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18840

DP/ID/SER.A/1443
22 February 1991
ORIGINAL: ENGLISH

FEASIBILITY ANALYSIS UNIT FOR PRE-INVESTMENT STUDIES
(NATIONAL INVESTMENT BANK)

DP/GHA/87/026/11-57

GHANA

Technical report: Conclusions and recommendations, including
pre-feasibility analyses of various projects,
for cement and lime-based products*

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

Based on the work of Henrik Carlsen, chemical engineer

Backstopping officer: U. Loeser, Feasibility Studies Branch

United Nations Industrial Development Organization
Vienna

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Explanatory notes:

BHOC	Bank for Housing and Construction
BRRRI	Building and Road Research Institute, Kumasi
GHACEM	Ghacem Ltd. (Cement Grinding Plants in Tema and Takoradi)
CHASTINET	Ghana National Scientific And Technological Information Network
GIHOC	Ghana Industrial Holding Corporation
GSB	Ghana Standards Board
GSD	Geological Survey Department
PIB	Prices and Incomes Board
NBSSI	National Board for Small Scale Industries
NIB	National Investment Bank, Accra
UNDP	United Nations Development Programme
MT	Metric tonnes
TPD	Metric tonnes per day
TPY	Metric tonnes per year
USD	U.S. dollars

ABSTRACT:

Post title: Chemical Engineer (cement and lime-based products)

Project No.: DP/GHA/87/026/11-57

Objective: To evaluate available local reserves of limestone, kaolin and talc and prepare pre-feasibility studies for projects based upon the utilization of these minerals (refer the Job description Annexe I)

Duration: 2 months divided into two missions each with the duration of 1 month

Main conclusions and recommendations from first visit to Ghana:

The survey of the resources of the three types of raw materials referred to in the job description shows that considerable reserves exist of limestone and kaolin, whereas economic reserves of talc have so far not been identified.

Limestone occurs in ample quantities at Nauli near the ocean coast in the western region and in smaller deposits in a number of other locations. However, the Nauli limestone is covered by an excessive amount of overburden about 20 meters deep, which will add to the cost of mining and may be a major obstacle for exploitation of the deposit in industrial scale operation.

Some of the other deposits of limestone may be suitable for a small scale production of clinker in the northern part of the Country in which the cost of cement is at present high due to the long distance of transport from the existing cement grinding plants. The limestone can also be used for production of composite cement, quick-lime, hydrated lime, calcium carbonate (precipitated) and for a number of other applications within industry and agriculture.

An alternative source of raw material for local production of clinker, quicklime or other lime-based products is represented by the occurrences of deposits of oyster shells along the banks of the lower course of the Volta River and around lagoons in the costal regions of the country. The quantity of oyster shell within these deposits has not been established by any in depth survey, but seems to be several million tonnes of almost pure calcium carbonate.

Substantial reserves of kaolin occur in the southern part of the Country but are only exploited in a small scale for the manufacture of ceramics and as a filler in paint, paper, rubber, pharmaceuticals and other locally produced materials.

It is recommended to encourage the reconstruction of the kaolin processing plant at Saltpond Ceramics Ltd., which is at present out of operation, and to explore the feasibility of a larger scale mining and processing operation in the Western Region for production of a consistent quality of kaolin for sale to the local industries and for export. Local production of talc was not investigated because it was not possible to identify any known reserves of industrial importance.

The report includes pre-feasibility analyses of relevant projects for the manufacture of cement, lime and refined kaolin from the indigenous raw materials with recommendations for further studies and the eventual realisation of the projects which appear to be viable.

TABLE OF CONTENTS.

	Page
Introduction	6
I Limestone	7
II Oystershells	14
III Kaolin	15
IV Talc	16
Conclusions and recommendations	17
 <u>Annexes:</u>	
I Job description	21
II List of activities	24
III List of persons met	26
IV List of references	29
V Cement Plant in Western Region	30
VI Small-Scale Cement Plant in Northern Region	34
VII Buipe Lime Plant	52
VIII Mini-Cement Plant in South Ghana	70
IX Small-Scale Lime Plant in South Ghana	87
X Kaolin Plant in Western Region	91

INTRODUCTION

The present report was prepared by Henrik Carlsen and covers his visits to Ghana during the periods 14 August to 9 September and 14 November to 13 December, 1990 in the capacity of "Consultant Chemical Engineer" and with the duties as stated in UNIDO's job description, Annexe I.

The objectives of the mission were, under the supervision of the Chief Technical Adviser and in cooperation with other members of the Project team, to conduct a technical study and prepare a pre-feasibility study for projects based upon the utilization of local resources of the minerals limestone, kaolin and talc.

During the visits the Consultant collected and studied all relevant reports and data, which were readily available at the National Investment Bank (NIB), or which were obtained during visits to the Geological Survey Department (GSD). Further information was collected during visits to the Ministry of Industries, the Minerals Commission, the Association of Ghana Industries, the Building and Road Research Institute (Kumasi) and other organisations as well as to some of the users or potential users of the relevant minerals.

The information collected was used for the preparation of pre-feasibility reports for prospective projects comprising small scale plants for production of cement, lime and kaolin. The pre-feasibility reports are attached herewith as annexes V through X.

The general part of the report contains the Consultant's qualitative evaluation of the resources of limestone, kaolin and talc in Ghana and their potentials for exploitation as raw materials for existing or new enterprises within the Country or for exports.

In the last chapter on Conclusions and Recommendations the Consultant identifies the projects or activities, which in his opinion deserve to be pursued further as interesting investment schemes.

I LIMESTONE

A. Use of limestone for cement production

The major deposit of limestone in Ghana occurs at Nauli in the coastal area near the border to Côte d'Ivoire. Other deposits are found at Oterkpolu about 80 km North of Accra, at Buipè and at Fo River near the Volta Lake and at Bonga-Da and Daboya in the Northern part of the Country.

A number of smaller deposits, which might be suitable for local exploitation have also been identified and studied by the Geological Survey Department.

The Nauli deposit with proven reserves of 400 million metric tons has been studied several times by different teams as a possible source of limestone for production of clinker in Ghana. The results from the analysis of core samples from the previous raw material investigations indicate that the chemical composition of the limestone is suitable for production of Portland cement clinker.

However, the rock is covered by several meters of overburden, which need to be removed before the limestone can be quarried in open cast operation. The amount of overburden to be removed is calculated to be approximately 3 tons for each ton of limestone quarried. This is far more than normally considered acceptable for economic operation of a limestone quarry and will add to the cost of operation of the quarry and hence the cost of the clinker produced.

The excessive amount of overburden is a serious disadvantage for any project based upon the utilization of the Nauli limestone deposit because of high costs for the opening-up and the development of the quarry. This seems also to be the main reason for the negative outcome of the latest evaluation of the feasibility of a clinker producing plant at Nauli made by Ghacem.

The Nauli deposit has also been studied by other teams, some of which have expressed a more optimistic view, but the Consultant has so far not seen any conclusive report in support of the clinker plant project.

Although the merit of the Nauli clinker project seems to be doubtful due to high costs of production and also due to the competition from low cost clinker shipped to West Africa in 20,000 DWT carriers from high capacity plants in Mediterranean countries at the price of approximately USD 38 per metric ton C&F Tema, it would be of interest to prepare a new study based upon the existing reports on the raw material investigations, but with updated data for the costs of investment and operation based upon the present day price level and the latest proven technology. A comprehensive study of the potentials of the Nauli deposit could not be carried out within the scope of the present mission, but a preliminary evaluation was made and attached herewith as annexe V.

The Bonga-Da and the Buipé deposits are considerably smaller than the deposit at Nauli and the quality of the limestone is lower due to veins of low carbonate or dolomitic material.

The estimated quantities of limestone suitable for mining are:

At Bonga-Da:	6.6 million tons (low magnesia)
At Buipé:	6.0 - - - -

These deposits are too small for a clinker production to match the total demand of Ghana, which is at present at least 600,000 tons/year. However, each of the deposits may be adequate for the operation of a "small-scale cement plant" with a capacity of about 100,000 tpy corresponding to the estimated demand for cement in the interior part of the Country within the next several years.

A pre-feasibility study for a 100,000 tpy cement production plant at Bonga-Da was prepared by the Building and Road Research Institute (BRRi) in 1974 and followed up by Part One of a feasibility study also prepared by BRRi and submitted in April 1977. According to these reports it should be possible to produce cement from the Bonga-Da deposit at a price which would be competitive with the cost of cement delivered to the northern part of the Country by road transport from either of the grinding plants in Tema or in Takoradi.

Although the establishing of a cement plant with this capacity would only replace about 10 % of the expected import of clinker over the next several years, it would make a significant contribution to the efforts for reduction of the expenditure of foreign currency.

The Buipé deposit was studied in 1962-63, in 1976-77 and latest in 1989-90 by core drilling and pitting. The results indicate that the CaO content of the productive layers is slightly lower than the value of approximately 44 % required for the production of Portland cement clinker. It will therefore be necessary to upgrade the limestone by adding up to about 10 % of Oystershell, which consists of almost pure calcium carbonate and thus contains nearly 56 % CaO.

Oystershell is not available in the vicinity of Buipé, but can be obtained from deposits about 12 km south of Akosombo dam. The cost of transportation of this material by road to Akosombo and by barge from there to Buipé will add to the cost of production. Nevertheless, the Buipé deposit deserves attention because of its favourable location in relation to the market in the Northern part of the Country and near the navigable Volta Lake.

The viability of a 100,000 tpy cement plant at Buipé is discussed in Annexe VI based upon the present price level for plant equipment, production cost and cement. With an internal rate of return at 16.5 % this project is only viable if supported by a favourable scheme of financing and tax holiday for the initial years of production.

However, this preliminary evaluation should be followed up by a more detailed study based upon tenders for equipment and construction and taking into account the effect of producing blended cement such as masonry cement, pozzolana cement and composite cement.

The introduction of blended cement has also been studied by Ghacem and discussed with the Ghana Standards Board (GSB). The use of limestone and pozzolana as constituents of cement is being introduced in many Countries and has been widely accepted by the users of cement.

In Ghana the Standards Board has issued standards for masonry cement and pozzolana cement but for non-bearing building work only. In order to promote the use of local raw materials it is proposed to consider the release of composite cement and pozzolana cement for use in general construction. This can be done without jeopardizing the quality of concrete structures provided the new type of cement is manufactured and used in accordance with proper specifications and guidance.

Pozzolana cement is produced in many Countries, mainly from natural pozzolana. In Ghana there are no known occurrences of natural pozzolana, but large amounts of bauxite waste, which after calcination at 700 degr. C has pozzolanic properties. Preliminary studies have indicated that the bauxite waste found in Ghana is suitable for the production of a pozzolana cement containing up to 30 % calcined bauxite waste.

The introduction of pozzolana cement offers several advantages and some disadvantages as follows:

Advantages:

- The use of pozzolana as a substitute for clinker will reduce the import of clinker by up to 30 %.
- Concrete made from pozzolana cement develops a high resistance against chemical attack from sea water and acid sulphate soil and is therefore especially suitable for maritime and foundation construction.
- Pozzolana cement has a low heat of hydration, which is an advantage for its use in hot climatic conditions and for massive concrete structures.
- The cost of natural or artificial pozzolana (such as calcined bauxite waste) is normally lower than the cost of clinker, and pozzolana cement can therefore be sold at a price which is somewhat lower than the price of Portland Cement.

Disadvantages:

- Concrete made from pozzolana cement has low initial strength. However the final strength is normally equal to that of concrete made from Portland Cement.
- The colour of some types of pozzolana may affect the appearance of the concrete surface, and cement made from such types of pozzolana may therefore not be acceptable for all types of concrete structures.

The drying and calcining of bauxite waste require a processing plant and the use of a substantial amount of fuel. Furthermore, the calcined bauxite will have to carry heavy cost of transportation from the deposits to the cement grinding plants.

However, it may still be possible to produce a pozzolana cement, which can be sold at a lower price than Portland Cement and the saving in foreign exchange due to the lower consumption of imported clinker will be considerably higher than the expenditure on imported fuel for the calcining of the Bauxite waste.

The installation for drying and calcining of Bauxite waste could be built near one of the major deposits of this material and the calcined product transported by road to one of the existing cement grinding plants in Tema and Takoradi. If the calcining plant is to be located at Kibi it may also be considered to transport calcined Bauxite to a new grinding plant at Kumasi, where it would be mixed with clinker or lime from the contemplated new plants at Buipé.

The use of calcined Bauxite waste for production of a lime-pozzolana type of cement is discussed in the following chapter.

B. Use of limestone for production of lime

The use of quicklime and hydrated lime in Ghana is very limited, which is mainly due to the lack of local industrial scale producers. The present practise of construction is to use Portland Cement for structures, building blocks and mortars. Lime from import or from small scale producers is used mainly for white wash of finished walls or for various purposes within the chemical industries.

Although the present consumption of lime in Ghana is probably less than 5,000 tonnes per year, the potential demand is much bigger. Different types of lime can substitute cement for a number of applications within the building industry and be used to meet the demand for liming of sour agricultural soil and for stabilization of laterite for road construction.

The need for promotion of the production and the use of lime products is dealt with in many reports by the Building and Road Research Institute, covering also the results of trial burning of lime in small scale updraught kilns.

Although the small scale and labour intensive production of lime may satisfy a substantial portion of the market for hydrated lime, there is also a need for somewhat bigger plants for the supply of well defined lime products in accordance with standard specifications and suitable for use by building and road contractors, agriculture and many industries, some of which rely today on the use of cement, imported hydrated lime or precipitated calcium carbonate.

A project for construction of an industrial scale lime plant at Buipé with capacity 80 tpd of hydrated lime or 33,000 tonnes of hydrated lime per year was started in 1980, but met with financial and supplier problems and was never completed. By now the initial capital investment must be considered as sunk, but it may still be feasible to reactivate the project and to obtain a satisfactory return on a new investment for the financing of the erection and commissioning of the plant.

The situation of this project is being studied by the management of Buipe Lime Company and by the major shareholder The Bank for Housing and Construction (BHOC). As it appears from the report attached herewith as Annexe VII, the project will yield a quite satisfactory return on investment, provided that the cost of completion is kept within the budget, and provided that the Company will be able to operate at the necessary break-even point of plant utilization.

The reactivation of the project is therefore recommendable, but it is important to ensure efficient cost control during the erection and commissioning of the plant, and to launch a lime promotion campaign simultaneously with commencement of production.

In order to insure acceptance of the new lime products by the market it is necessary to have a clear product- and marketing plan covering the types of lime products to be offered for sale and the expected demands by different groups of consumers.

As the limestone deposit at Buipé has a rather low content of calcium carbonate and holds varying contents of magnesium carbonate and oxides of silicium, aluminium and iron, it is not suitable for production of a very pure quality of high carbonate lime. However, the limestone is well suitable for production of a less pure hydrated lime, hydraulic or non-hydraulic depending upon the carbonate content of the limestone. These types of lime can be marketed as quicklime or hydrated lime in bags or in bulk and will be suitable for use as building lime, agricultural lime and most other purposes.

Pure white lime, if needed, could be made by the burning of oyster shell from deposits near the Akosombo dam, and sold at a premium price.

Building lime should be priced competitive not only in relation to imported lime and lime from small scale producers, but also in relation to Portland Cement. However, substitution of lime for cement is normally done in the ratio 1:1 by volume, which corresponds to ratio 1:2 by weight. The use of lime in mortars will therefore offer a saving as long as the price of lime is less than double the price of cement.

It should be observed that the Buipé lime plant is based upon the same limestone deposit as proposed for the establishing of a small scale cement plant as already referred to in the previous chapter.

If it is decided to proceed with the implementation of the small scale cement plant project as well as the lime plant project, these projects should be coordinated in order to clarify questions with regard to priorities and timing. Furthermore it should be considered to merge the projects in order to enable the sharing of a number of facilities under one common management.

Provided that the limestone deposit at Buipé is big enough to serve both project, it may be beneficial to combine the projects because of the synergetic effect of joint operation. One of the advantages may a better utilization of the limestone deposit by the use of dolomitic stone for lime production leaving low magnesia material for the clinker plant.

C. Limestone for other uses

Limestone is at present used as aggregate in the production of terrazzo floors and terrazzo tiles and for other construction purposes. However, limestone may also be used together with lime - for soil stabilization or for conditioning of sour agricultural soil. It is recommended to promote these uses of limestone, for which waste limestone fines from the lime production will be the natural source.

II OYSTERSHELLS

Oystershells are found at a number of locations along a 50 km stretch of the lower Volta river between Akuse and Tefle and at lagoons in the costal area. The total reserves have previously been indicated to be very limited and insufficient for use as raw material for an industrial scale production of cement or lime. However, information received from local entrepreneurs indicates that the reserves may be considerably bigger and may hold several million tonnes of shells.

It appears that some of the shells occur in beds with a thickness of at least 20 meters and situated well above the water level of the river.

The shells are at present used mainly for small scale local production of lime and scouring powder, and as an aggregate in terazzo floors and tiles. However, they consist of almost 100 % calcium carbonate and could be used for a number of other purposes such as production of precipitated (or finely ground) calcium carbonate, calcium carbide and for production of white cement.

III KAOLIN

The three major deposits of kaolin in Ghana are located at Abandze-Saltpond (Central Region), at Kibi (Eastern Region) and at Teleku-Bokazo (Western Region).

The Abandze-Saltpond kaolin was used for production of whiteware and crockery at Saltpond Ceramics Limited until production was stopped in 1987 because of liquidity problems. The factory has recently been taken over by a new owner, and may soon be recommissioned.

The biggest of the deposits is located at Teleku-Bokazo and is estimated to contain at least 29 million tons of clay, mainly kaolin. The quality varies due to veins and zones with quartz pebbles and due to yellow staining for the top layers. However, an almost white grade of kaolin is dug by hand and sold for various purposes.

The main uses of the kaolin are as a filler in paint, paper, rubber, detergents, insecticides, plastics, pharmaceuticals and for the manufacture of ceramics.

The installations at Saltpond Ceramics include a processing plant for washing, classifying and filtering of the raw kaolin, and before the plant was closed in 1987 it was also a supplier of kaolin to other industries.

The consumption of kaolin by the local industries should be promoted by the marketing of specified grades for each application, and the potentials of export should be studied by comparison of the cost of the kaolin from Saltpond or Teleku-Bokazo with the prices demanded by foreign producers.

The present consumption of kaolin in Ghana is estimated to be approximately 3,700 tpy, of which about 75 % is used by the paint industry. More than 90 % of the kaolin is supplied from the local deposits, but a number of other filler materials are still imported. Some of the imported materials may be necessary constituents in paint or in other products, but other materials might be replaced with local kaolin if suitable grades are made available for each type of application.

In other Countries kaolin is used for similar purposes as in Ghana, and for a number of other purposes such as for the manufacture of white cement. Some of the Countries do not have own reserves of kaolin and rely entirely upon import of this commodity, which is traded in different grades in accordance with standard specifications.

In order to explore the viability of export of kaolin from Ghana it is necessary to study the quality of the kaolin in some detail and to estimate the production cost of different grades of kaolin for comparison with world market prices.

A preliminary assessment of the viability of local processing of kaolin is attached herewith as annexe X. With the assumed figures for investment cost and sales prices for kaolin the project appears to be profitable, but this conclusion is subject to verification of the cost figures based upon laboratory analysis of the raw kaolin.

When estimating the cost of mining and processing kaolin from the deposit at Teleku-Bakazo it is important to consider the cost of the precautions, which may be needed in order to eliminate or minimize any possible adverse environmental effect of the operation. As the kaolin occurs in an almost horizontal forestal area and in part below the water table, it may be advantageous to create an artificial lake with a bucket chain excavator or a floating washmill for enabling extraction of the material several feet below the water table.

IV TALC

Although talc is found in several areas in Ghana, none of the occurrences have been found to be suitable for large scale exploitation. The known occurrences are at Ajumako, north of Mumford, Central Region, in the Pudo area, Upper East Region, in the Anum area and between Tsito and Kpuita, Volta Region. Local workings for production of crude distemper and powder for cosmetics is reported to take place in the last mentioned area.

Talc is also found in the form of talc phyllite in the Nwuku stream near Axim in the Western Region. This material was previously found to contain too many impurities to be of economic importance, but it would be interesting to review the viability of the possible processing of this material into a marketable talcum product making use of the latest technology.

The total consumption of talc in Ghana is estimated at approximately 500 tpy, the majority of which is imported. The biggest consumers are the paint industry and the pharmaceutical industry, both of which require talc of high purity.

The aspects of replacing imported talc with local material depend entirely upon the possibility of finding local deposits of adequate quality and size. It should therefore be considered to carry out a more detailed survey and sampling of talc from the known and possible new occurrences.

CONCLUSIONS AND RECOMMENDATIONS

The possibilities of promoting the use of limestone, oyster shells, kaolin and talc from local deposits in Ghana were studied with the following results.

Ghana has several deposits of limestone suitable for production of lime products, construction, composite cement, industrial uses and for soil conditioning in agriculture. However, the use of limestone for these purposes is at present very limited.

The limestone deposits can also be used for production of Portland cement clinker, but may not necessarily be adequate for production of clinker at a cost, which can compete with the price on clinker imported from Europe.

If clinker can be produced locally and delivered to the existing grinding plants in Tema and Takoradi at a competitive price, it can replace the total of the import. This is a very interesting possibility, which has been studied several times in the past, but has not so far been proved to be economically viable, the main reason being the cost of removing an excessive amount of overburden covering the limestone deposit at Nauli in the Western Region.

An alternative possibility of establishing a local production of clinker would be to set up a small cement plant at Buipé or at Bonga-Da, both located in the interior of the Country with the advantage of a local market protected by the high cost of transportation of cement from the grinding plant at the sea ports.

Local production of clinker may also be based upon the use of oyster shells from the lower course of the Volta River. A feasibility study presented by South Ghana Cement and Lime Company Limited indicates that a mini-cement plant based upon this raw material and low cost technology equipment will be feasible and economically viable. This project is a good initiative and deserves the attention of investors.

The total reserves of oyster shells are not known, but may be several million tonnes. If sufficient quantities of this material are available for exploitation, it may be feasible to establish a full size clinker producing plant and thus eliminate all future import of clinker or cement.

It is therefore recommended to conduct a comprehensive survey of the deposits of oyster shells for assessment of the total reserves available for exploitation.

Most of the deposits of limestone or oyster shells are also suitable for the production of different types of lime. It is recommended to reactivate the existing lime plant project at Buipé in the Northern Region and to establish small scale lime plants in other areas for promotion of the use of lime as a valuable substitute for cement within the building industry.

Kaolin is found in major deposits at Kibi in the Eastern Region, at Saltpond in the Central Region and, especially at Teleku-Bakazo in the Western Region. Most of the present consumption in Ghana is already covered by supply from small scale producers in these areas, but it may be possible to promote the use of kaolin as well as export thereof by the establishing of a larger scale mining and processing plant. This could be based upon the recommissioning of the operation of the kaolin processing plant at Saltpond Ceramics Ltd. or by the creation of a new plant in the Western Region.

Talc exists in Ghana, but is only utilized in small scale local operations. None of the previous studies have identified occurrences of economic importance for large scale production. However, it is recommended to carry out a more detailed survey of the known occurrences.

The results of pre-feasibility studies for the production of cement, lime and refined kaolin are shown in Annexes V to X attached to the present report, and are summarized as follows:

1. The full scale production of cement clinker or cement based upon the limestone deposit at Nauli in the Western Region is at present not economically viable because of the high cost of removal of the excessive amount of overburden.
Recommendation: Detailed study of the feasibility of removing the overburden for access to 25 million tonnes of limestone.
(Reference Annexe V).
2. A small-scale cement plant with capacity 100,000 TPY located at Buipé near the Volta Lake in the Northern Region may be viable if based upon low capital cost technology and the sale of cement at a price of 17,500 Cedis per 50 kg bag corresponding to 100 USD per metric tonne, ex factory without tax.
Recommendation: Execution of detailed feasibility study.
(Reference Annexe VI).
3. The rehabilitation of the existing project for the construction of a lime plant at Buipé with capacity 33,000 TPY of hydrated lime is viable subject to successful completion and commissioning within the budget, and subject to the sale of all of the production at rated capacity at the price of 788 Cedis per 25 kg bag corresponding to 90 USD per metric tonne of hydrated lime.
Recommendation: Review the costs of erection and commissioning of the plant. Prepare rehabilitation report as documentation for new financing.
(Reference Annexe VII).
4. A mini cement plant with capacity 20,000 TPY located near the oyster shell deposits at the lower course of the Volta River and based upon low capital cost vertical kiln technology is economically viable subject to final confirmation of the total cost of investment used for the feasibility report.
Recommendation: Verify basic cost figures and proceed with applications for financing.
(Reference Annexe VIII).
It is recommended to carry out a survey of the deposits of oystershell in order to obtain an estimate of the proven and the possible reserves.

5. A small-scale lime plant with capacity 3,000 TPY of hydrated lime located near the oyster deposits at the lower Volta River is economically viable subject to confirmation of the cost of investment used in the pre-feasibility calculation.

Recommendation: Carry out detailed feasibility studies for a small-scale lime plant to supply lime products for the local market and alternatively for a larger scale plant for export to other West African countries.
(Reference Annexe IX).

6. A preliminary estimate of the cost of investment and the cost of production for a kaolin processing plant in the Western Region indicates that the production of refined kaolin will be viable if a high quality of coater type kaolin can be produced.

Recommendation: It is recommended to carry out a detailed feasibility study based upon laboratory and pilot scale testing of the raw material.
(Reference Annexe X).

7. Previous surveys of occurrences of talc have not identified deposits of industrial importance. However, some of the deposits seem to be worked by local enterprises.

Recommendation: It is proposed to carry out a comprehensive survey to establish if any of the known deposits of talc or talc phyllite may be suitable for industrial scale production.



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

PROJECT IN THE REPUBLIC OF GHANA
 Feasibility Analysis Unit for Pre-investment Studies
 at the National Investment Bank (NIB)

JOB DESCRIPTION

DP/GHA/87/026/11-57

Post title Chemical Engineer (cement and lime-based products)

Juration Two months

Date required 1 March 1990

Duty station Accra, Ghana

Purpose of project- Enable the Government, the National Investment Bank (NIB) and other sponsors to decide on the implementation of industrial projects through the establishment of a Feasibility Analysis Unit at NIB; this unit will enable NIB and its potential clients to

- o Identify new industrial investment projects;
- o Assess their industrial investment potential;
- o Prepare and evaluate techno-economic feasibility studies;
- o Appraise the modernisation, diversification or expansion of existing industrial ventures.

- Build up an investment portfolio consisting of industrial project proposals of an innovative or pioneering nature.

- Strengthen the capacity of NIB to provide training and consulting services to improve industrial project evaluation and preparation of pre-feasibility and feasibility studies.

DUTIES

Under the supervision of the Chief Technical Adviser and in cooperation with other members of the Project team the expert shall conduct a technical study of the following Project proposals and prepare a pre-feasibility study to enable the

.... / ...

Applications and communications regarding this Job Description should be sent to:

Project Personnel Recruitment Branch, Department of Industrial Operations
 UNIDO, Vienna International Centre, P.O. Box 300, A-1400, Vienna, Austria

Government of Ghana to decide on further implementation priorities.

1. Establishment of small/medium scale projects for the extraction and processing for domestic industrial consumption and export of
 - (a) lime stone
 - (b) kaoline
 - (c) talc
2. Establishment of production facilities for
 - (a) cement clinker
 - (b) quick lime
 - (c) calcium carbaonate
 - (d) kaoline and talc based products

In particular the expert shall

- assess and advise on the suitability of the available raw and auxiliary materials, utilities, manpower and other inputs.
 - advise on the additional or supplementary sources for such inputs
 - prepare a technical report outlining
 - (1) equipment, physical facilities, raw materials and other inputs required, manpower needs, training, technology, environment and waste management.
 - (2) An evaluation of available technologies bringing out their merits and demerits and suggestions for adoption in Ghana
 - (3) Production/process flow highlighting bottlenecks and problem areas with indicative solutions.
 - (4) Any other information of particular importance or relevance in relation to the projects under development or the sources and quality of equipment, or other inputs or environment.
- provide such other inputs to the project activities including training as may lie within the sphere of his competence.

The expert will also be expected to submit a report on the findings of his mission, suggestions and comments.

QUALIFICATIONS

Must hold an advance university degree in the appropriate area of specialisation and must possess extensive experience of relevance.

LANGUAGE

English

BACKGROUND INFORMATION : The Government of Ghana places special emphasis on the development of industries which have a capacity for increasing domestic resource use. Although significant progress has been made since 1984 the country remains heavily dependent on the flow of foreign capital. The reforms undertaken during the past three years should ensure that positive growth is maintained in the major economic sectors during the next two years. This growth must be accompanied by fundamental structural changes within these sectors in order to generate self-sustaining development capacity.

A key role will have to be played by the development financing institutions of Ghana, particularly by the National Investment Bank (NIB). As the foreign exchange constraints tightened, opportunities for expanding manufacturing investment were reduced. The Government has in recent years relied on foreign finance as a source of industrial investment and credit worth US\$ 53.5 million has been obtained in 1986 to permit an expansion of industrial imports and to facilitate industrial sector rehabilitation.

The share of the private sector joint venture firms will have to increase in 1989/90. The Government's recent emphasis on privatisation is also likely to further increase the role of joint ventures in Ghanaian manufacturing. NIB will have to revitalise its business, which was so far confined to small scale production, and will, therefore, in the short and medium run, continue to depend on its capacity to channel domestic finance and foreign exchange allocations to well defined, profitable and bankable industrial projects. As a step towards this goal, the Feasibility Analysis Unit for pre-investment studies is assigned to the NIB.

Travel and Work Schedule

Post: DP/GHA/87/026/11-57

Title: Chemical Engineer (cement and lime-based products)

Name of expert: Mr. Henrik Carlsen

First half of split-mission:

Duration: 12 august - 11 september 1990

- | | |
|-------------|--|
| 12 aug 1990 | Departure from Copenhagen for travel to Vienna, Austria. |
| 14 aug | Briefing at UNIDO, Vienna.
Departure from Vienna for travel to Accra, Ghana. |
| 14 aug | Arrival in Accra. |
| 15 aug | Meeting with Chief Technical Adviser, Feasibility Study Project NIB/UNDP. |
| 15 - 8 sep | Review of previous reports and visits to the following Departments, Institutions and Enterprises: <ul style="list-style-type: none"> - Geological Survey Department - Ministry of Industries, Science and Technology - Bank of Housing and Construction - Ghacem Ltd. - Kaolin deposit at Teleku Bokazo, Western Region - Saltponds Ceramics Ltd. - Kpond Hydroelectric Power Station - Ghana Export Promotion Council - GIHOC Paints Co. Ltd. - Building and Road Research Institute, Kumasi - Ashanti Goldfields Corporation - Freedom Chemical Industries Ltd. - Association of Ghana Industries - State Transport Corporation - GIHOC Marble Works Co. Ltd. |
| 9 sep | Air travel to Vienna |
| 10 sep | Visit to UNIDO, Vienna for debriefing |
| 11 sep | Travel to Copenhagen. |
| 12 sep | Elaboration of interim report in Copenhagen. |

GHANA Feasibility Study Project

Travel and Work Schedule (continued)

Post: DP/GHA/87/026/11-57

Title: Chemical Engineer (cement and lime-based products)

Name of expert: Mr. Henrik Carlsen

Second half of split-mission:

Duration: 14 november - 13 december 1990

- 12 nov 1990 Departure from Copenhagen for travel to Vienna, Austria.
- 13 nov Briefing at UNIDO, Vienna.
- 14 nov Departure from Vienna for travel to Accra, Ghana.
Arrival in Accra.
- 15 nov Visit to UNDP Office, Accra
Meeting with Mr. Asare, NIB, Accra,
Director, National Investment Bank,
Feasibility Study Project NIB/UNDP.
- 15 nov - 2 dec Review of previous reports and visits to
the following Departments, Institutions and
Enterprises:
- Geological Survey Department
 - Ghana Oil Company LTD., Accra
 - Bank of Housing and Construction
 - GIHOC Steel Works Ltd., Tema
 - Ghana Export Promotion Council
 - National Board for Small Scale Industries (NBSSI)
 - Ghana National Scientific and Technological Information Network (GHASTINET)
 - Prices and Incomes Board (PIB)
 - Statistical Service, Accra
 - South Ghana Cement and Lime C. Ltd., Tema
 - Tropical Agricultural Development Consultancy, Accra
- 3 dec Visits to Buipé, Northern Region for inspection of limestone deposit and Site of lime plant
- 4 dec Visit to limestone deposit at Bonga-Da, Northern Region
- 5 dec Return journey to Accra
- 6 dec Preparation of report
- 7 dec Visit to lime plant at Cacavelli, Lomé
- 8 dec - 12 dec Visit to lime and cement enterprises in Accra and Tema and preparation of pre-feasibility analyses
- 13 dec Air travel to Vienna
- 14 dec Visit to UNIDO, Vienna for debriefing
- 15 dec Travel to Copenhagen.
- 16 sep - 21 dec Elaboration of final report in Copenhagen.

List of Officials and Management Staff Personnel met during the Mission.

<u>Name</u>	<u>Title</u>
Dr. G.O. Kesse	Director, Geological Survey Department, Accra
Mr. Abey	Geological Survey Department
Mr. Samuel K. Asiedu	Principal Technical Officer (Geology) and Superintendent of Records, Geological Survey Department, Accra
Mr. Daniel K. Agyei	Geological Survey, Tamale
Mr. Tor Nygaard	Deputy Managing Director, Ghacem Ltd.
Mr. Espen Sandsdalen	Deputy Works Manager, Ghacem Ltd., Tema Factory
Mr. Bortsi	Ministry of Industries, Science and Technology
Mr. Daniel Amamoo	Asst. Director, Prices and Incomes Board, Accra
Mr. Ocran Humphreys	Consultant, National Board for Small Scale Industries (NBSSI), Accra
Mr. J.A. Villars	Co-ordinator, Ghana National Scientific and Technological Information Network (GHASTINET), Accra
Dr. J.K. Ocloo	Building and Road Research Institute
Mr. Eugene Atiemo	Chemical Engineer, Building and Road Research Institute
Mr. J.K. Ayetey	Engineering Geologist, Building and Road Research Institute
Mr. Eddie Imbeah-Amoakuh	Executive Secretary, Association of Ghana Industries
Mr. S.D. Adisi	General Manager, GIHOC Paints Co. Ltd.

List of Officials and Management Staff Personnel met during the Mission. (continued)

<u>Name</u>	<u>Title</u>
Mr. Tawia Akyea	Director, Trade Information. Public Relations and Export Services, Ghana Export Promotion Council
Mr. G.K. Artiso	Manager, Saltpond Ceramics Ltd.
Mr. Joseph Anim-Addo	Director, Freedom Chemical Ind. Ltd.
Mr. K.M. Nkrumah	Director, Bank for Housing and Construction, Accra
Mrs. Maud D. Biney	Bank of Housing and Construction, Accra
Mr. Kwame Kwakye-Mintah	Bank for Housing and Construction, Accra
Mr. J.B. Yirerong	Managing Director, Buipé Lime Project
Mr. Francis W. Tuyee	Managing Director, South Ghana Cement and Lime Co. Ltd., Tema
Mr. M.A. Odaymat	Managing Director, B.B.C. Industrials Co. Ghana Ltd., Accra
Mr. Daniel S. Nashief	Managing Director, Dunnia Lime In- dustries Ltd., Tema
Mr. T. Abaka-Mensah	Production Manager, Ghana Steel Works, Tema
Mr. Nenyi Kow Nkensen I	Managing Director, Ghana Oil Co. Ltd. (GOIL), Accra
Mr. K. Abeasi	General Manager (Operations/Marketing) Ghana Oil Co. Ltd. (GOIL), Accra
Mr. Henry B. Obeng	Chief Consultant, Tropical Agricultural Development Consultancy, Accra
Mr. Ouro-Djobo Samah	Chef Division Opérations, Centre de la Construction et du Logement a Cacavelli, Lomé, Togo

**List of Officials and Management Staff Personnel met
during the Mission. (continued)**

<u>Name</u>	<u>Title</u>
Mr. Yaw Osafu-Mafo	Managing Director, National Investment Bank
Mr. Asaré	Director, National Investment Bank
Mr. George Quartey	National Investment Bank
D. J.M.I. Sait	Chief Technical Adviser, Feasibility Analysis Unit NIB/UNDP, Accra
Mr. M.N. Kumar	Metal Wire Industry Consultant, UNIDO
Mr. Adolf Tauchmann	Rubber Industry Consultant, UNIDO
Mr. Antti Ahonen	Market Study Consultant, UNIDO
Mr. C.R.S. Nguéfack	Assistant du Directeur, l'ONUDI, Lomé, Togo
Mr. Thomas Bergklau	Programme Officer, UNDP Accra

List of References

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(Geological Survey Dep.) The Mineral and Rock Resources in
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- Management Development
and Productivity
Institute (MDPI) The Preliminary Market Study on
Industrial Minerals in Ghana,
May 1989.
- Department of Geology,
University of Ghana,
Legon Preliminary assessment of Industrial
Mineral Resources in Ghana,
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- Building and Road
Research Institute
(BRI) A Feasibility Study of Manufacture
of Portland Cement in Northern
Ghana, April 1977.
- A.A. Hammond (BRI) Flexural and Compressive Strength
Properties of Bauxite-Waste
Pozzolana Cement Concrete,
May 1979.
- N.S. Bawa and
E.T. Bartel-Kornacka
(BRI) Production and Use of Building Lime
in Ghana, June 1964.
- J.K. Ayetey and J.O.Gogo
(BRI) Lime Production from Typical
Carbonate Deposits in Ghana,
November 1973.
- BRI, Kumasi Construction Materials Manufacture,
October 1974 (Volume 4 of "Actions
to Achieve Cost Reduction in Public
Construction Sector")
- National Investment Bank
(NIB) Market Report Limestone Based
Clinker and Cement, April 1990
- National Investment Bank
(NIB) Kaolin Market in Ghana, July 1990
- National Investment Bank
(NIB) Market Study Talc (Draft report
August 1990)

Cement Plant at Nauli (West Cement)

Pre-feasibility Analysis

Date: 21 dec 1990

Project: Cement Plant at Nauli (West Cement)

Products: Portland Cement

Capacity: 1200 TPD or 400,000 TPY

Type of plant: 4-stage preheater plant

Location: Near the major limestone deposit at Nauli in the Western Region.

Assumptions: Complete cement plant with necessary, but not advanced control equipment, and with additional equipment for the removal of 3.5 tonnes of overburden for each tonne of limestone.

Source of cost estimates: HC-Consult

Summary:

The pay-back period of 8.4 years indicates that the project is not viable. The profitability depends very much upon the estimated figures for cost of production, and especially upon heavy costs of extraction of the deeply embedded limestone. Any further analysis of the viability of this project should therefore begin with a study of the feasibility of using new technology for removing the large quantities of overburden at an acceptable cost of operation.

1. Capital expenditure.

Rate of exchange: 1 USD = 350 Cedis

Item	Local		Imported		Total
	mill.C.	'ooo \$	mill.C.	'ooo \$	'ooo \$
Land	280	800			800
Site preparation	630	1,800			1,800
Struct.+Civil Eng. a	10,050	28,700		7,180	35,880
--- do --- b					
Incorp. fixed assets					
a					
b					
c					
Plant equip. a	4,092	11,690		46,750	58,440
--- do --- b	410	1,170		4,675	5,845
Aux. & service	252	720		720	1,440
Pre-prod. exp.	344	984		3,936	4,920
Inventory	1,120	3,200			3,200
Total		49,064		63,261	112,325

Source of Finance:

Equity : 32,325,000 USD
 Loan (10 % incl. charges): 80,000,000 USD

Depreciation	Rate	USD/year
Structures	5 %	1,794
Plant equipment a	5 %	2,922
Plant equipment b	25 %	1,461
Total		6,177

2. Production Cost.

Rate of exchange: 1 USD = 350 Cedis

Item	Requirements	Unit cost		Total
	Units/year	Cedis	\$	'ooo \$
Oyster shells	nil			0
Iron Ore	4,000 MT		35	140
Gypsum	16,000 MT		25	400
Paper bags	8.0 million		.294	2,350
Fuel oil	32,000 MT		286	9,150
Electric power	52 million KWH	3.00	.00857	450
Manpower	500 man-year	350.000	1,000	500
Maintenance, repair				1,100
Spare parts				1,500
Consumables				2,000
Factory Overheads				400
Adm., labour				200
non-labour				100
Marketing, labour				100
non-lab.				200
Total				18,590

3. Sales Price

The income from sale is based upon sales price 1400 Cedis per 50 kg bag of cement ex factory and without tax. This corresponds to 80 USD per metric tonnes.

4. Pay-back Period

Rate of exchange: 1 USD = 350 Cedis

Item	Local	Imported	Total
	'000 \$	'000 \$	'000 \$
1 Cost of investment	49,064	63,261	112,325
2 Capital interest			8,000
3 Depreciation			6,200
4 Subtotal (2 + 3)			14,200
5 Factory Cost			18,590
6 Total Production Cost (4+5)			32,790
7 Income from sale			32,000
8 Gross Profit (7 - 6)			- 790
9 Income tax			0
10 Net profit (8 - 9)			- 790
11 "Pay-back Profit" (10+4)			13,410

Simple Pay-back Period:

$$SPP = \frac{\text{Cost of investment}}{\text{Pay-back Profit}} = \frac{112,325}{13,410} = 8.4 \text{ years}$$

Simple Rate of Return on Cost of Investment:

$$SRR = \frac{NP + I}{K} \times 100 = \frac{-790 + 8,000}{112,325} \times 100 = 6.4 \%$$

Cement Plant at Buipé (Lake Cement)

Pre-feasibility Analysis

Date: 21 dec 1990

Project: Cement Plant at Buipé (Lake Cement)

Products: Portland Cement

Type of plant: Complete cement plant based upon low capital cost technology plant with the necessary but not advanced control equipment. Rotary kiln plant with a minimum of structures, storage capacity and mechanization.

Capacity: 300 TPD or 100,000 TPY of Portland Cement.

Source of cost estimates: HC-Consult

Computation programme: COMFAR 2.1

Summary:

The COMFAR computation indicates IRR = 16.5 %.
This is a quite low return on investment and may not suffice to make the project viable without special benefits such as low interest loans or a tax holiday.

However, the viability may be improved if the costs of investment can be reduced for example by the use of a vertical shaft kiln type of plant. It is therefore proposed to proceed with a detailed feasibility study.

Lale Cements

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Feasibility Study

1 year(s) of construction, 15 years of production

currency conversion rates:

foreign currency 1 unit = 1.0000 units accounting currency

local currency 1 unit = 1.0000 units accounting currency

accounting currency: US Dollars 000's

Total initial investment during construction phase

fixed assets:	27120.60	56.584 % foreign
current assets:	800.00	0.000 % foreign
total assets:	27920.60	54.563 % foreign

Source of funds during construction phase

equity & grants:	8000.00	0.000 % foreign
foreign loans:	14000.60	
local loans:	4620.00	
total funds:	26620.60	52.552 % foreign

Cashflow from operations

Year:	1	2	3
operating costs:	3049.39	4261.08	4534.98
depreciation :	2159.42	2219.42	2219.42
interest :	2576.16	2446.91	2230.14
production costs	7784.98	8867.41	9034.54
thereof foreign:	36.79 %	35.53 %	34.02 %
total sales :	6060.00	9000.00	10000.00
gross income :	-1794.98	122.59	955.46
net income :	-1794.98	122.59	955.46
cash balance :	-749.38	709.99	1596.43
net cashflow :	2211.30	4708.56	5378.23

Net Present Value at: 20.00 % = -4241.97
 Internal Rate of Return: 16.49 %
 Return on equity¹: 15.29 %
 Return on equity²: 19.90 %

Index of Schedules produced by CONFAR

Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance

Total Initial Investment in US Dollars

Year	1990
Fixed investment costs	
Land, site preparation, development	650.000
Buildings and civil works	8970.000
Auxiliary and service facilities . .	360.000
Incorporated fixed assets	0.000
Plant machinery and equipment . . .	14610.000

Total fixed investment costs	24590.000
Pre-production capital expenditures.	2530.600
Net working capital	900.000

Total initial investment costs . . .	27920.600
Of it foreign, in %	54.963

Total Current Investment in US Dollars

Year	1991	1992	1993
Fixed investment costs			
Land, site preparation, development	0.000	0.000	0.000
Buildings and civil works	0.000	0.000	0.000
Auxiliary and service facilities .	200.000	0.000	0.000
Incorporated fixed assets	100.000	0.000	0.000
Plant, machinery and equipment . .	200.000	0.000	0.000
Total fixed investment costs	500.000	0.000	0.000
Preproduction capital expenditures.	0.000	0.000	0.000
working capital	229.314	80.357	26.786
Total current investment costs . . .	729.314	80.357	26.786
of it foreign, \$	50.367	41.896	41.897



Total Production Costs in US dollars

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Cost of raw capacity (single product)	60,000	90,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Raw material	213,528	329,432	364,330	364,330	364,330	364,330	364,330	364,330	364,330	364,330
Other raw materials	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Utilities	72,000	103,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000
Energy	156,000	229,000	2810,000	2810,000	2810,000	2810,000	2810,000	2810,000	2810,000	2810,000
Labour, direct	152,400	225,600	240,000	240,000	240,000	240,000	240,000	240,000	240,000	240,000
Repair, maintenance	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Spares	340,000	460,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000
Factory overheads	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Factory costs	2732,133	3271,032	4334,330	4334,330	4334,330	4334,330	4334,330	4334,330	4334,330	4334,330
Administrative overheads	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Indirect costs, sales and distribution	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Direct costs, sales and distribution	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Depreciation	2153,420	2213,420	2213,420	2213,420	2213,420	2213,420	2213,420	2213,420	2213,420	2213,420
Financial costs	578,175	546,903	520,142	513,375	513,375	513,375	513,375	513,375	513,375	513,375
Total production costs	7854,322	8357,410	9034,541	8917,774	8691,003	8773,122	8641,355	8424,558	8297,822	8164,075
Costs per unit (single product)	123,750	39,527	30,345	33,173	36,010	73,791	75,414	74,246	72,073	67,641
Cost of materials	35,737	35,523	34,022	33,535	33,024	30,298	29,443	28,737	27,932	27,127
Cost of labour	23,728	33,364	42,432	43,537	44,634	43,730	40,240	51,706	53,261	55,155
Total labour	232,400	325,600	340,000	340,000	340,000	340,000	340,000	340,000	340,000	340,000

Total Production Costs in US Dollars

Year	2001	2002	2003	2004- 5
% of nom. capacity (single product)	100.000	100.000	100.000	100.000
Raw material I	364.000	364.000	364.000	364.000
Other raw materials	0.000	0.000	0.000	0.000
Utilities	120.000	120.000	120.000	120.000
Energy	2810.000	2810.000	2810.000	2810.000
Labour, direct	240.000	240.000	240.000	240.000
Repair, maintenance	200.000	200.000	200.000	200.000
Spare parts	500.000	500.000	500.000	500.000
Factory overheads	100.000	100.000	100.000	100.000
Factory costs	4334.000	4334.000	4334.000	4334.000
Administrative overheads	100.000	100.000	100.000	100.000
Indir. costs, sales and distribution	150.000	150.000	150.000	150.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000
Depreciation	1627.300	1325.100	445.500	445.500
Financial costs	496.000	279.242	27.500	0.000
Total production costs	6703.289	6189.322	5120.950	5033.500
Costs per unit (single product) .	67.033	61.893	51.210	50.335
Of it foreign, %	26.035	24.430	11.271	9.729
Of it variable, %	57.217	61.026	74.956	75.269
Total labour	340.000	340.000	340.000	340.000

Net Working Capital in US Dollars

Year	1981	1982	1983	1984-1985
Coverage <i>adc</i> <i>coto</i>				
Current assets \$				
Accounts receivable 1 360.0	7.832	10.677	11.653	11.653
Inventory and materials 23 17.9	313.445	627.674	939.743	856.743
Energy 1 360.0	4.633	7.025	7.686	7.686
Spares 72 5.9	66.273	56.273	166.273	166.273
Work in progress 15 24.0	116.641	164.623	166.624	166.624
Finished products 10 36.0	90.539	112.539	123.154	123.154
Cash in hand 29 18.0	57.533	61.467	62.778	62.778
Total current assets	1145.955	1274.259	1317.088	1317.088
Current liabilities and				
Accounts payable 15 24.0	116.641	164.623	166.624	166.624
Net working capital	1029.314	1109.679	1150.456	1150.456
Increase in working capital	229.314	96.357	26.756	6.000
Net working capital, local	361.930	1009.679	1024.234	1024.234
Net working capital, foreign	67.383	101.000	112.222	112.222

Note: *adc* = average days of coverage ; *coto* = coefficient of turnover .

Source of Finance, construction in US Dollars

year	1970
Equity, ordinary ..	5000.000
Equity, preference.	0.000
Subsidies, grants .	0.000
Loan A, foreign .	14000.000
Loan B, foreign..	0.000
Loan C, foreign .	0.000
Loan A, local....	12620.000
Loan B, local....	0.000
Loan C, local....	0.000

Total loan	12620.000
Current liabilities	0.000
Bank overdraft	1300.600

Total funds	27920.600

 Source of Finance, production in US dollars

Year	1951	1952	1953	1954-1962	2003
Equity, ordinary ..	0.000	0.000	0.000	0.000	0.000
Equity, preference.	0.000	0.000	0.000	0.000	0.000
Subsidies, grants .	0.000	0.000	0.000	0.000	0.000
Loan A, foreign .	0.000	-1166.667	-1166.667	-1166.667	-1166.666
Loan B, foreign..	0.000	0.000	0.000	0.000	0.000
Loan C, foreign .	0.000	0.000	0.000	0.000	0.000
Loan A, local....	-385.000	-385.000	-385.000	-385.000	0.000
Loan B, local....	0.000	0.000	0.000	0.000	0.000
Loan C, local....	0.000	0.000	0.000	0.000	0.000
Total loan	-385.000	-1551.667	-1551.667	-1551.667	-1166.666
Current liabilities	116.641	47.367	13.996	0.000	0.000
Bank overdraft	749.379	-709.566	-1349.492	0.000	0.000
Total funds	481.520	-2213.666	-2376.163	-1551.667	-1166.666

Cashflow Tables, construction in US dollars

Year	1990
Total cash inflow . .	26620.000
Financial resources .	26620.000
Sales, net of tax . .	0.000
Total cash outflow . .	27920.600
Total assets	26620.000
Operating costs . . .	0.000
Cost of finance . . .	1300.600
Repayment	0.000
Corporate tax	0.000
Dividends paid	0.000
Surplus (deficit) .	-1300.600
Cumulated cash balance	-1300.600
Inflow, local	12620.000
Outflow, local	12574.000
Surplus (deficit) .	45.400
Inflow, foreign . . .	14000.000
Outflow, foreign . . .	15346.000
surplus (deficit) .	-1346.000
net cashflow	-26620.000
Cumulated net cashflow	-26620.000



Cashflow tables, production in US dollars

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total cash inflow	616,641	3037,937	10006,000	3330,000	3330,000	3330,000	3330,000	3330,000	9990,000	3330,000	3330,000
Financial resources	116,641	47,337	15,936	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Sales, net of tax	5530,000	8990,000	9990,000	9990,000	9990,000	9990,000	9990,000	9990,000	9990,000	9990,000	9990,000
Total cash outflow	6356,519	3328,001	8403,570	8150,022	7933,355	7716,439	7499,722	7282,955	7066,139	6845,432	6632,455
Total assets	945,955	122,344	42,781	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Operating costs	3042,283	4201,632	4534,330	4534,330	4534,330	4534,330	4534,330	4534,330	4534,330	4534,330	4534,330
Cost of finance	2576,175	2446,393	2220,142	2013,375	1736,503	1573,842	1362,075	1145,303	929,542	712,775	496,061
Payments	385,000	1551,667	1551,667	1551,667	1551,667	1551,667	1551,667	1551,667	1551,667	1551,667	1551,667
Corporate tax	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Dividends paid	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Surplus (Deficit)	-742,275	709,326	1536,426	1333,373	2056,745	2273,511	2430,273	2707,645	2923,312	3100,573	3257,141
Comulated cash balance	-2059,476	-1340,430	253,326	2035,314	4132,659	6436,179	8916,443	11623,450	14547,760	17337,330	21045,333
Inflow, local	6036,641	3032,337	10004,330	3330,000	3330,000	3330,000	3330,000	3330,000	9990,000	3330,000	3330,000
Outflow, local	4839,135	5331,334	5375,143	5445,855	5345,756	5245,426	5145,355	5045,455	4945,355	4845,255	4745,155
Surplus (Deficit)	1257,457	3641,153	4629,187	4544,145	4644,244	4744,344	4844,443	4944,543	5044,643	5144,743	5244,843
Inflow, foreign	11,000	3,000	1,337	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Outflow, foreign	2017,333	2326,167	2326,167	2326,167	2326,167	2326,167	2326,167	2326,167	2326,167	2326,167	2326,167
Surplus (Deficit)	-2006,333	-2323,167	-2323,167	-2323,167	-2323,167	-2323,167	-2323,167	-2323,167	-2323,167	-2323,167	-2323,167
Net cashflow	411,333	403,562	533,334	5405,020	5405,020	5405,020	5405,020	5405,020	5405,020	5405,020	5405,020
Comulated net cashflow	-2443,700	-19700,140	-14321,310	-8916,387	-3511,367	1333,152	7233,172	12793,190	18108,210	23423,230	28738,250

Note: (brackets)

Cashflow tables, production in US Dollars

Year	2002	2003	2004	2005
Total cash inflow . .	9990.000	9990.000	9990.000	9990.000
Financial resources .	0.000	0.000	0.000	0.000
Sales, net of tax . .	9990.000	9990.000	9990.000	9990.000
Total cash outflow . .	6415.899	5809.146	4584.960	4584.960
Total assets	0.000	0.000	0.000	0.000
Operating costs . . .	4584.960	4584.960	4584.960	4584.960
Cost of finance . . .	279.242	37.509	0.000	0.000
Repayment	1551.667	1166.666	0.000	0.000
Corporate tax	0.000	0.000	0.000	0.000
Dividends paid	0.000	0.000	0.000	0.000
Surplus (deficit) . .	3574.111	4150.654	5405.020	5405.020
Cumulated cash balance	24619.340	28770.199	34175.210	39560.230
Inflow, local	9990.000	9990.000	9990.000	9990.000
Outflow, local	4645.056	4184.960	4184.960	4184.960
Surplus (deficit) . .	5344.944	5805.020	5805.020	5805.020
Inflow, foreign . . .	0.000	0.000	0.000	0.000
Outflow, foreign . . .	1770.833	1654.166	400.000	400.000
Surplus (deficit) . .	-1770.833	-1654.166	-400.000	-400.000
Net cashflow	5405.020	5405.020	5405.020	5405.020
Cumulated net cashflow	34323.270	39728.290	45133.310	50538.330

Cashflow Discounting:

a) Equity paid versus Net income flow:		
Net present value	-2716.20 at	20.00 %
Internal Rate of Return (ISRE1) ..	15.29 %	
b) Net Worth versus Net cash returns:		
Net present value	-54.20 at	20.00 %
Internal Rate of Return (ISRE2) ..	19.90 %	
c) Internal Rate of Return on total investment:		
Net present value	-4241.97 at	26.00 %
Internal Rate of Return (IRR) ..	16.49 %	
Net Worth = Equity paid plus reserves		



COMFAR
1975
1974

CONFAR 2.1 - NATIONAL INVESTMENT BANK, S.A.P.A. - Lima

Net Income Statement in US Dollars

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Total sales, incl. sales tax	6000,000	9000,000	10000,000	10000,000	10000,000	10000,000	10000,000	10000,000	10000,000	10000,000
Less: variable costs, incl. sales tax	2313,389	3465,032	3948,980	3848,980	3848,980	3848,980	3848,980	3848,980	3848,980	384,330
Variable margin as % of total sales	3686,612 61.444	5534,918 61.493	6151,020 61.510	6151,020 61.510	6151,020 61.510	6151,020 61.510	6151,020 61.510	6151,020 61.510	6151,020 61.510	6151,020 61.510
Non-variable costs, incl. depreciation	2905,420	2965,420	2965,420	2965,420	2965,420	2459,310	2459,310	2459,310	2459,310	2412,300
Operational margin as % of total sales	781,132 13.020	2567,498 28.520	3185,600 31.556	3185,600 31.556	3185,600 31.556	3691,720 36.317	3711,720 37.117	3711,720 37.117	3711,720 37.117	3733,720 37.337
Cost of finance	3576,175	2446,209	2230,142	2013,375	1736,603	1579,342	1363,375	1146,303	929,542	713,375
Gross profit	-1794,333	122,590	955,453	1172,225	1368,991	2111,379	2348,645	2565,412	2792,173	3025,345
Allowances	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Taxable profit	-1794,333	122,590	955,453	1172,225	1368,991	2111,379	2348,645	2565,412	2792,173	3025,345
Tax	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Net profit	-1794,333	122,590	955,453	1172,225	1368,991	2111,379	2348,645	2565,412	2792,173	3025,345
Dividends paid	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Undistributed profit	-1794,333	122,590	955,453	1172,225	1368,991	2111,379	2348,645	2565,412	2792,173	3025,345
Accumulated undistributed profit	-1794,333	-1672,394	-716,336	455,289	1344,280	3956,159	6304,304	8870,216	11652,390	14673,740
Gross profit, % of total sales	-29.316	1.362	9.555	11.722	13.390	21.119	23.486	25.654	27.922	30.253
Net profit, % of total sales	-29.316	1.362	9.555	11.722	13.390	21.119	23.486	25.654	27.922	30.253
P.E. Net profit, % of equity	-22.437	1.532	11.343	14.653	17.362	26.398	29.323	32.048	34.777	37.334
ROI, Net profit/interest, % of invest.	2.356	9.368	11.602	11.602	11.602	13.446	13.519	13.519	13.519	13.619

Large Company



Net Income Statement in US Dollars

	2001	2002	2003	2004	2005
Total sales, incl. sales tax	10000,000	10000,000	10000,000	10000,000	10000,000
Less: variable costs, incl. sales tax	3348,330	3348,330	3349,360	3848,980	3843,950
Variable margin	6151,020	6151,020	6151,020	6151,020	6151,020
as % of total sales	61.510	61.510	61.510	61.510	61.510
Non-variable costs, incl. depreciation	2373,300	2071,160	1194,500	1194,500	1194,500
Operational margin	3777,720	4079,320	4956,520	4956,520	4956,519
as % of total sales	37.777	40.793	49.565	49.565	49.565
Cost of finance	436,000	279,242	87,500	0,000	0,000
Gross profit	3291,712	3800,679	4869,020	4956,520	4956,519
allowances	0,000	0,000	0,000	0,000	0,000
Taxable profit	3291,712	3800,679	4869,020	4956,520	4956,519
Tax	0,000	0,000	0,000	0,000	0,000
Net profit	3291,712	3800,679	4869,020	4956,520	4956,519
Dividends paid	0,000	0,000	0,000	0,000	0,000
Distributed profit	3291,712	3800,679	4869,020	4956,520	4956,519
Accumulated undistributed profit	17900,050	21760,720	26623,750	31596,270	36542,790
Gross profit, % of total sales	32.917	38.007	48.690	49.565	49.565
Net profit, % of total sales	32.917	38.007	48.690	49.565	49.565
SOE, Net profit, % of equity	41.021	47.508	60.363	61.957	61.956
SOI, Net profit, % of invest.	13.753	14.360	13.952	18.052	18.052

Live Clients

Projected Balance Sheets, construction in US dollars

Year	1970
Total assets	27920.500
Fixed assets, net of depreciation	0.000
Construction in progress	27920.500
Current assets	0.000
Cash, bank	0.000
Cash surplus, finance available .	0.000
Loss carried forward	0.000
Loss	0.000
Total liabilities	27920.500
Equity capital	2000.000
Reserves, retained profit	0.000
Profit	0.000
Long and medium term debt	19920.000
Current liabilities	0.000
Bank overdraft, finance required.	1000.500
Total debt	19920.500
Equity, % of liabilities	10.651



COMEFAR (C)
S.A.
UNITED

COMFAR 2.1 - NATIONAL INVESTMENT BANK, S.A.S., GUATEMALA

Projected Balance Sheets, Production in US dollars

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total assets	23402.120	26011.040	24267.750	22334.850	22053.240	22613.450	23410.430	24424.170	25624.250	27128.960	28253.210
Fixed assets, net of depreciation	24981.180	22241.780	21022.540	18502.520	16283.400	14370.200	13178.900	11453.600	9796.300	8124.000	6670.000
Construction in progress	500.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Current assets	1038.422	1212.832	1254.202	1254.302	1254.202	1254.302	1254.302	1254.302	1254.302	1254.302	1254.302
Cash, bank	57.533	61.467	62.778	62.778	62.778	62.778	62.778	62.778	62.778	62.778	62.778
Loan surplus, finance available	0.000	0.000	253.938	295.912	412.655	626.169	3916.445	11823.450	14547.370	17657.810	20471.210
Less carried forward	0.000	1794.583	1622.294	716.936	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Less	1734.553	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total liabilities	23402.120	26311.040	24267.750	22322.850	22053.240	22613.450	23410.430	24424.170	25624.250	27128.960	28253.210
Equity, capital	8000.000	8000.000	8000.000	8000.000	8000.000	8000.000	8000.000	8000.000	8000.000	8000.000	8000.000
Reserves, retained profit	0.000	0.000	0.000	0.000	455.269	1344.280	395.153	6304.604	8700.218	11553.370	14023.200
Profit	0.000	122.230	555.452	1172.225	1719.991	2111.679	2543.645	2565.412	2732.172	3025.345	3231.710
Loans and deposits, term debt	15225.000	16683.300	15131.670	13560.000	12028.330	10476.670	8524.593	7373.330	5521.663	4276.000	2718.200
Current liabilities	116.641	164.629	180.624	180.624	180.624	180.624	180.624	180.624	180.624	180.624	180.624
Less current, finance required	2050.477	1340.432	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total debt	20402.120	18188.450	15312.250	13760.620	12268.960	10657.230	9105.623	7553.957	6002.230	4459.234	3393.270
Equity, % of liabilities	29.167	30.405	32.566	34.854	36.276	35.377	34.173	31.754	31.183	29.433	27.750

Unit: US dollars

Projected Balance Sheets, Production in US dollars

Year	2002	2003	2004	2005
Total assets	51105.620	34810.360	39766.890	44723.410
Fixed assets, net of depreciation	5171.601	4723.101	4274.601	3826.100
Construction in progress	0.000	0.000	0.000	0.000
Current assets	1254.302	1254.302	1254.302	1254.302
Cash, bank	62.778	62.778	62.778	62.778
Cash surplus, finance available .	24519.349	23779.190	34175.210	39580.230
Loss carried forward	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000
Total liabilities	51105.620	34810.360	39766.890	44723.410
Equity capital	8000.000	8000.000	8000.000	8000.000
Reserves, retained profit	17980.050	21760.730	26829.750	31536.270
Profit	369.679	469.620	436.520	436.519
Long and medium term debt	1166.666	0.000	0.000	0.000
Current liabilities	180.624	180.624	180.624	180.624
Bank overdraft, finance required.	0.000	0.000	0.000	0.000
Total debt	1347.291	180.625	180.625	180.625
Equity, % of liabilities	25.717	22.93%	20.117	17.836

Buipé Lime Project

Pre-feasibility Analysis

Date: 21 dec 1990

Project: Rehabilitation of Buipé Lime Project
(Previous investment assumed sunk)

Products: Hydrated Lime

Capacity: 100 TPD or 33,000 TPY of Hydrated Lime

Type of plant: Complete lime plant with quarry equipment, crushing plant, rotary kiln with preheater, hydrators and auxiliary equipment.

Source of cost estimates: Buipé Lime Company Ltd.

Computation programme: COMFAR 2.1

Summary:

The internal rate of return IRR = 26.6 % would be acceptable for most projects, but may seem low for a rehabilitation project taking into account only the new investment. It is therefore proposed to study the cost figures for the erection and the commissioning of the plant in detail and endeavour to reduce all cost to a minimum. This could possibly be achieved by the allocation of a larger portion of the work to execution by local labour.

Buipe Lime Company Ltd
12.12.90
Revised Feasibility Study

1 year(s) of construction, 15 years of production

currency conversion rates:

foreign currency 1 unit = 1.0000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: 1000 US\$

Total initial investment during construction phase

fixed assets:	3270.00	43.884 % foreign
current assets:	0.00	0.000 % foreign
total assets:	3270.00	43.884 % foreign

Source of funds during construction phase

equity & grants:	880.00	25.000 % foreign
foreign loans :	1000.00	
local loans :	1000.00	
total funds :	2880.00	42.361 % foreign

Cashflow from operations

Year:	1	2	3
operating costs:	1491.90	1885.05	2003.00
depreciation :	336.00	336.00	336.00
interest :	513.63	487.66	460.49
production costs	2341.54	2708.71	2799.49
thereof foreign	16.60 %	13.55 %	12.33 %
total sales :	1800.00	2700.00	2970.00
gross income :	-541.54	-8.71	170.51
net income :	-541.54	-8.71	170.51
cash balance :	-348.36	209.35	393.38
net cashflow :	264.17	800.21	962.58

Net Present Value at: 26.00 % = 68.26
Internal Rate of Return: 26.58 %
Return on equity1: 19.40 %
Return on equity2: 27.68 %

Index of Schedules produced by COMU A.P.

Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance

Total Initial Investment in 1000 US\$

Year	1990.1	1990.2
Fixed investment costs		
Land, site preparation, development	0.000	0.000
Buildings and civil works	500.000	0.000
Auxiliary and service facilities	100.000	0.000
Incorporated fixed assets	140.000	0.000
Plant machinery and equipment	2040.000	0.000
	-----	-----
Total fixed investment costs	2780.000	0.000
Pre-production capital expenditures	230.000	260.000
Net working capital	0.000	0.000
	-----	-----
Total initial investment costs	3010.000	260.000
Of it foreign, in %	43.355	50.000

Total Current Investment in 1000 US\$

Year	1991	1992	1993
Fixed investment costs			
Land, site preparation, development	0.000	0.000	0.000
Buildings and civil works	0.000	0.000	0.000
Auxiliary and service facilities	0.000	0.000	0.000
Incorporated fixed assets	0.000	0.000	0.000
Plant, machinery and equipment	0.000	0.000	0.000
	-----	-----	-----
Total fixed investment costs	0.000	0.000	0.000
Preproduction capitals expenditures	0.000	0.000	0.000
Working capital	43.927	14.733	4.420
	-----	-----	-----
Total current investment costs	43.927	14.733	4.420
of it foreign, %	0.000	0.000	0.000

Total Production Costs in 1000 US\$

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
% of nom. capacity (single product)	60.606	90.909	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000
Raw material 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other raw materials	160.000	240.000	264.000	264.000	264.000	264.000	264.000	264.000	264.000	264.000
Utilities	26.667	40.000	44.000	44.000	44.000	44.000	44.000	44.000	44.000	44.000
Energy	575.758	863.636	950.000	950.000	950.000	950.000	950.000	950.000	950.000	950.000
Labour, direct	273.000	273.000	273.000	273.000	273.000	273.000	273.000	273.000	273.000	273.000
Repair, maintenance	181.479	193.418	197.000	197.000	197.000	197.000	197.000	197.000	197.000	197.000
Spares	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000	50.000
Factory overheads	225.000	225.000	225.000	225.000	225.000	225.000	225.000	225.000	225.000	225.000
Factory costs	1491.903	1385.055	2003.000	2003.000	2003.000	2003.000	2003.000	2003.000	2003.000	2003.000
Administrative overheads	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Indir. costs, sales and distribution	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Depreciation	336.000	336.000	336.000	336.000	316.000	229.000	229.000	229.000	229.000	25.000
Financial costs	513.633	487.656	460.486	431.791	401.150	368.025	331.726	291.376	245.852	193.723
Total production costs	2341.536	2708.711	2799.486	2770.791	2720.150	2600.025	2563.726	2523.376	2477.853	2221.723
Costs per unit (single product)	117.077	90.290	84.833	83.963	82.429	78.789	77.689	76.466	75.086	67.325
of it foreign, %	16.595	13.546	12.333	11.678	10.732	10.010	9.305	8.596	7.880	2.682
of it variable, %	33.581	43.543	46.344	46.824	47.696	49.900	50.606	51.415	52.360	58.336
Total labour	273.000	273.000	273.000	273.000	273.000	273.000	273.000	273.000	273.000	273.000

Total Production Costs in 1000 US\$

Year	2001	2002	2003- 5
% of max. capacity (single product)	100.000	100.000	100.000
Raw material I	0.000	0.000	0.000
Other raw materials	264.000	264.000	264.000
Utilities	44.000	44.000	44.000
Energy	950.000	950.000	950.000
Labour, direct	273.000	273.000	273.000
Repair, maintenance	197.000	197.000	197.000
Spares	50.000	50.000	50.000
Factory overheads	225.000	225.000	225.000
Factory costs	2003.000	2003.000	2003.000
Administrative overheads	0.000	0.000	0.000
Indir. costs, sales and distribution	0.000	0.000	0.000
Direct costs, sales and distribution	0.000	0.000	0.000
Depreciation	25.000	25.000	25.000
Financial costs	133.158	61.823	0.000
Total production costs	2161.158	2099.823	2028.000
Costs per unit (single product)	65.490	63.328	61.455
Of it foreign, \$	1.754	0.773	0.000
Of it variable, %	60.033	62.082	63.974
Total labour	273.000	273.000	273.000

Net Working Capital in 1000 US\$

Year		1991	1992	1993	1994-2005
Coverage	mdc coto				
Current assets &					
Accounts receivable	1 360.0	4.144	5.236	5.564	5.564
Inventory and materials	26 13.9	13.407	20.111	22.122	22.122
Energy	10 36.0	15.993	23.990	26.389	26.389
Spares	90 4.0	12.500	12.500	12.500	12.500
Work in progress	7 51.4	29.009	36.654	38.947	38.947
Finished products	7 51.4	29.009	36.654	38.947	38.947
Cash in hand	1 360.0	2.026	2.059	2.069	2.069
Total current assets		106.090	137.204	146.539	146.539
Current liabilities and					
Accounts payable	15 24.0	62.163	78.544	83.453	83.458
Net working capital		43.927	58.661	63.081	63.081
Increase in working capital		43.927	14.733	4.420	0.000
Net working capital, local		43.927	58.661	63.081	63.081
Net working capital, foreign		0.000	0.000	0.000	0.000

Note: mdc = minimum days of coverage ; coto = coefficient of turnover .

Source of Finance, construction in 1000 US\$

Year	1990.1	1990.2
Equity, ordinary ..	280.000	0.000
Equity, preference.	0.000	0.000
Subsidies, grants .	0.000	0.000
Loan A, foreign .	1000.000	0.000
Loan B, foreign..	0.000	0.000
Loan C, foreign .	0.000	0.000
Loan A, local....	1000.000	0.000
Loan B, local....	0.000	0.000
Loan C, local....	0.000	0.000
	-----	-----
Total loan	2000.000	0.000
Current liabilities	0.000	0.000
Bank overdraft	130.000	260.000
	-----	-----
Total funds	3010.000	260.000



CCIFAR 2.1 - NATIONAL INVESTMENT BANK, ACCRA, GHANA

Source of Finance, Production in 1000 US\$

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Equity, ordinary	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Equity, preference	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Subsidies, grants	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Loan A, foreign	-83.333	-83.333	-83.333	-83.333	-83.333	-83.333	-83.333	-83.333	-83.333	-83.333	-83.333
Loan B, foreign	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Loan C, foreign	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Loan A, local	-15.567	-19.877	-25.381	-32.609	-41.383	-52.842	-67.674	-86.157	-110.014	-140.477	-179.375
Loan B, local	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Loan C, local	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total loan	-98.900	-103.210	-108.714	-115.742	-124.716	-136.175	-150.807	-169.490	-193.347	-223.810	-262.728
Current liabilities	62.163	16.381	4.914	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Bank overdraft	343.363	-203.345	-393.380	-135.638	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total funds	311.626	-286.174	-497.180	-251.380	-124.716	-136.175	-150.807	-169.490	-193.347	-223.810	-262.708

Bupe Lise Company Ltd ... 12.12.90

CCIFAR 2.1 - NATIONAL INVESTMENT BANK, ACCRA, GHANA

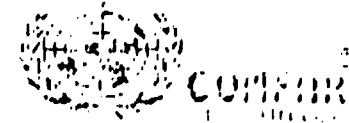
Source of Finance, Production in 1000 US\$

Year	2002
Equity, ordinary	0.000
Equity, preference	0.000
Subsidies, grants	0.000
Loan A, foreign	-83.333
Loan B, foreign	0.000
Loan C, foreign	0.000
Loan A, local	-229.045
Loan B, local	0.000
Loan C, local	0.000
Total loan	-312.379
Current liabilities	0.000
Bank overdraft	0.000
Total funds	-312.379

Bupe Lise Company Ltd ... 12.12.90

Cashflow Tables, construction in 1000 US\$

Year	1990.1	1990.2
Total cash inflow . .	2550.000	0.000
Financial resources .	2820.000	0.000
Sales, net of tax . .	0.000	0.000
Total cash outflow . .	3010.000	260.000
Total assets	2880.000	0.000
Operating costs . . .	0.000	0.000
Cost of finance . . .	130.000	260.000
Repayment	0.000	0.000
Corporate tax	0.000	0.000
Dividends paid	0.000	0.000
Surplus (deficit) .	-130.000	-260.000
Cumulated cash balance	-130.000	-390.000
Inflow, local	1660.000	0.000
Outflow, local	1795.000	130.000
Surplus (deficit) .	-135.000	-130.000
Inflow, foreign . . .	1220.000	0.000
Outflow, foreign . . .	1305.000	130.000
Surplus (deficit) .	-85.000	-130.000
Net cashflow	-2890.000	0.000
Cumulated net cashflow	-2890.000	-2990.000



CCHPAR 2.1 - NATIONAL INVESTMENT BANK, ACCRA, GHANA

Cashflow tables, production in 1000 US\$

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total cash inflow	1862.163	2716.381	2974.914	2970.000	2970.000	2970.000	2970.000	2970.000	2970.000	2970.000	2970.000
Financial resources	62.163	16.381	4.914	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sales, net of tax	1900.000	2700.000	2970.000	2970.000	2970.000	2970.000	2970.000	2970.000	2970.000	2970.000	2970.000
Total cash outflow	2210.526	2507.036	2591.524	2550.533	2528.867	2507.200	2485.533	2463.866	2442.200	2420.533	2398.666
Total assets	106.090	31.115	9.334	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Operating costs	1491.903	1885.655	2003.000	2003.000	2003.000	2003.000	2003.000	2003.000	2003.000	2003.000	2003.000
Cost of finance	513.633	487.656	460.486	431.791	471.150	368.025	331.726	291.376	245.852	193.723	133.158
Repayment	98.900	103.210	108.714	115.742	124.716	136.175	150.807	169.490	193.347	223.910	262.709
Corporate tax	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit)	-343.363	209.345	393.390	419.467	441.133	462.800	484.467	506.134	527.800	549.467	571.134
Cumulated cash balance	-739.363	-529.018	-135.638	283.929	724.962	1187.763	1672.229	2178.363	2706.163	3255.630	3826.763
Inflow, local	1862.163	2716.381	2974.914	2970.000	2970.000	2970.000	2970.000	2970.000	2970.000	2970.000	2970.000
Outflow, local	1872.669	2190.796	2286.951	2277.616	2277.616	2277.616	2277.616	2277.616	2277.617	2277.617	2277.616
Surplus (deficit)	-10.447	525.585	687.963	692.384	692.384	692.384	692.384	692.384	692.383	692.383	692.384
Inflow, foreign	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Outflow, foreign	337.917	316.250	294.583	272.917	251.250	229.583	207.917	186.250	164.583	142.917	121.250
Surplus (deficit)	-337.917	-316.250	-294.583	-272.917	-251.250	-229.583	-207.917	-186.250	-164.583	-142.917	-121.250
Net cashflow	264.170	900.212	962.580	967.000	967.000	967.000	967.000	967.000	967.000	967.000	967.000
Cumulated net cashflow	-2615.930	-1915.613	-853.038	113.962	1080.962	2047.962	3014.962	3981.962	4948.962	5915.962	6882.962

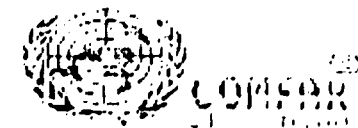
Bulpe Lise Company Ltd

Cashflow tables, production in 1000 US\$

Year	2002	2003	2004	2005
Total cash inflow	2970.000	2970.000	2970.000	2970.000
Financial resources	0.000	0.000	0.000	0.000
Sales, net of tax	2970.000	2970.000	2970.000	2970.000
Total cash outflow	2377.261	2003.000	2003.000	2003.000
Total assets	0.000	0.000	0.000	0.000
Operating costs	2003.000	2003.000	2003.000	2003.000
Cost of finance	61.823	0.000	0.000	0.000
Repayment	312.379	0.000	0.000	0.000
Corporate tax	0.000	0.000	0.000	0.000
Dividends paid	0.000	0.000	0.000	0.000
Surplus (deficit)	592.739	967.000	967.000	967.000
Cumulated cash balance	4419.563	5386.563	6353.563	7320.563
Inflow, local	2970.000	2970.000	2970.000	2970.000
Outflow, local	2277.618	2003.000	2003.000	2003.000
Surplus (deficit)	692.382	967.000	967.000	967.000
Inflow, foreign	0.000	0.000	0.000	0.000
Outflow, foreign	99.533	0.000	0.000	0.000
Surplus (deficit)	-99.533	-0.000	-0.000	-0.000
Net cashflow	967.000	967.000	967.000	967.000
Cumulated net cashflow	7849.362	8816.362	9783.362	10750.360

Cashflow Discounting:

a) Equity paid versus Net income flow:		
Net present value	-461.53 at	26.00 %
Internal Rate of Return (IRRE1) ..	19.40 %	
b) Net Worth versus Net cash return:		
Net present value	97.54 at	26.00 %
Internal Rate of Return (IRRE2) ..	27.68 %	
c) Internal Rate of Return on total investment:		
Net present value	68.26 at	26.00 %
Internal Rate of Return (IRR) ..	26.58 %	
Net Worth = Equity paid plus reserves		

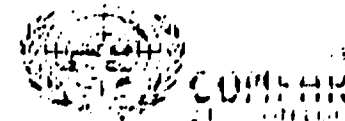


COMFAR 2.1 - NATIONAL INVESTMENT BANK, ACCRA, GHANA

Net Income Statement in 1000 US\$

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Total sales, incl. sales tax	1200.000	2700.000	2970.000	2970.000	2970.000	2970.000	2970.000	2970.000	2970.000	2970.000
Less: variable costs, incl. sales tax	706.303	1179.455	1297.400	1297.400	1297.400	1297.400	1297.400	1297.400	1297.400	1297.400
Variable margin	1013.697	1520.545	1672.600	1672.600	1672.600	1672.600	1672.600	1672.600	1672.600	1672.600
As % of total sales	56.316	56.316	56.316	56.316	56.316	56.316	56.316	56.316	56.316	56.316
Non-variable costs, incl. Depreciation	1041.600	1041.600	1041.600	1041.600	1021.600	934.600	934.600	934.600	934.600	700.600
Operational margin	-27.903	479.945	631.000	631.000	651.000	738.000	738.000	738.000	738.000	942.000
As % of total sales	-1.550	17.733	21.245	21.246	21.919	24.848	24.843	24.848	24.848	31.717
Cost of finance	513.633	437.956	460.486	431.731	401.150	369.025	331.726	291.376	245.852	193.723
Gross profit	-541.536	-8.711	170.514	199.209	249.850	369.975	406.274	446.624	492.147	748.277
Allowances	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Taxable profit	-541.536	-8.711	170.514	199.209	249.850	369.975	406.274	446.624	492.147	748.277
Tax	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Net profit	-541.536	-8.711	170.514	199.209	249.850	369.975	406.274	446.624	492.147	748.277
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Undistributed profit	-541.536	-8.711	170.514	199.209	249.850	369.975	406.274	446.624	492.147	748.277
Accumulated undistributed profit	-541.536	-550.247	-379.733	-180.524	69.326	439.301	845.575	1292.199	1784.346	2532.623
Gross profit, % of total sales	-30.085	-0.323	5.741	6.707	8.412	12.457	13.679	15.038	16.571	25.195
Net profit, % of total sales	-30.095	-0.323	5.741	6.707	8.412	12.457	13.679	15.038	16.571	25.195
R.O.E, Net profit, % of equity	-61.538	-0.990	19.377	22.637	28.392	42.043	46.167	50.753	55.926	85.031
R.O.I, Net profit/interest, % of invest.	-0.954	16.298	21.440	21.440	22.120	25.076	25.076	25.076	25.076	32.000

Buipa Lise Company Ltd



COMFAR 2.1 - NATIONAL INVESTMENT BANK, ACCRA, GHANA

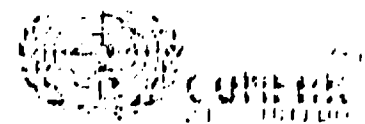
Net Income Statement in 1000 US\$

Year	2001	2002	2003	2004	2005
Total sales, incl. sales tax	2970.000	2970.000	2970.000	2970.000	2970.000
Less: variable costs, incl. sales tax	1297.400	1297.400	1297.400	1297.400	1297.400
Variable margin	1672.600	1672.600	1672.600	1672.600	1672.600
As % of total sales	56.316	56.316	56.316	56.316	56.316
Non-variable costs, incl. depreciation	730.600	730.600	730.600	730.600	730.600
Operational margin	942.000	942.000	942.000	942.000	942.000
As % of total sales	31.717	31.717	31.717	31.717	31.717
Cost of finance	133.158	61.823	0.000	0.000	0.000
Gross profit	808.842	880.177	942.000	942.000	942.000
Allowances	0.000	0.000	0.000	0.000	0.000
Taxable profit	808.842	880.177	942.000	942.000	942.000
Tax	0.000	0.000	0.000	0.000	0.000
Net profit	808.842	880.177	942.000	942.000	942.000
Dividends paid	0.000	0.000	0.000	0.000	0.000
Undistributed profit	808.842	880.177	942.000	942.000	942.000
Accumulated undistributed profit	3341.665	4221.643	5163.643	6105.643	7047.643
Gross profit, % of total sales	27.234	29.636	31.717	31.717	31.717
Net profit, % of total sales	27.234	29.636	31.717	31.717	31.717
ROE, Net profit, % of equity	91.914	160.020	107.045	107.045	107.045
ROI, Net profit/interest, % of invest.	32.007	32.007	32.007	32.007	32.007

Buipe Lise Company Ltd

Projected Balance Sheets, construction in 1000 US\$

Year	1990.1	1990.2
Total assets	3010.000	3270.000
Fixed assets, net of depreciation	0.000	3010.000
Construction in progress	3010.000	250.000
Current assets	0.000	0.000
Cash, bank	0.000	0.000
Cash surplus, finance available	0.000	0.000
Less carried forward	0.000	0.000
Less	0.000	0.000
Total liabilities	2010.000	3270.000
Equity capital	330.000	330.000
Reserves, retained profit	0.000	0.000
Profit	0.000	0.000
Long and medium term debt	2000.000	2000.000
Current liabilities	0.000	0.000
Bank overdraft, finance required	130.000	350.000
Total debt	2130.000	2390.000
Equity, % of liabilities	29.236	26.911



CM/FAR 2.1 - NATIONAL INVESTMENT BANK, ACCRA, GHANA

Projected Balance Sheets, Production in 1000 US\$

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total assets	3581.626	3285.452	2958.786	2736.101	2662.025	2715.302	2970.768	3247.902	3546.702	4071.168	4617.302
Fixed assets, net of depreciation	2934.000	2598.000	2262.000	1926.000	1610.000	1381.000	1152.000	923.000	694.000	669.000	644.000
Construction in progress	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Current assets	104.063	135.145	144.469	144.469	144.469	144.469	144.469	144.469	144.469	144.469	144.469
Cash, bank	2.026	2.059	2.069	2.069	2.069	2.069	2.069	2.069	2.069	2.069	2.069
Cash surplus, finance available	0.000	0.000	0.000	283.829	724.962	1187.763	1672.229	2178.363	2706.163	3255.629	3926.763
Loss carried forward	0.000	541.536	550.247	379.733	180.524	0.000	0.000	0.000	0.000	0.000	0.000
Loss	541.536	8.711	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total liabilities	3581.626	3285.452	2958.786	2736.101	2662.025	2715.302	2970.768	3247.902	3546.702	4071.168	4617.302
Equity capital	880.000	880.000	880.000	880.000	880.000	880.000	880.000	880.000	880.000	880.000	880.000
Reserves, retained profit	0.000	0.000	0.000	0.000	0.000	69.326	439.301	845.575	1292.199	1764.346	2533.629
Profit	0.000	0.000	170.514	194.209	249.850	369.975	406.274	446.624	492.147	546.277	616.642
Long and medium term debt	1901.100	1797.640	1689.176	1573.433	1448.717	1312.542	1161.735	992.245	798.897	575.059	312.379
Current liabilities	62.163	78.544	83.458	83.458	83.458	83.458	83.458	83.458	83.458	83.458	83.458
Bank overdraft, finance required	738.363	529.018	135.638	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total debt	2701.626	2405.452	1908.272	1656.892	1532.176	1396.000	1245.193	1075.703	882.355	658.545	395.859
Equity, % of liabilities	24.570	26.785	29.742	32.163	33.058	32.409	29.622	27.094	24.812	21.615	19.059

Projected Balance Sheets, Production in 1000 US\$

Year	2002	2003	2004	2005
Total assets	5185.101	6127.101	7069.101	8011.101
Fixed assets, net of depreciation	619.000	594.000	569.000	544.000
Construction in progress	0.000	0.000	0.000	0.000
Current assets	144.469	144.469	144.469	144.469
Cash, bank	2.069	2.069	2.069	2.069
Cash surplus, finance available .	4419.562	5336.562	6353.562	7320.562
Loss carried forward	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000
Total liabilities	5185.101	6127.101	7069.101	8011.101
Equity capital	880.000	880.000	880.000	880.000
Reserves, retained profit	3341.465	4221.643	5163.643	6105.643
Profit	830.177	942.000	942.000	942.000
Long and medium term debt	-0.000	-0.000	-0.000	-0.000
Current liabilities	83.458	83.458	83.458	83.458
Bank overdraft, finance required.	0.000	0.000	0.000	0.000
Total debt	83.458	83.458	83.458	83.458
Equity, % of liabilities	16.972	14.362	12.449	10.985

Mini Cement Plant in South Ghana

Pre-feasibility Analysis

Date: 21 dec 1990

Project: Mini Cement Plant in Southern Ghana (Tuyee)

Products: Portland Cement

Capacity: 90 TPD or 20,000 TPY (assuming a realistic output of 90 % of 90 TPD working 250 days in a year)

Source of cost estimates: South Ghana Cement and Lime Company Ltd.

Computation programme: COMFAR 2.1

Type of plant: Low cost vertical shaft kiln plant with a minimum of structures, storage capacity and control equipment.

Raw materials: Oyster shells, clay, Iron Ore and gypsum.

Fuel: Coke Breeze

Summary:

The internal rate of return is 25.3 % according to the COMFAR computation. This is somewhat lower than the figure given in a feasibility report prepared by South Ghana Cement and Lime Company, but is still very adequate for demonstration of the viability of the project.

Mini cement
12 Dec 1990
Revised

1 year(s) of construction, 15 years of production

currency conversion rates:

foreign currency 1 unit = 1.0000 units accounting currency
local currency 1 unit = 1.0000 units accounting currency
accounting currency: million Cedis

Total initial investment during construction phase

fixed assets:	267.98	63.810 % foreign
current assets:	56.00	0.000 % foreign
total assets:	323.98	52.780 % foreign

Source of funds during construction phase

equity & grants:	67.00	48.955 % foreign
foreign loans :	0.00	
local loans :	215.30	
total funds :	282.30	11.619 % foreign

Cashflow from operations

Year:	1	2	3
operating costs:	159.00	230.00	299.00
depreciation :	32.25	32.25	32.25
interest :	53.18	41.98	30.79
production costs	244.43	304.23	362.03
thereof foreign	7.49 %	6.02 %	5.05 %
total sales :	218.70	328.05	437.40
gross income :	-25.73	23.82	75.37
net income :	-25.73	13.10	41.45
cash balance :	-91.69	-23.60	5.29
net cashflow :	4.54	61.44	79.14

Net Present Value at: 28.00 % = -32.05
Internal Rate of Return: 25.34 %
Return on equity1: 42.41 %
Return on equity2: 25.84 %

Index of Schedules produced by CCMFAR

Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance

Total Initial Investment in million Cedis

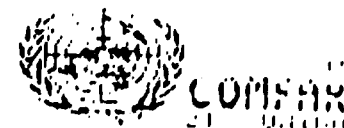
Year	1990.1	1990.2
Fixed investment costs		
Land, site preparation, development	0.000	0.000
Buildings and civil works	15.000	0.000
Auxiliary and service facilities	10.000	0.000
Incorporated fixed assets	0.000	0.000
Plant machinery and equipment	195.000	0.000
	-----	-----
Total fixed investment costs	220.000	0.000
Pre-production capital expenditures.	19.995	27.989
Net working capital	56.000	0.000
	-----	-----
Total initial investment costs	295.995	27.989
Of it foreign, in %	57.771	0.000

Total Current Investment in million Cedis

Year	1991	1992	1993	1994
Fixed investment costs				
Land, site preparation, development	0.000	0.000	0.000	0.000
Buildings and civil works	0.000	0.000	0.000	0.000
Auxiliary and service facilities	0.000	0.000	0.000	0.000
Manufacturing plant assets	0.000	0.000	0.000	0.000
Fleet, machinery and equipment	0.000	0.000	0.000	0.000
Total fixed investment costs	0.000	0.000	0.000	0.000
Preproduction capitals expenditures.	0.000	0.000	0.000	0.000
Working capital	55.156	25.892	25.344	26.017
Total current investment costs	55.156	25.892	25.344	26.017
Of it foreign, %	0.000	0.000	0.000	0.000

Total Production Costs in million Cedis

Year	1991	1992	1993	1994	1995	1996-99	2000	2001-5
1 of m.c. capacity (single product)	40.000	60.000	80.000	100.000	100.000	100.000	100.000	100.000
Raw material 1	109.000	164.000	218.000	273.000	273.000	273.000	273.000	273.000
Other raw materials	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Utilities	10.000	15.000	19.000	24.000	24.000	24.000	24.000	24.000
Energy	1.000	2.000	2.000	3.000	3.000	3.000	3.000	3.000
Labour, direct	6.000	8.000	12.000	15.000	15.000	15.000	15.000	15.000
Repair, maintenance	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
Spare	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Factory overheads	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Factory costs	136.000	199.000	261.000	325.000	325.000	325.000	325.000	325.000
Administrative overheads	21.000	28.000	34.000	41.000	41.000	41.000	41.000	41.000
Indir. costs, sales and distribution	2.000	3.000	4.000	4.000	4.000	4.000	4.000	4.000
Direct costs, sales and distribution	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Depreciation	32.247	32.247	32.247	31.847	30.146	20.250	3.850	0.750
Financial costs	53.179	41.984	30.788	19.532	8.397	0.000	0.000	0.000
Total production costs	244.426	304.230	362.035	421.439	408.543	390.250	373.850	370.750
Costs per unit (single product)	0.030	0.025	0.022	0.021	0.020	0.019	0.018	0.018
Of it foreign, \$	7.487	6.015	5.055	4.247	3.990	4.177	0.401	0.000
Of it variable, \$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total labour	8.000	10.000	15.000	18.000	18.000	18.000	18.000	18.000



Net Working Capital in million Cedis

Year	1991	1992	1993	1994	1995-2005
Coverage a/c					
cote					
Current assets &					
Accounts receivable 30 12.0	13.250	19.167	24.917	30.833	30.833
Inventory and materials 83 4.3	83.278	97.042	110.553	124.317	124.317
Energy 1 360.0	0.003	0.006	0.006	0.000	0.000
Spares 0 ---	0.000	0.000	0.000	0.000	0.000
Work in progress 30 12.0	11.333	16.503	21.750	27.083	27.083
Finished products 30 12.0	13.003	18.917	24.583	30.500	30.500
Cash in hand 15 24.0	1.542	1.917	2.333	2.750	2.750
Total current assets	122.409	153.631	184.142	215.492	215.492
Current liabilities and					
Accounts payable 30 12.0	11.333	16.503	21.750	27.083	27.083
Net working capital	111.156	137.047	162.392	188.408	188.408
Increase in working capital	55.156	25.992	25.344	26.017	0.000
Net working capital, local	111.156	137.047	162.392	188.408	188.408
Net working capital, foreign	0.000	0.000	0.000	0.000	0.000

Note: a/c = minimum days of coverage; cote = coefficient of turnover.

 Source of Finance, construction in million Cedis

Year	1990.1	1990.2
Equity, ordinary ..	67.000	0.000
Equity, preference.	0.000	0.000
Subsidies, grants .	0.000	0.000
Loan A, foreign .	0.000	0.000
Loan B, foreign..	0.000	0.000
Loan C, foreign .	0.000	0.000
Loan A, local....	215.300	0.000
Loan B, local....	0.000	0.000
Loan C, local....	0.000	0.000
	-----	-----
Total loan	215.300	0.000
Current liabilities	0.000	0.000
Bank overdraft	13.695	27.989
	-----	-----
Total funds	295.995	27.989

Source of Finance, production in million Cedis

Year	1991	1992	1993	1994	1995	1996
Equity, ordinary ..	0.000	0.000	0.000	0.000	0.000	0.000
Equity, preference.	0.000	0.000	0.000	0.000	0.000	0.000
Subsidies, grants .	0.000	0.000	0.000	0.000	0.000	0.000
Loan A, foreign .	0.000	0.000	0.000	0.000	0.000	0.000
Loan B, foreign..	0.000	0.000	0.000	0.000	0.000	0.000
Loan C, foreign .	0.000	0.000	0.000	0.000	0.000	0.000
Loan A, local....	-43.060	-43.060	-43.060	-43.060	-43.060	0.000
Loan B, local....	0.000	0.000	0.000	0.000	0.000	0.000
Loan C, local....	0.000	0.000	0.000	0.000	0.000	0.000
Total loan	-43.060	-43.060	-43.060	-43.060	-43.060	0.000
Current liabilities	11.333	5.250	5.157	5.333	0.000	0.000
Bank overdraft	91.695	23.604	-5.213	-31.691	-63.100	-56.897
Total funds	59.963	-14.206	-43.117	-69.418	-106.160	-56.897

Cashflow Tables, construction in million Cedis

Year	1990.1	1990.2
Total cash inflow . .	282.300	0.000
Financial resources .	282.300	0.000
Sales, net of tax . .	0.000	0.000
Total cash outflow . .	295.995	27.989
Total assets	282.000	0.000
Operating costs . . .	0.000	0.000
Cost of finance . . .	13.995	27.989
Repayment	0.000	0.000
Corporate tax	0.000	0.000
Dividends paid	0.000	0.000
Surplus (deficit) . .	-13.695	-27.989
Cumulated cash balance	-13.695	-27.989
Inflow, local	249.500	0.000
Outflow, local	124.506	27.989
Surplus (deficit) . .	124.506	-27.989
Inflow, foreign	32.800	0.000
Outflow, foreign . . .	171.000	0.000
Surplus (deficit) . .	-138.200	0.000
Net cashflow	-282.000	0.000
Cumulated net cashflow	-282.000	-282.000



Cashflow tables, production in million Cedis

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total cash inflow	230.033	333.300	442.567	552.083	546.750	546.750	546.750	546.750	546.750	546.750	546.750
Financial resources	11.333	5.250	5.167	5.333	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Sales, net of tax	218.700	328.050	437.400	546.750	546.750	546.750	546.750	546.750	546.750	546.750	546.750
Total cash outflow	321.729	356.904	437.273	520.392	483.650	440.425	440.425	440.425	440.425	447.805	449.200
Total assets	66.489	31.142	30.511	31.350	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Operating costs	153.000	230.000	299.000	370.000	370.000	370.000	370.000	370.000	370.000	370.000	370.000
Cost of finance	53.179	41.984	30.788	19.592	8.397	0.000	0.000	0.000	0.000	0.000	0.000
Repayment	43.060	43.060	43.060	43.060	43.060	0.000	0.000	0.000	0.000	0.000	0.000
Corporate tax	0.000	10.719	33.914	56.390	62.193	70.425	70.425	70.425	70.425	77.805	73.300
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit)	-91.695	-23.604	5.293	31.691	63.100	106.325	106.325	106.325	106.325	98.945	97.550
Cumulated cash balance	-133.378	-156.982	-151.689	-119.998	-56.898	49.427	155.752	262.077	368.402	467.347	564.897
Inflow, local	230.033	333.300	442.567	552.083	546.750	546.750	546.750	546.750	546.750	546.750	546.750
Outflow, local	321.729	356.904	437.273	520.392	483.650	440.425	440.425	440.425	440.425	447.805	449.200
Surplus (deficit)	-91.695	-23.604	5.293	31.691	63.100	106.325	106.325	106.325	106.325	98.945	97.550
Inflow, foreign	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Outflow, foreign	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Surplus (deficit)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Net cashflow	4.544	61.440	79.141	94.344	114.557	106.325	106.325	106.325	106.325	98.945	97.550
Cumulated net cashflow	-277.456	-216.016	-136.875	-42.531	72.025	178.350	284.675	391.000	497.326	596.271	693.820

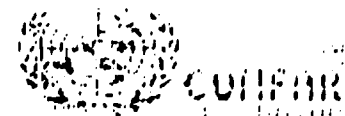
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Cashflow tables, production in 1988-1992

	1988	1989	1990	1991
Total cash inflow	546.750	546.750	546.750	546.750
Financial resources	0.000	0.000	0.000	0.000
Sales, net of tax	546.750	546.750	546.750	546.750
Total cash outflow	449.200	449.200	449.200	449.200
Total assets	0.000	0.000	0.000	0.000
Operating costs	370.000	370.000	370.000	370.000
Cost of finance	0.000	0.000	0.000	0.000
Repayment	0.000	0.000	0.000	0.000
Corporate tax	79.200	79.200	79.200	79.200
Dividends paid	0.000	0.000	0.000	0.000
Surplus (deficit)	97.550	97.550	97.550	97.550
Cumulated cash balance	502.547	759.997	357.547	955.097
Inflow, local	546.750	546.750	546.750	546.750
Outflow, local	449.200	449.200	449.200	449.200
Surplus (deficit)	97.550	97.550	97.550	97.550
Inflow, foreign	0.000	0.000	0.000	0.000
Outflow, foreign	0.000	0.000	0.000	0.000
Surplus (deficit)	0.000	0.000	0.000	0.000
Net cashflow	97.550	97.550	97.550	97.550
Cumulated net cashflow	791.370	888.920	986.470	1084.021

Cashflow Discounting:

a) Equity paid versus Net income flow:		
Net present value	73.42 at	28.00 %
Internal Rate of Return (IRR1) ..	32.31 %	
b) Net Worth versus Net cash return:		
Net present value	-17.67 at	28.00 %
Internal Rate of Return (IRR2) ..	25.63 %	
c) Internal Rate of Return on total investment:		
Net present value	-32.05 at	29.00 %
Internal Rate of Return (IRR) ..	25.33 %	
Net Worth = Equity paid plus reserves		



Net Income Statement in million Cedis

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Total sales, incl. sales tax	218.700	328.050	437.400	546.750	546.750	546.750	546.750	546.750	546.750	546.750
Less: variable costs, incl. sales tax	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Variable margin	218.700	328.050	437.400	546.750	546.750	546.750	546.750	546.750	546.750	546.750
As % of total sales	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000
Non-variable costs, incl. depreciation	191.247	262.247	331.247	401.847	400.146	390.250	390.250	390.250	390.250	373.850
Operational margin	27.453	65.803	106.153	144.903	146.604	156.500	156.500	156.500	156.500	172.900
As % of total sales	12.553	20.059	24.269	26.503	26.814	28.624	28.624	28.624	28.624	31.623
Cost of finance	53.179	41.984	30.768	19.592	8.397	0.000	0.000	0.000	0.000	0.000
Gross profit	-25.726	23.819	75.365	125.311	138.207	156.500	156.500	156.500	156.500	172.900
Allowances	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Taxable profit	-25.726	23.819	75.365	125.311	138.207	156.500	156.500	156.500	156.500	172.900
Tax	0.000	10.719	33.914	56.390	62.193	70.425	70.425	70.425	70.425	77.805
Net profit	-25.726	13.101	41.451	68.921	76.014	86.075	86.075	86.075	86.075	95.095
Dividends paid	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Undistributed profit	-25.726	13.101	41.451	68.921	76.014	86.075	86.075	86.075	86.075	95.095
Accumulated undistributed profit	-25.726	-12.625	28.825	97.746	173.760	259.835	345.910	431.985	518.060	613.155
Gross profit, % of total sales	-11.763	7.261	17.230	22.919	25.278	28.624	28.624	28.624	28.624	31.623
Net profit, % of total sales	-11.763	3.994	9.477	12.606	13.903	15.743	15.743	15.743	15.743	17.393
ROE, net profit, % of equity	-38.397	19.553	61.867	102.867	113.454	128.470	128.470	128.470	128.470	141.333
ROI, Net profit-interest, % of invest.	0.143	15.173	18.599	21.359	20.369	20.771	20.771	20.771	20.771	22.947

23



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CONFAR 2.1

NATIONAL INVESTMENT BANK, ACCRA, GHANA

63

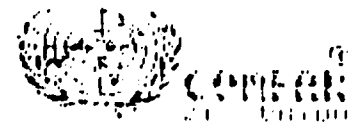
Net Income Statement in million Cedis

Year	2001	2002	2003	2004	2005
Total sales, incl. sales tax	546.750	546.750	546.750	546.750	546.750
Less: variable costs, incl. sales tax	0.000	0.000	0.000	0.000	0.000
variable margin as % of total sales	546.750 100.000	546.750 100.000	546.750 100.000	546.750 100.000	546.750 100.000
Non-variable costs, incl. depreciation	370.750	370.750	370.750	370.750	370.750
Operational margin as % of total sales	176.000 32.190	176.000 32.190	176.000 32.190	176.000 32.190	176.000 32.190
Cost of finance	0.000	0.000	0.000	0.000	0.000
Gross profit	176.000	176.000	176.000	176.000	176.000
Finance charges	0.000	0.000	0.000	0.000	0.000
Finance profit	176.000	176.000	176.000	176.000	176.000
tax	79.200	79.200	79.200	79.200	79.200
Net profit	96.800	96.800	96.800	96.800	96.800
Dividends paid	0.000	0.000	0.000	0.000	0.000
Undistributed	96.800	96.800	96.800	96.800	96.800
Accumulated retained profit	709.955	806.755	903.555	1000.355	1097.155
Gross profit, as % of total sales	32.190	32.190	32.190	32.190	32.190
Net profit, as % of total sales	17.705	17.705	17.705	17.705	17.705
Pre-tax Net Profit	186.478	186.478	186.478	186.478	186.478
Post-tax Net Profit	23.359	23.359	23.359	23.359	23.359

Mini cement

Projected Balance Sheets, construction in million Cedis

Year	1990.1	1990.2
Total assets	295.995	323.984
Fixed assets, net of depreciation	0.000	239.995
Construction in progress	239.995	27.989
Current assets	56.000	56.000
Cash, bank	0.000	0.000
Cash surplus, finance available .	0.000	0.000
Loss carried forward	0.000	0.000
Loss	0.000	0.000
Total liabilities	295.995	323.984
Equity capital	67.000	67.000
Reserves, retained profit	0.000	0.000
Profit	0.000	0.000
Long and medium term debt	215.300	215.300
Current liabilities	0.000	0.000
Bank overdraft, finance required.	13.695	41.684
Total debt	228.995	256.984
Equity, % of liabilities	22.636	20.680



COMPAR 2.1 - NATIONAL INVESTMENT BANK, ACCRA, GHANA

Projected Balance Sheets, Production in million Cedis

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total assets	303.951	302.846	368.010	354.887	324.741	353.919	439.994	526.069	612.144	707.239	804.039
Fixed assets, net of depreciation	235.737	203.490	171.242	139.395	109.249	88.969	68.749	48.499	28.249	24.399	23.649
Construction in progress	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Current assets	120.947	151.714	181.808	212.742	212.742	212.742	212.742	212.742	212.742	212.742	212.742
Cash, bank	1.542	1.917	2.333	2.750	2.750	2.750	2.750	2.750	2.750	2.750	2.750
Cash surplus, finance available	0.000	0.000	0.000	0.000	0.000	49.428	155.753	262.078	368.403	467.348	564.893
Loss carried forward	0.000	25.726	12.625	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Loss	25.726	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total liabilities	303.951	302.846	368.010	354.887	324.741	353.919	439.994	526.069	612.144	707.239	804.039
Equity capital	67.000	67.000	67.000	67.000	67.000	67.000	67.000	67.000	67.000	67.000	67.000
Reserve, retained profit	0.000	0.000	0.000	29.825	97.746	173.760	259.631	345.910	431.985	518.060	613.155
Profit	0.000	13.101	41.451	88.921	76.014	86.075	86.075	86.075	86.075	95.095	96.800
Long and medium term debt	172.240	129.180	86.120	43.060	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Current liabilities	11.333	16.563	21.750	27.083	27.083	27.083	27.083	27.083	27.083	27.083	27.083
Loss over/short, finance required	133.378	156.562	151.669	119.997	56.897	0.000	0.000	0.000	0.000	0.000	0.000
Total Debt	316.951	302.745	259.559	190.141	83.981	27.083	27.083	27.083	27.083	27.083	27.083
Equity % of liabilities	17.450	17.501	18.206	18.679	20.632	18.931	15.227	12.736	10.945	9.473	8.332

Final Report ... 12 Dec 1991

Projected Balance Sheets, Production in million Cedis

Year	2002	2003	2004	2005
Total assets	909.839	997.639	1094.439	1191.239
Fixed assets, net of depreciation	22.839	22.149	21.399	20.649
Construction in progress	0.000	0.000	0.000	0.000
Current assets	212.742	212.742	212.742	212.742
Cash, bank	2.750	2.750	2.750	2.750
Cash surplus, finance available .	662.448	759.997	657.548	955.096
Loss carried forward	0.000	0.000	0.000	0.000
Loss	0.000	0.000	0.000	0.000
Total liabilities	909.839	997.639	1094.439	1191.239
Equity capital	67.000	67.000	67.000	67.000
Reserves, retained profit	709.955	806.755	903.555	1000.355
Profit	96.800	96.800	96.800	96.800
Long and medium term debt	0.000	0.000	0.000	0.000
Current liabilities	27.083	27.083	27.083	27.083
Bank overdraft, finance required.	0.000	0.000	0.000	0.000
Total debt	27.083	27.083	27.083	27.083
Equity, % of liabilities	7.438	6.716	6.122	5.624

Small-Scale Lime Plant in South Ghana

Pre-feasibility Analysis

Date: 21 dec 1990

Project: Small-scale Lime Plant in South Ghana

Products: Hydrated Lime

Capacity: 9.0 TPD or 3,000 TPY of Hydrated Lime

Source of cost estimates: HC-Consult

Type of plant: Vertical shaft kiln lime plant with all equipment for burning and hydration of lime.

Raw material: Oyster shells

Fuel: Fuel Oil

Summary:

The simple pay-back period of 4.9 years indicates that the project is viable. However, the basic cost figures are estimates only and should be checked and used for confirmation of the profitability before any final evaluation is made.

1. Capital expenditure.

Rate of exchange: 1 USD = 350 Cedis

Item	Local		Imported		Total
	mill.C.	'ooo \$	mill.C.	'ooo \$	'ooo \$
Land	10	29			29
Site preparation	7	20			20
Struct.+Civil Eng. a	50	143			143
--- do --- b	0	0			0
Incorp. fixed assets					
a					
b					
c					
Plant equip. a	8.4	24		32	56
--- do --- b	3.5	10		10	20
Erection	12	34		20	54
Aux. & service	5	14		0	14
Pre-prod. exp.	3.5	10			10
Inventory	14	40			40
Total	113.4	324		62	386

Source of Finance:

Equity : 116,000 USD
 Loan (10 % incl. charges): 270,000 USD

Depreciation	Rate	USD/year ('ooo)
Structures : 10 %		22
Plant equipment a : 10 %		6
Plant equipment b : 25 %		5
Total		33

2. Production Cost.

Rate of exchange: 1 USD = 350 Cedis

Item	Requirements	Unit cost		Total
	Units/year	Cedis	\$	'ooo \$
Fuel Oil	350 MT	101,000	289.00	101
Petrol	300 gals.	1,000	2.86	1
Electric Power	100,000 KWH	5.25	.015	2
Paper bags	120,000 off	70	.200	24
Manpower	30 man-year	350.000	1,000	30
Maintenance, repair				6
Spare parts				3
Consumeables				5
Factory Overheads				5
Adm., labour				10
non-labour				5
Marketing, labour				10
non-lab.				5
Total				207

3. Sales Price.

The income from sale is based upon sales price 875 Cedis per 25 kg bag of hydrated lime or 100 USD per metric tonne ex factory without tax.

4. Pay-back Period

Rate of exchange: 1 USD = 350 Cedis

Item	Local	Imported	Total
	'000 \$	'000 \$	'000 \$
1 Cost of investment			386
2 Capital interest			27
3 Depreciation			33
4 Subtotal (2 + 3)			60
5 Factory Cost			207
6 Total Production Cost (4+5)			267
7 Income from sale (3000x100)			300
8 Gross Profit (7 - 6)			33
9 Income tax (45 %)			15
10 Net profit (8 - 9)			18
11 "Pay-back Profit" (10 + 4)			78

Simple Pay-back Period (for operation at 3.000 TPY output):

$$\text{SPP} = \frac{\text{Cost of investment}}{\text{Pay-back Profit}} = \frac{386,000}{78,000} = 4.9 \text{ years}$$

Simple Rate of Return on Cost of Investment:

$$\text{SRR} = \frac{\text{NP} + \text{I}}{\text{K}} \times 100 = \frac{18 + 27}{386} \times 100 = 11.7 \%$$

Kaolin Processing Plant in Western Ghana

Pre-feasibility Analysis Date: 21 dec 1990

Project: Kaolin Processing Plant in Western Ghana

Products: Refined Kaolin

Capacity: 25 TPD or 7,500 TPY of Refined Kaolin

Source of cost estimates: HC-consult

Computation programme: COMFAR 2.1

Type of Plant: Wet processing plant for washing raw kaolin with equipment for separation of the material into different size range fractions with bleaching tanks, filters and spray dryers.

Summary:

The internal rate of return IRR = 32.1 % indicates that the project is viable with the assumed figures for the cost of plant and production, and at the assumed sale price for refined kaolin. As the price of kaolin varied considerably with the quality of refined product, it is necessary to carry out tests in the laboratory for determination of the particle size distribution of the raw kaolin and the yield of coater type and filler type product per unit of mined material.



WESTERN HULLIN
 9.100.1990.1400
 Feasibility

1 year(s) of construction, 15 years of production.

CURRENCY CONVERSION RATES:

foreign currency 1 unit = 1.0000 units accounting currency,
 local currency 1 unit = 1.0000 units accounting currency
 accounting currency: 1000 US\$

Total initial investment during construction phase

fixed assets:	4425.00	66.215 % foreign
current assets:	0.00	0.000 % foreign
total assets:	4425.00	66.215 % foreign

Source of funds during construction phase

equity & grants:	1100.00	33.333 % foreign
foreign loans:	2000.00	
local loans:	300.00	
total funds:	4000.00	60.000 % foreign

Cashflow from operations

years	1	2	3
operating costs:	274.40	394.10	434.00
depreciation :	371.85	371.85	371.85
interest :	705.80	637.00	564.20
production costs	1356.05	1402.95	1370.05
thereof foreign	57.76 %	52.38 %	49.93 %
total sales :	1125.00	1657.50	1875.00
gross income :	-231.05	284.55	504.95
net income :	-231.05	284.55	504.95
cash balance :	-147.36	372.50	595.50
net cash flow :	342.44	1229.50	1439.70

Net Present Value at: 20.00 % = 2276.20
 Internal rate of return: 32.14 %
 Return on equity¹: 33.41 %
 Return on equity²: 37.17 %

Index of Schedules produced by CONFAR

Total initial investment	Cashflow Tables
Total investment during production	Projected Balance
Total production costs	Net income statement
Working Capital requirements	Source of finance

Total Initial Investment in 1000 US\$

Year	1990.1	1990.2
Fixed investment costs		
Land, site preparation, development	57.000	0.000
Buildings and civil works	829.000	0.000
Auxiliary and service facilities . .	33.000	0.000
Incorporated fixed assets	0.000	0.000
Plant machinery and equipment . . .	2900.000	0.000
	-----	-----
Total fixed investment costs	3679.000	0.000
Pre-production capital expenditures	132.000	364.000
Net working capital	0.000	0.000
	-----	-----
Total initial investment costs . . .	4061.000	364.000
Of it foreign, in %	65.747	71.429

Total Current Investment in 1961

Year	1961	1962	1963
Fixed investment costs			
Land, site preparation, development	0.000	0.000	0.000
Buildings and civil works	0.000	0.000	0.000
Military and service facilities . .	0.000	0.000	0.000
Incorporated fixed assets	0.000	0.000	0.000
Plant, machinery and equipment . .	0.000	0.000	0.000
Total fixed investment costs	0.000	0.000	0.000
Preproduction capital expenditures	0.000	0.000	0.000
Working capital	3.156	3.304	1.301
Total current investment costs . . .	3.156	3.304	1.301
Of it foreign, \$	3.278	3.242	3.342

Total Production Costs in 1000 US\$

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
2 of max. capacity (single product)	60,000	90,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Raw material I	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Other raw materials	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Utilities	3,600	5,400	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Energy	33,500	140,400	156,000	156,000	156,000	156,000	156,000	156,000	156,000	156,000
Labour, direct	43,200	64,500	72,000	72,000	72,000	72,000	72,000	72,000	72,000	72,000
Labour, variable	66,600	33,300	111,000	111,000	111,000	111,000	111,000	111,000	111,000	111,000
Stores	11,500	21,600	24,000	24,000	24,000	24,000	24,000	24,000	24,000	24,000
Factory overheads	15,500	22,500	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Factory costs	235,400	358,500	394,000	394,000	394,000	394,000	394,000	394,000	394,000	394,000
Administrative overheads	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Instr. costs, sales and distribution	30,300	30,300	30,300	30,300	30,300	30,300	30,300	30,300	30,300	30,300
Direct costs, sales and distribution	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Depreciation	371,850	371,850	371,850	366,850	366,850	366,850	337,500	320,300	320,300	320,300
Financial costs	709,800	637,000	564,200	491,400	418,600	345,800	273,000	200,200	127,400	54,500
Total production costs	1356,950	1402,350	1370,050	1292,250	1199,450	1126,650	1044,550	967,100	894,300	833,500
Costs per unit (single product)	301,344	207,344	182,673	172,300	159,927	150,220	139,273	128,947	119,243	94,467
Of it foreign X	57,756	52,375	49,925	48,520	46,271	44,646	43,176	41,257	39,291	35,790
Of it variable X	17,654	25,596	29,123	30,876	33,265	35,415	38,198	41,257	44,616	62,320
Total labour	56,200	79,300	97,000	97,000	97,000	97,000	97,000	97,000	97,000	97,000

Total Production Costs in 1961-62

Year	1961-62
% of nom. capacity (single product)	100.000
Raw material 1	0.000
Other raw materials	0.000
Utilities	6.000
Energy	156.000
Labour, direct	72.000
Repair, maintenance	111.000
Spare	24.000
Factory overheads	25.000

Factor, costs	394.000
Administrative overheads	10.000
Indiv. costs, sales and distribution	20.000
Direct costs, sales and distribution	0.000
Depreciation	30.000
Financial costs	0.000

Total production costs	464.000

Costs per unit (single product)	61.867
of it foreign, %	2.526
of it variable, %	65.991
Total labour	87.000

Net Working Capital in 1000 US\$

Year	1991	1992	1993	1994-2005
Coverage sdc coto				
Current assets &				
Accounts receivable . . . 0 ---	0.000	0.000	0.000	0.000
Inventory and materials . 0 ---	0.000	0.000	0.000	0.000
Energy 0 ---	0.000	0.000	0.000	0.000
Spares 90 4.0	1.300	2.760	3.000	3.000
work in progress 5 72.0	3.133	4.775	5.306	5.306
Finished products 10 56.0	6.589	9.814	10.889	10.889
Cash in hand 15 24.0	6.133	9.036	10.033	10.033
Total current assets	17.706	26.385	29.278	29.278
Current liabilities and				
Accounts payable 15 24.0	9.550	11.325	15.917	15.917
net working capital	8.156	15.060	13.361	13.361
increase in working capital	8.156	6.904	1.301	0.000
net working capital, local	7.856	11.610	12.861	12.861
net working capital, foreign	0.300	0.450	0.500	0.500

Notes: sdc = minimum days of coverage ; coto = coefficient of turnover .

 Source of Finance, construction in 1969-70

res:	1770.1	1770.1
Equity, ordinary ..	1200.000	0.000
Equity, preference.	0.000	0.000
Subsidies, grants .	0.000	0.000
Loan A, foreign .	2000.000	0.000
Loan B, foreign..	0.000	0.000
Loan C, foreign .	0.000	0.000
Loan A, local....	300.000	0.000
Loan B, local....	0.000	0.000
Loan C, local....	0.000	0.000
-----	-----	-----
Total loan	2900.000	0.000
Current liabilities	0.000	0.000
Bank overdraft	61.000	364.000
-----	-----	-----
Total funds	4061.000	364.000

 Source of Finance, production in 1000 US\$

Year	1991	1992	1993	1994-2000
Equity, ordinary ..	0.000	0.000	0.000	0.000
Equity, preference.	0.000	0.000	0.000	0.000
Subsidies, grants .	0.000	0.000	0.000	0.000
Loan A, foreign .	-200.000	-200.000	-200.000	-200.000
Loan B, foreign..	0.000	0.000	0.000	0.000
Loan C, foreign .	0.000	0.000	0.000	0.000
Loan A, local....	-80.000	-80.000	-80.000	-80.000
Loan B, local....	0.000	0.000	0.000	0.000
Loan C, local....	0.000	0.000	0.000	0.000
Total loan	-280.000	-280.000	-280.000	-280.000
Current liabilities	9.550	4.775	1.592	0.000
Bank overdraft	147.355	-372.456	-199.960	0.000
Total funds	-123.095	-647.721	-478.268	-280.000

 Cashflow Tables, construction in local

Year	1977	1978
Total cash inflow . . .	4,000,000	6,000,000
Financial resources . . .	1,000,000	0,000,000
Sales, ret. of tax . . .	0,000,000	6,000,000
Total cash outflow . . .	4,000,000	364,000
Total assets	2679,000	0,000
Operating costs	0,000	0,000
Cost of finance	152,000	364,000
Repayment	0,000	0,000
Corporate tax	0,000	0,000
Evidence paid	0,000	0,000
Surplus (deficit)	-61,000	-364,000
Cumulated cash balance . . .	-61,000	-425,000
Inflow, local	1600,000	6,000,000
Outflow, local	1391,000	104,000
Surplus (deficit)	209,000	-104,000
Inflow, foreign	2400,000	0,000
Outflow, foreign	2670,000	260,000
Surplus (deficit)	-270,000	-260,000
net cashflow	-3679,000	0,000
Cumulated net cashflow . . .	-3679,000	-3679,000

Cash flow tables, production in 1000 US\$

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Total cash inflow	1134,559	1632,275	1876,572	1875,000	1875,000	1875,000	1875,000	1875,000	1875,000	1875,000	1875,000
Financial resources	3,350	4,775	1,532	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Sales, net of tax	1125,000	1627,500	1875,000	1875,000	1875,000	1875,000	1875,000	1875,000	1875,000	1875,000	1875,000
Total cash outflow	1281,916	1319,779	1,291,893	1285,400	1132,600	1059,800	987,000	914,200	841,400	758,000	454,000
Total assets	17,766	8,679	2,693	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Operation costs	274,400	394,100	434,000	434,000	434,000	434,000	434,000	434,000	434,000	434,000	434,000
Cost of finance	703,900	637,000	564,200	431,400	413,600	345,300	273,000	200,200	127,400	54,500	0,000
Repa. cost	200,000	200,000	200,000	200,000	200,000	230,000	290,000	290,000	280,600	230,000	230,000
Corporate tax	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Dividends paid	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Surplus (deficit)	-147,356	372,476	595,493	659,600	742,400	815,200	888,000	960,800	1032,600	1105,000	1441,000
Cumulated cash balance	-572,356	-199,893	395,639	1065,239	1807,639	2622,839	3510,839	4471,639	5503,239	6611,639	8152,639
Inflow, local	1134,559	1632,275	1875,572	1875,000	1875,000	1875,000	1875,000	1875,000	1875,000	1875,000	1875,000
Outflow, local	567,406	653,329	666,843	642,400	621,600	600,800	580,000	559,200	539,400	517,500	495,500
Surplus (deficit)	567,144	978,946	1210,549	1232,600	1253,400	1274,200	1295,000	1315,800	1336,600	1357,500	1379,500
Inflow, foreign	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Outflow, foreign	714,500	645,750	615,929	543,000	511,000	459,000	407,000	355,000	303,000	251,000	199,000
Surplus (deficit)	-714,500	-645,750	-615,929	-543,000	-511,000	-459,000	-407,000	-355,000	-303,000	-251,000	-199,000
Net cashflow	842,444	1,329,476	1,439,639	1,441,000	1,441,000	1,441,000	1,441,000	1,441,000	1,441,000	1,441,000	1,441,000
Cumulated net cashflow	-303,356	-1747,040	-307,361	1130,639	2574,639	4013,639	5456,639	6897,639	8338,639	9779,639	11220,639

WESTERN PACIFIC ... 3 DEC 1990

Cashflow tables, production in 1000 US\$

Year	2002	2003	2004	2005
Total cash inflow	1375.000	1375.000	1375.000	1375.000
Financial resources	0.000	0.000	0.000	0.000
Sales, net of tax	1375.000	1375.000	1375.000	1375.000
Total cash outflow	434.000	434.000	434.000	434.000
Total assets	0.000	0.000	0.000	0.000
Operating costs	434.000	434.000	434.000	434.000
Cost of finance	0.000	0.000	0.000	0.000
Repairs etc.	0.000	0.000	0.000	0.000
Corporate tax	0.000	0.000	0.000	0.000
Dividends paid	0.000	0.000	0.000	0.000
Surplus (deficit)	1441.000	1441.000	1441.000	1441.000
Cumulated cash balance	9493.639	10934.640	12375.640	13816.640
Inflow, local	1375.000	1375.000	1375.000	1375.000
Outflow, local	422.000	422.000	422.000	422.000
Surplus (deficit)	1453.000	1453.000	1453.000	1453.000
Inflow, foreign	0.000	0.000	0.000	0.000
Outflow, foreign	12.000	12.000	12.000	12.000
Surplus (deficit)	-12.000	-12.000	-12.000	-12.000
Net cashflow	1441.000	1441.000	1441.000	1441.000
Cumulated net cashflow	12651.640	14092.640	15533.640	16974.640

Cashflow Discounting:

a) Equity paid versus Net income flow:		
net present value	1415.42 at	20.00 %
Internal Rate of Return (IRRE1) ..	33.41 %	
b) Net Worth versus Net cash returns:		
Net present value	1743.68 at	20.00 %
Internal Rate of Return (IRRE2) ..	37.17 %	
c) Internal Rate of Return on total investment:		
Net present value	2276.10 at	20.00 %
Internal Rate of Return (IRR) ..	32.14 %	
Net Worth = Equity paid plus reserves		

Net Income Statement in 1900 U.S.

Year	1921	1922	1923	1924	1925	1926	1927	1928	1929
Total sales, incl. sales tax	1125,000	1637,500	1375,000	1375,000	1375,000	1375,000	1375,000	1375,000	1375,000
Less: variable costs, incl. sales tax	232,400	353,100	399,000	399,000	399,000	399,000	399,000	399,000	399,000
variable margin	892,600	1284,400	976,000	976,000	976,000	976,000	976,000	976,000	976,000
as % of total sales	79.720	78.720	79.720	79.720	79.720	79.720	79.720	79.720	79.720
Non-variable costs, incl. depreciation	406,350	406,350	406,350	401,350	381,350	381,350	382,350	382,350	382,350
operational margin	470,250	878,050	569,650	574,650	594,650	594,650	594,650	594,650	594,650
as % of total sales	42.256	54.610	57.021	57.299	58.355	58.355	57.251	59.099	59.099
cost of finance	202,300	202,300	202,300	202,300	202,300	202,300	202,300	202,300	202,300
gross profit	267,950	675,750	367,350	372,350	392,350	392,350	392,350	392,350	392,350
all charges	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
taxable profit	267,950	675,750	367,350	372,350	392,350	392,350	392,350	392,350	392,350
tax	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
net profit	267,950	675,750	367,350	372,350	392,350	392,350	392,350	392,350	392,350
dividends paid	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
undistributed profit	267,950	675,750	367,350	372,350	392,350	392,350	392,350	392,350	392,350
accumulated undistributed profit	231,050	53,700	553,450	1141,200	1816,750	2565,100	3395,550	4303,451	5354,151
gross profit, % of total sales	20.239	16.862	26.931	27.080	28.829	28.829	28.829	28.829	28.829
net profit, % of total sales	20.333	16.862	26.931	27.080	28.829	28.829	28.829	28.829	28.829
acc. net profit, % of equity	19.654	23.713	42.079	48.563	56.276	62.363	69.204	75.653	81.453
ROI, Net profit/interest, % of invest.	12.316	23.634	27.468	27.536	29.110	29.110	29.343	29.479	29.479

Net Income Statement in 1000 US\$

Year	2001	2002	2003	2004	2005
Total sales, incl. sales tax	1975.000	1375.000	1375.000	1375.000	1975.000
Less: variable costs, incl. sales tax.	399.000	399.000	399.000	399.000	399.000
-----	-----	-----	-----	-----	-----
Variable margin	1476.000	1476.000	1476.000	1476.000	1476.000
As % of total sales	78.720	78.720	78.720	78.720	78.720
Non-variable costs, incl. depreciation	65.000	65.000	65.000	65.000	65.000
-----	-----	-----	-----	-----	-----
Operational margin	1411.000	1411.000	1411.000	1411.000	1411.000
As % of total sales	75.253	75.253	75.253	75.253	75.253
Cost of finance	0.000	0.000	0.000	0.000	0.000
-----	-----	-----	-----	-----	-----
Gross profit	1411.000	1411.000	1411.000	1411.000	1411.000
Allowances	0.000	0.000	0.000	0.000	0.000
Taxable profit	1411.000	1411.000	1411.000	1411.000	1411.000
Tax	0.000	0.000	0.000	0.000	0.000
-----	-----	-----	-----	-----	-----
Net profit	1411.000	1411.000	1411.000	1411.000	1411.000
Dividends paid	0.000	0.000	0.000	0.000	0.000
Undistributed profit	1411.000	1411.000	1411.000	1411.000	1411.000
Accumulated undistributed profit	7936.650	9347.650	10758.650	12169.650	13580.650
Gross profit, % of total sales	75.253	75.253	75.253	75.253	75.253
Net profit, % of total sales	75.253	75.253	75.253	75.253	75.253
ROE, Net profit, % of equity	117.583	117.583	117.583	117.583	117.583
ROI, Net profit:interest, % of invest.	36.250	36.250	36.250	36.250	36.250

 Projected Balance Sheets, construction in 10.0.55

Year	1955.1	1955.2
Total assets	4051.000	4425.000
Fixed assets, net of depreciation	0.000	4051.000
construction in progress	4051.000	354.900
Current assets	0.000	0.000
cash, bank	0.000	0.000
cash surplus, finance available .	0.000	0.000
loss carried forward	0.000	0.000
stock	0.000	0.000
Total liabilities	4051.000	4425.000
Equity capital	1250.000	1250.000
Reserves, retained profit	0.000	0.000
Profit	0.000	0.000
Long and medium term debt	2500.000	2500.000
Current liabilities	0.000	0.000
Bank overdraft, finance required.	301.000	425.000
Total debt	2801.000	3225.000
Equity, % of liabilities	39.549	27.119



CONFIDENTIAL
COMPTON
 (INCORPORATED)
 UNITED STATES OF AMERICA

(CONFER 2.1) NATIONAL INVESTMENT BOARD, WASHINGTON, GEORGIA

Projected Balance Sheets, Production in 1000 US\$

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Total
Total assets	4,011,905	3,936,735	3,734,367	4,037,117	4,432,667	4,901,017	5,451,477	6,079,366	6,760,067	7,541,517	55,525,527
Fixed assets, net of depreciation	405,915	365,100	330,945	292,400	259,750	226,639	191,349	157,449	124,549	100,000	1,500,000
Construction in progress	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Current assets	11,572	17,289	19,194	19,194	19,194	19,194	19,194	19,194	19,194	19,194	191,940
Cash, bank	6,133	9,696	10,083	10,083	10,083	10,083	10,083	10,083	10,083	10,083	100,830
Less provision, finance available	0.000	0.000	395,639	1,063,240	1,607,639	2,622,640	3,510,839	4,471,639	5,505,240	6,481,640	45,140,000
Less carried forward	0.000	231,050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	231,050
Less	231,050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	231,050
Total liabilities	4,301,905	3,936,735	3,734,367	4,037,117	4,432,667	4,901,017	5,451,477	6,079,366	6,760,067	7,541,517	55,525,527
Equity capital	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	12,000,000
Reserves, retained profit	0.000	0.000	53,500	538,450	1,141,200	1,816,750	2,565,100	3,395,550	4,333,450	5,334,150	35,525,527
Profit	0.000	284,550	504,950	592,750	675,550	748,350	830,450	907,900	980,760	1,041,550	8,411,050
Long and medium term debt	2,200,000	2,400,000	1,960,000	1,680,000	1,400,000	1,120,000	840,000	560,000	280,000	0.000	11,000,000
Current liabilities	9,550	14,325	15,917	15,917	15,917	15,917	15,917	15,917	15,917	15,917	159,170
Less overcraft, finance required	572,355	199,860	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	572,355
Total debt	3,191,905	2,454,185	1,975,917	1,695,917	1,415,917	1,135,917	855,917	575,917	295,917	15,917	15,917
Equity, % of liabilities	27,875	30,467	32,134	29,724	27,072	24,485	22,012	19,739	17,699	15,501	15,111

WESTERN INVESTMENT BOARD, WASHINGTON, GEORGIA

(CONFER 2.1) NATIONAL INVESTMENT BOARD, WASHINGTON, GEORGIA

Projected Balance Sheets, Production in 1000 US\$

Year	2002	2003	2004	2005
Total assets	10363,370	11374,570	13385,570	14735,370
Fixed assets, net of depreciation	1040,543	1010,543	980,643	950,643
Construction in progress	0,000	0,000	0,000	0,000
Current assets	19,134	13,134	13,134	13,134
Cash, bank	10,033	10,033	10,033	10,033
Cash surplus, finance available	343,641	1034,540	1235,540	1316,540
Loss carried forward	0,000	0,000	0,000	0,000
Loss	0,000	0,000	0,000	0,000
Total liabilities	10363,370	11374,570	13385,570	14735,370
Equity capital	1200,000	1200,000	1200,000	1200,000
Reserves, retained profit	5326,630	3347,630	1958,630	1269,630
Profit	1411,000	1411,000	1411,000	1411,000
Long and medium term debt	0,000	0,000	0,000	0,000
Current liabilities	15,317	15,317	15,317	15,317
Bank overdraft, finance received	0,000	0,000	0,000	0,000
Total debt	15,317	15,317	15,317	15,317
Equity, % of liabilities	11,969	10,621	9,353	8,119