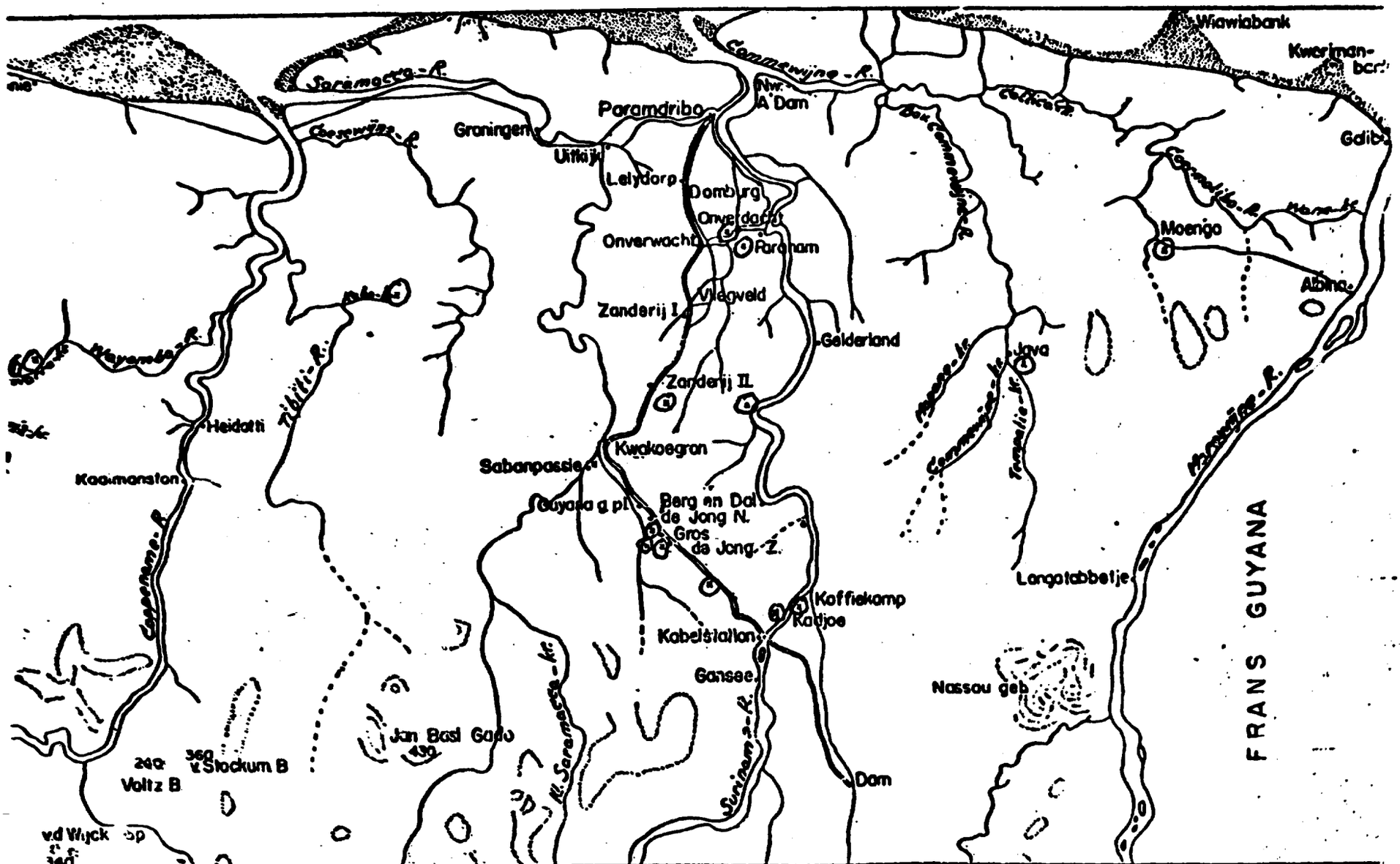
Sincerely yours,

Zdeněk A. Engelthaler

III. ANNEXES

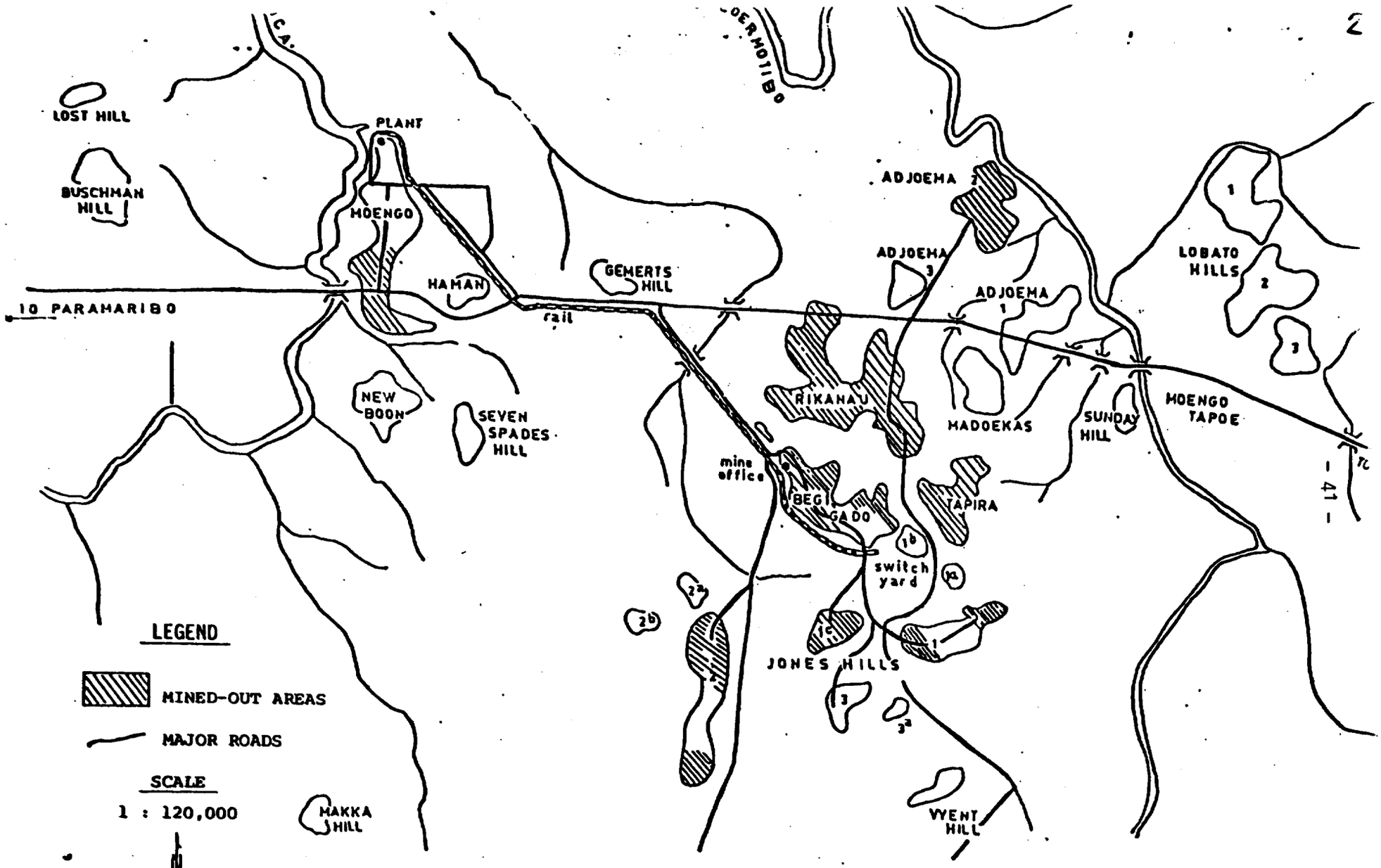
1. Known Kaolin Deposits in Suriname
2. Mined-out Bauxite Areas in Moengo, Suriname
3. Drilling Programme of the Rikanau Mine

Annex I

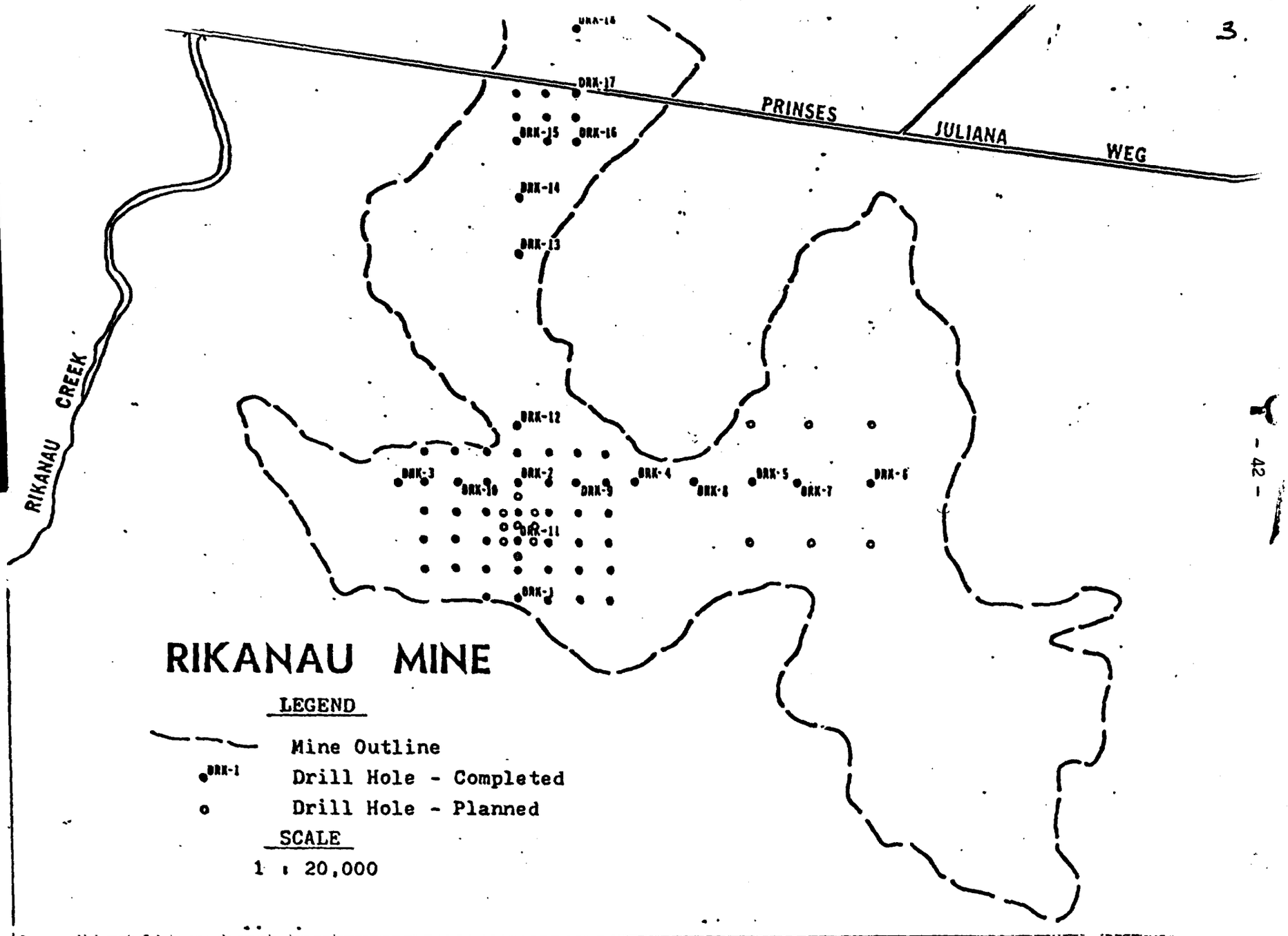


Geol. Mijnbk. Dienst | afd.

Bekende "kaolien" vindplaatsen
(KNOWN "KAOLIN" DEPOSITS)



MINED-OUT BAUXITE AREAS
MOENGO, SURINAME


PRINSES JULIANA WEG
RIKANAU CREEK
DRK-17
DRK-15
DRK-16
DRK-14
DRK-13
DRK-12
DRK-3
DRK-2
DRK-4
DRK-5
DRK-6
DRK-10
DRK-9
DRK-8
DRK-7
DRK-11
DRK-1
RIKANAU MINE
LEGEND
Mine Outline
DRK-1 Drill Hole - Completed
Drill Hole - Planned
SCALE
1 : 20,000