MEMORANDUM AND RECOMMENDATION

OF THE

PRESIDENT OF THE

INTERNATIONAL DEVELOPMENT ASSOCIATION

TO THE

EXECUTIVE DIRECTORS

ON A

PROPOSED CREDIT

OF SDR 6.2 MILLION

TO THE

DEMOCRATIC REPUBLIC OF MADAGASCAR

FOR A

ILMENITE MINING ENGINEERING CREDIT

May 25, 1988
CURRENCY AND EQUIVALENT UNITS

Currency Unit = Malagasy Franc (FMG)
US$1.00 = FMG 1,273 (May 2, 1988)

WEIGHTS AND MEASURES

Metric system

ABBREVIATIONS

BRGM - Bureau de Recherches Géologiques et Minières (France)
DGM - Direction des Mines et de la Géologie
MIEM - Ministère de l'Industrie, de l'Energie et des Mines
MM - QIT - Madagascar Minerals Ltd. et Cie.
OMNIS - Office Militaire National des Industries Stratégiques
QIT - QIT-Fer et Titane Inc. (Canada)

FISCAL YEAR

January 1 - December 31
MADAGASCAR

ILMENITE MINING ENGINEERING PROJECT

CREDIT AND PROJECT SUMMARY

Borrower: Democratic Republic of Madagascar

Beneficiary: Office Militaire National des Industries Stratégiques (OMNIS).

Amount: SDR 6.2 million (US$8.55 million).

Terms: Standard, with 40 years maturity.

Onlending Terms: The government would make the proceeds of the credit available to OMNIS as an advance and shall ensure that OMNIS shall make available such funds as its contribution to the Joint-Venture for the carrying out of the Project. Upon the final decision of the partners as to whether to proceed with the development of the ilmenite mine, associated facilities and infrastructure, the Borrower and OMNIS shall decide on the terms and conditions of arrangements for settlement of the advance, which shall be satisfactory to the Association.

Financing Plan: OMNIS US$ 0.2 million
                 QIT US$ 7.4 million
                 IDA US$ 8.55 million
                 TOTAL US$ 16.15 million

Economic Rate of Return: Not applicable

Staff Appraisal: None

Map: IBRD 20699
1. The following memorandum and recommendation on a proposed engineering credit to Madagascar for SDR 6.2 million (US$8.55 million) is submitted for approval. The proposed credit would be on standard IDA terms with 40 years maturity and help finance an engineering project. QIT, the private partner, would make an equity contribution of SDR 5.3 million (US$7.4 million equivalent).

2. Background. Madagascar is well known for its wide variety of mineral deposits as would be expected in view of its geological continuity with the southern African continent. While it is best known for the production of chromite, graphite and mica, there have been a multiplicity of other minerals produced in the country, i.e. gold, industrial beryl, monazite, garnet, feldspar, kaolin, barytes, quartz and the full range of carbonate rocks (marble, limestone, calcite). There has also been continuous production of ornamental and semiprecious stones. In addition many other mineral resources have been identified: rare earth metals, ilmenite, zircon, bauxite, iron ore, nickel, copper, platinum group metals, lead, molybdenum, manganese and tin. However, this vast potential is largely untapped and so far the value of mineral production has not been significant in the overall economic performance of Madagascar; it currently contributes just over three percent of export revenues (down from five percent in 1978). The mining sector, like the rest of the industrial sector, has been adversely affected between the mid-1970s and early 1980s by interventionist economic policies of the Government characterized by nationalizations, price controls, overvaluation of the Malagasy franc and centralized rationing of foreign exchange.

3. The mining sector is at a critical stage where transition from a sector with a very restricted investment climate to an open sector welcoming private investment, both local and foreign, should be supported. The proposed engineering credit would be used to prepare a large-scale mineral sands project to be developed as a joint-venture by Office Militaire National des Industries Stratégiques (OMNIS), the principal Government enterprise for mineral development and mining operations, and QIT. The latter, a Canadian wholly-owned subsidiary of BP/Minerals, is a major player in the titanium dioxide slag industry controlling about 40 percent of the world market. OMNIS and QIT have formed an unincorporated joint-venture (OMNIS 51 percent, QIT 49 percent) with QIT the operator. The proposed OMNIS/QIT ilmenite mining project concept is to produce about 600,000 tons of ilmenite (used primarily for the production of titanium dioxide pigment, the major pigment in nearly all white paints), and smaller quantities of the co-products rutile (main source material for titanium metal which is widely used in high performance aircraft), zircon (the principal source of the element zirconium used mainly in foundries,
refractories and ceramics), and monazite (used in petroleum catalysts, metallurgy, electronics, optical and special glasses, magnets). The proposed operation will require careful planning to avoid long-term environmental damage to the areas being mined which include one of the remaining tracts of littoral tropical rain forests.

4. **Rationale for IDA Involvement.** The proposed ilmenite mining project is central to Madagascar medium-term development strategy which aims to diversify exports and encourage private sector participation. The proposed engineering credit, which would finance OMNIS's share of the engineering phase of the ilmenite mining project, would allow a more active participation by OMNIS during the preparation stage of the main project. The credit, by enhancing collaboration between OMNIS, QIT and the Bank, would facilitate preparation of the ilmenite mining project. Successful implementation of the project will help demonstrate to the outside world that the development of the mineral potential of Madagascar can now be realized with the participation of private foreign investment. It would help establish the credibility of Madagascar for major new investments in mining as well as other sectors. In view of the relative importance of this new mining venture, IDA participation would also provide an avenue for linking the project to country policy and institutional reform strategy, setting an example of a sound project in the areas of management, operational responsibilities, fiscal regime, environmental protection and social impact. IDA's involvement would ensure that the delicate environmental questions raised by the project are properly addressed in the context of the comprehensive environmental action plan under preparation by the Government (with IDA's assistance).

5. **Project Objectives.** The main objective of the proposed engineering project is to help OMNIS carry out its share of Phase III of project preparation. In accordance with the terms of the joint-venture agreement which was signed in March 1986, QIT provided all the financing for Phase I (exploratory work to confirm the quantity, grades and product qualities of the ore body amounting to US$2.2 million and covering the May 1986 to February 1987 period) and Phase II (detailed drilling work in order to select a mining plan for 20 years and pilot-scale plant to produce heavy mineral concentrates to provide data for a full-scale plant design amounting to US$12 million and covering the period March 1987-December 1988). Phase III, which would be partly financed by this engineering credit, is described below.

6. **Project Description.** In order to assist preparation of the ilmenite mining project, the engineering credit would finance OMNIS's share of the following work: (a) setting up of a Wet Pilot and Mineral Separation Pilot Plant to optimize and confirm flowsheets developed during Phase II; (b) completion of basic engineering for the following facilities: dredge and concentrator plant, mineral separation plant, power plant, dock/harbor; (c) completion of the environmental impact study. Also included would be some complementary drilling, ore body delineation and limited infrastructure development, i.e. road and bridge construction to have access to the area which is the likely location of the mineral processing and product facility, market studies, and product/pilot plant test work. If the project is judged economically and financially viable, the engineering credit would also finance preparation of bid documents, prequalification of
contractors as needed and evaluation of bids. In addition to the above elements, the project scope includes OMNIS internal costs, to monitor and promote the project, technical assistance for OMNIS, and the refinancing of a Project Preparation Fund advance (PPF) which had been granted to the Government in October 1987 to prepare the ilmenite mining project. The total cost of the engineering project is estimated at US$16.2 million equivalent (exclusive of taxes, from which the project is exempt), of which US$15.2 million equivalent represent foreign costs (94 percent of the total). An amount of US$8.55 would be financed by the proposed credit, including US$750,000 for the refinancing of the PPF and US$700,000 for technical assistance to OMNIS, monitoring and follow-up activities. The cost estimate is based on 1988 prices. Price contingencies based on an annual worldwide inflation rate of 5 percent and physical contingencies of 15 percent of all costs are included. The Government would make the proceeds of the credit available to OMNIS as an advance and would ensure that OMNIS make such funds available as its contribution to the joint-venture for the carrying out of the Project. Upon the final decision of the partners of the Joint-Venture Agreement as to whether to proceed with the development of the ilmenite mine, associated facilities and infrastructure, the Borrower and OMNIS would decide on the terms and conditions of arrangements for settlement of the advance, which would be satisfactory to the Association. QIT would finance both foreign and local project costs through its equity contribution. Within the framework of the unincorporated joint-venture, QIT-Madagascar Minerals, which is registered and domiciled in Madagascar and which is the operator for the joint-venture, will be the operator for the proposed engineering credit. A breakdown of costs and the financing plan are shown in Schedule A. Amounts and methods of procurement and of disbursements, and the disbursement schedule are shown in Schedule B. A timetable of key project processing events and the status of Bank Group operations in Madagascar are given in Schedules C and D respectively. A map is attached. The following technical annexes are also attached: Annex I, project background information: Madagascar Mining Sector Development Issues, Objectives and Strategy; Project Formulation and Preparation; The Impact of Madagascar Ilmenite Mining Project on the World Market; Annex II, Environmental issues; Annex III, Project Execution.

7. **Agreed Actions.** The Government/OMNIS have agreed on the following actions: (a) a legal agreement between OMNIS, QIT, and QIT-Madagascar Minerals as operator for the joint-venture acceptable to IDA, spelling out the specific obligations of the partners to the joint-venture and of the operator for the carrying out of the engineering credit. Effectiveness of this agreement would be a condition of effectiveness of the credit; (b) IDA approval of the terms of reference for an environmental impact study would be a condition of effectiveness.

8. **Benefits.** Heavy mineral sand reserves in Madagascar are amongst the largest in the world and the country stands to become a major source of these minerals. There are strong indications that exploitation of these heavy mineral sands is a financially and economically viable proposition. The project would require an investment of approximately US$130 million and would generate about US$40 million per year in gross foreign exchange earnings. In addition, it would provide employment and stimulate development of the Southeast region of Madagascar. The engineering credit would
enable OMNIS to become a more effective partner in project preparation, and
it would advance the project implementation schedule while ensuring
adequate consideration of environmental issues.

9. **Risks.** The major risk associated with the project is a change in
corporate strategy of QIT or its parent company BP/Minerals. Market or
political risks could also affect the attractiveness of the deposit. The
Government's professional approach to the development of the ilmenite
mining project, as shown by its request for the engineering credit to
ensure satisfactory preparation, should reduce the political risk. Market
risks are not considered high because the titanium dioxide pigment market
has been experiencing a significant recovery since 1984 after 10 years of
low growth. Plants worldwide are now working at full capacity and a
medium-to long-term growth rate of 2-3 percent per year is forecast. Last,
there is an inherent risk in the execution of a major project in a country
with minimal infrastructure and scarce resources. The potential benefits
outweigh the risks discussed above.

10. **Recommendation.** I am satisfied that the proposed credit would
comply with the Articles of Agreement of the Association and recommend that
the Executive Directors approve the proposed credit.

Barber Conable
President

**Attachments**

Washington, D.C.
May 25, 1988
## Schedule A

### MADAGASCAR

**ILMENITE MINING ENGINEERING CREDIT**

**ESTIMATED COSTS AND FINANCING PLAN**

<table>
<thead>
<tr>
<th>Estimated Costs</th>
<th>Local</th>
<th>Foreign</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Basic Engineering:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet Plant/Dry Plant</td>
<td>-</td>
<td>6.3</td>
<td>6.3</td>
</tr>
<tr>
<td>Dock/ Harbor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dredge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Plant</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infrastructure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Complementary Drilling and Orebody Delineation</td>
<td>0.2</td>
<td>0.9</td>
<td>1.1</td>
</tr>
<tr>
<td>3. Logistical Support Activities</td>
<td>0.2</td>
<td>0.5</td>
<td>0.7</td>
</tr>
<tr>
<td>4. Market Studies</td>
<td>-</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>5. Product/Pilot Plant Testwork</td>
<td>-</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>6. Heavy Equipment and Infrastructure Construction</td>
<td>0.3</td>
<td>3.2</td>
<td>3.5</td>
</tr>
<tr>
<td>Base Cost</td>
<td>0.7</td>
<td>11.4</td>
<td>12.1</td>
</tr>
<tr>
<td>Physical Contingencies</td>
<td>0.1</td>
<td>1.7</td>
<td>1.8</td>
</tr>
<tr>
<td>Price Contingencies</td>
<td></td>
<td>0.6</td>
<td>0.6</td>
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<tr>
<td>Joint-Venture Project Cost</td>
<td>0.8</td>
<td>13.7</td>
<td>14.5</td>
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<td>7. Technical Assistance OMNIS</td>
<td>-</td>
<td>0.5</td>
<td>0.5</td>
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<tr>
<td>8. OMNIS Internal Project Cost</td>
<td>0.2</td>
<td>0.2</td>
<td>0.4</td>
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<tr>
<td>9. Refinancing of PPF</td>
<td>-</td>
<td>0.75</td>
<td>0.75</td>
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<tr>
<td>Total OMNIS Cost</td>
<td>0.2</td>
<td>1.45</td>
<td>1.65</td>
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<tr>
<td>Total Project Cost</td>
<td>1.0</td>
<td>15.15</td>
<td>16.15</td>
</tr>
</tbody>
</table>

1/ Exclusive of taxes and duties.

**Financing Plan**

<table>
<thead>
<tr>
<th></th>
<th>Local</th>
<th>Foreign</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMNIS</td>
<td>0.2</td>
<td>-</td>
<td>0.2</td>
</tr>
<tr>
<td>QIT</td>
<td>0.8</td>
<td>6.6</td>
<td>7.4</td>
</tr>
<tr>
<td>IDA</td>
<td>-</td>
<td>8.55</td>
<td>8.55</td>
</tr>
<tr>
<td>Total</td>
<td>1.0</td>
<td>15.15</td>
<td>16.15</td>
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</table>
### MADAGASCAR
ILMENITE MINING ENGINEERING CREDIT
PROCUREMENT METHOD AND DISBURSEMENTS

<table>
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<tr>
<th>Project Element</th>
<th>Procurement Method</th>
<th>Total Cost (US$ million)</th>
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<tr>
<td></td>
<td>ICB</td>
<td>LIB</td>
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<tr>
<td>1. Consultants/Basic Engineering</td>
<td>6.3*</td>
<td>6.3</td>
</tr>
<tr>
<td>2. Complementary Drilling and Ore Body Delineation</td>
<td>1.1</td>
<td>1.1</td>
</tr>
<tr>
<td>3. Logistical Support Activities</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>4. Market Studies</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>5. Product/Pilot Plant Testwork</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>6. Heavy Equipment</td>
<td>3.2</td>
<td>0.3</td>
</tr>
<tr>
<td>7. Consultants for OMNIS</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>8. OMNIS - Project Promotion/</td>
<td>.2</td>
<td>.2</td>
</tr>
<tr>
<td>Monitoring</td>
<td></td>
<td></td>
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<tr>
<td>9. Refinancing of PPF</td>
<td>0.75</td>
<td>0.75</td>
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<tr>
<td>Total</td>
<td>3.2</td>
<td>10.35</td>
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</tbody>
</table>

**Note:**
- Figures in parenthesis are amounts financed by the Association.
- * Includes amounts for items financed by QIT and procured under its own procedures.
- Consultants for OMNIS and Consultants/Basic Engineering (US$4.4 million) will be procured as per IDA guidelines. Equipment (US$3.2 million) will be procured by LIB because of the specialized nature of the equipment and the limited number of suppliers for this type of equipment. US$0.2 million will be spent for project monitoring and promotion by OMNIS.

### Disbursements (US$ million)

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Basic Engineering</td>
<td>3.9</td>
<td>100% of foreign expenditures</td>
</tr>
<tr>
<td>2. Heavy Equipment</td>
<td>3.2</td>
<td>100% of foreign expenditures</td>
</tr>
<tr>
<td>3. Consultants for OMNIS/Project Promotion/ Monitoring</td>
<td>0.7</td>
<td>100% of foreign expenditures</td>
</tr>
<tr>
<td>4. Refinancing of PPF</td>
<td>0.75</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** To expedite disbursements, a special account to be maintained in foreign currency will be opened in an institution acceptable to IDA. The initial amount of the deposit into the account would be US$1.8 million. Disbursement will be fully documented except that statement of expenditures will be used for contracts costing less than US$50,000.

### Estimated IDA Disbursements

<table>
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<tr>
<th>IDA Fiscal Year</th>
<th>89</th>
<th>90</th>
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<tbody>
<tr>
<td>Annual</td>
<td>4.45</td>
<td>4.1</td>
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<tr>
<td>Cumulative</td>
<td>4.45</td>
<td>8.55</td>
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**Schedule C**

**MADAGASCAR**

**ILMENITE MINING ENGINEERING CREDIT**

**Timetable of Key Project Processing Events**

<table>
<thead>
<tr>
<th>Event Description</th>
<th>Date/Details</th>
</tr>
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<tbody>
<tr>
<td>a) Time taken to prepare:</td>
<td>Eight months</td>
</tr>
<tr>
<td>b) Prepared by:</td>
<td>QIT/OMNIS with IDA assistance</td>
</tr>
<tr>
<td>c) First IDA mission:</td>
<td>February 1987</td>
</tr>
<tr>
<td>d) Appraisal mission departure:</td>
<td>January 1988</td>
</tr>
<tr>
<td>e) Negotiations:</td>
<td>May 17-18, 1988</td>
</tr>
<tr>
<td>f) Planned Date of Effectiveness:</td>
<td>November 1988</td>
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</tbody>
</table>
## Status of Bank Group Operations in Madagascar

### A. Statement of Bank Loans and IDA Credits

**March 31, 1988**

<table>
<thead>
<tr>
<th>Loan or Credit number</th>
<th>Year</th>
<th>Borrower</th>
<th>Bank</th>
<th>IDA (1)</th>
<th>Undisbursed</th>
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<tr>
<td>1155</td>
<td>1981</td>
<td>GOVT OF MADAGASCAR</td>
<td>Accounting &amp; Audit Training</td>
<td>11.50</td>
<td>0.51</td>
</tr>
<tr>
<td>1211</td>
<td>1982</td>
<td>GOM /FOFIFAMA</td>
<td>Village Livestock II</td>
<td>15.00</td>
<td>10.05</td>
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<tr>
<td>1298</td>
<td>1983</td>
<td>OMNIS</td>
<td>Heavy Oil Exploration II</td>
<td>11.50</td>
<td>3.15</td>
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<tr>
<td>1337</td>
<td>1983</td>
<td>GOVT OF MADAGASCAR</td>
<td>Alaotra Rice Intensification</td>
<td>18.00</td>
<td>9.11</td>
</tr>
<tr>
<td>F 004</td>
<td>1984</td>
<td>MTP &amp; MTRT</td>
<td>Sixth Highway</td>
<td>20.00</td>
<td>2.35</td>
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<tr>
<td>F 008</td>
<td>1984</td>
<td>GOM /HASYMA</td>
<td>Cotton Development</td>
<td>9.90</td>
<td>1.05</td>
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<tr>
<td>1391</td>
<td>1984</td>
<td>GOVT OF MADAGASCAR</td>
<td>Sixth Highway</td>
<td>25.00</td>
<td>3.37</td>
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<td>1433</td>
<td>1984</td>
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<td>Cotton Development</td>
<td>7.90</td>
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<td>1497</td>
<td>1984</td>
<td>GOVT OF MADAGASCAR</td>
<td>Urban Development</td>
<td>12.80</td>
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<tr>
<td>A 007</td>
<td>1985</td>
<td>GOVT OF MADAGASCAR</td>
<td>Industrial Assistance</td>
<td>20.00</td>
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<tr>
<td>1541</td>
<td>1985</td>
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<td>1589</td>
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<td>1661</td>
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<td>12.91</td>
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<td>GOVT OF MADAGASCAR</td>
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<td>1694</td>
<td>1986</td>
<td>RNCFM</td>
<td>Third Railway</td>
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<td>1709</td>
<td>1986</td>
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<td>2nd Agricultural Institutions</td>
<td>10.00</td>
<td>10.18</td>
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<td>A 0032</td>
<td>1987</td>
<td>GOVT OF MADAGASCAR</td>
<td>Industry &amp; Trade Policy Adj.</td>
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<td>15260</td>
<td>1987</td>
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<td>Cyclone Rehabilitation</td>
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<td>15261</td>
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<td>Cyclone Rehabilitation</td>
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<td>1752</td>
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<td>Port Rehabilitation</td>
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<td>1787</td>
<td>1987</td>
<td>GOM /JIRAMA/MIEM/MPAREnergy I</td>
<td></td>
<td>25.00</td>
<td>27.47</td>
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<td>1804</td>
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<td>GOM /BTM</td>
<td>2nd Agricultural Credit</td>
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<td>1834</td>
<td>1987</td>
<td>GOVT OF MADAGASCAR</td>
<td>Industry &amp; Trade Policy Adj.</td>
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<td>10.84</td>
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<td>** 1978</td>
<td>1988</td>
<td>GOVT OF MADAGASCAR</td>
<td>Forest Management &amp; Protection</td>
<td>7.00</td>
<td>7.08</td>
</tr>
</tbody>
</table>

**Subtotal active projects:** 0.00 454.90 271.29

Total less cancellations: 38.77 736.46 271.29
of which has been repaid 8.81 6.48 0.00

Total outstanding incl. undisbursed: 29.96 729.98 (2)

Amount sold: 0.00 6.86 0.00
of which has been repaid 0.00 6.86 0.00

Total now held by Bank and IDA (1): 23.76 561.13 (2)

Total undisbursed: 0.00 271.29 (2)

---

**Not yet effective.**

(1) US$ amounts for credits are computed at rate of negotiations dates.

(2) Sum of Total now held by IDA and Total Undisbursed is higher than Total Outstanding because of depreciation of the US$. 

---
### B. Statement of IFC Investment (March 31, 1988)

<table>
<thead>
<tr>
<th>Year</th>
<th>Project Description</th>
<th>Loan (US$ Million)</th>
<th>Equity (US$ Million)</th>
<th>Total (US$ Million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>Sotema - Textile Mill et Majunga</td>
<td>11.000</td>
<td>0.299</td>
<td>11.299</td>
</tr>
<tr>
<td>1980</td>
<td>Bata - Shoe Manufacturing in Antananarivo</td>
<td>1.250</td>
<td>-</td>
<td>1.250</td>
</tr>
<tr>
<td>1983</td>
<td>Pecheries de Nossi-Be</td>
<td>2.570</td>
<td>0.099</td>
<td>2.669</td>
</tr>
<tr>
<td>1985</td>
<td>Cotona, S.A. at Antsirabe</td>
<td>9.563</td>
<td>0.184</td>
<td>9.747</td>
</tr>
<tr>
<td>1987</td>
<td>Satema-Textile Mill</td>
<td>3.744</td>
<td>0.010</td>
<td>3.754</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>28.127</strong></td>
<td><strong>0.592</strong></td>
<td><strong>28.719</strong></td>
</tr>
</tbody>
</table>

**Less: Repayments, sales cancellations and exchange adjustments**

<table>
<thead>
<tr>
<th></th>
<th>Loan (US$ Million)</th>
<th>Equity (US$ Million)</th>
<th>Total (US$ Million)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8.469</td>
<td>-</td>
<td>8.469</td>
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</table>

**Total commitments now held by IFC**

<table>
<thead>
<tr>
<th></th>
<th>Loan (US$ Million)</th>
<th>Equity (US$ Million)</th>
<th>Total (US$ Million)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>19.658</td>
<td>0.592</td>
<td>20.250</td>
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</table>

**Total undisbursed**

<table>
<thead>
<tr>
<th></th>
<th>Loan (US$ Million)</th>
<th>Equity (US$ Million)</th>
<th>Total (US$ Million)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.385</td>
<td>0.583</td>
<td>3.968</td>
</tr>
</tbody>
</table>
Sector Development Issues, Objectives and Strategy

1. Madagascar is well known for its diverse suite of mineral deposits as would be expected in view of its geological continuity with the southern African continent. While it is best known for the production of chromite, graphite and mica, there have been a multiplicity of other minerals produced in the country. In the metallic mineral group, production of chromite, gold, industrial beryl, monazite, has been recorded. In the industrial mineral sector there has been production of graphite, mica, garnet, feldspar, kaolin, barytes, quartz and the full range of carbonate rocks (marble, limestone, calcite, etc.). There has also been continuous production of ornamental and semiprecious stones. In addition, many other mineral resources have been identified: rare earth metals, ilmenite, zircon, bauxite, iron ore, nickel, copper, platinum group metals, lead, molybdenum, manganese and tin.

2. The value of mineral production has not been significant in the overall economic performance of Madagascar and it currently contributes just over three percent of export revenues (down from five percent in 1978). Some 1,500 persons are directly employed in the sector while perhaps another 3,000-4,000 derive at least a part of their income from small-scale mining activities. The mining sector, like the rest of the industrial sector, has been adversely affected during the 1970s and early 1980s by the interventionist economic policies of the Government characterized by nationalizations, price controls, overvaluation of the Malagasy franc and severe rationing of foreign exchange.

3. KRAOMA, the state-owned and controlled chromite firm is, in terms of export receipts, the most important industrial mining operation in Madagascar. The French consortium, Compagnie Minière d'Andriamena (COMINA), which had developed the chromite mines in the late 1960s was nationalized in 1976. Production of saleable chromite ore, which was 200,000 tons at the time of nationalization, decreased to less than 50,000 tons in 1982 due to management, technical and marketing problems. Since 1982 some improvements have been achieved and in 1986, 83,000 tons of marketable ore was produced. Today, the operation of KRAOMA is facing severe difficulties because of increased costs. A study of the strategic options available to the company, funded with a grant from the US Trade and Development Program, is assessing KRAOMA's present situation within a global industry context and will recommend strategies to enable KRAOMA's survival and viability.

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1/ A review of the Malagasy mining sector was presented in "Mémoire sur le Secteur Minier à Madagascar" (Report No.6782-MAG, Industry and Energy Operations Division, South-Central and Indian Ocean Department, Africa Region, dated November 30, 1987)
4. Graphite which, in terms of export receipts is second to chromite, is produced by five private producers. Over the last ten years, production has been stable. It appears that the Malagasy graphite industry is quite profitable. In view of the apparent profitability of the industry, the large reserves of high grade graphite and the established acceptability and desirability of Malagasy graphite, there seems to be scope to increase the output of the existing mines. However, the restricted availability of foreign exchange during the period under review, and the fear of nationalization resulted in an unfavorable investment climate for even minimal investment.

5. Quartz production, dominated by small-scale private operators has increased rapidly since the mid-1970s from less than 200 tons to about 1,500-2,000 tons per year, with over 99 percent of the quartz being produced to supply the market for high purity feedstock for the production of special glasses. At present, there are many restraints to expansion of capacity ranging from inadequate access to the principal producing areas in northeast Madagascar to the inability of the small producers to obtain either credit or foreign exchange for the purchase of equipment.

6. Recorded production, dominated by small-scale private operators or cooperatives has decreased steadily. The apparent poor performance of the sector is largely due to the increased smuggling which resulted from the Government requirement (until September 1987) that Malagasy gold be sold to a government agency at an official purchase price in FMG significantly below world price.

7. Mining is regulated by the Ministry of Industry, Energy, and Mining (MIEM) through the Directorate of Mines and Geology (DMG). The DMG is administratively divided into three services or departments, namely: i) the Service de la Géologie; ii) the Service des Projets Miniers; and, iii) the Service de l'Administration Minière. DMG appears to be administering the sector in a competent manner despite the paucity of professional staff and physical resources. Activities of the various departments are well documented in a timely manner and the work program is executed to acceptable standards. As in most developing countries, there is a lack of physical resources which impedes the efficiency of the DMG. For example, there is a shortage of vehicles to carry out field projects and a shortage of reagents for laboratory test work. Technical assistance to DMG with both economic and geology training and with the strengthening of the physical resource base would provide major benefits to Madagascar in the short/medium terms.

8. The National Military Office for Strategic Industries (OMNIS), created in 1975 is an autonomous agency under the direct authority of the President. OMNIS is responsible for the exploration of petroleum, bituminous sandstones and radioactive minerals as well as the execution of other strategic projects including the ilmenite mining project. OMNIS also supervises two state-owned enterprises, KRAOMA and SECREN, a shipbuilding and repair enterprise. In 1986 OMNIS entered into a joint-venture
agreement with a private Canadian firm QIT for the exploration, exploitation and marketing of titanium-bearing mineral sands on the southeast coast of Madagascar (OMNIS 51 percent, QIT 49 percent) with QIT the operator.

9. The investment climate and legislation for the sector is established by the Investment Code (1985), and the Mining Code which is currently under revision. Both documents have as one of their principal objectives the stimulation of private investment, both national and foreign, in the mining sector. The new investment code makes provision for a "contrat de partenariat" (partnership contract) whereby a joint-venture is set up with the State, the various incentives being subject to negotiation. Since the partnership contract is subject to legislative ratification, negotiated advantages have statutory force which contributes to their stability. On the whole, compared to the Charte des Entreprises Socialistes which was adopted by the Government in 1973, the new investment code represents a significant effort to induce the private sector to cooperate with the State. The principal problems with the legislation appear to be the lack of clear cut rules under which investors are able to operate in the sector. There is still a lack of automaticity for receipt of fiscal incentives under the Investment Code and the Mining Code has many discretionary provisions. Although these two Codes do not remove all ambiguities from the conditions offered to investors, they are major steps forward. In the mining sector, potential investors must have, in addition to an appropriate legislative and fiscal framework, ready access to the geological data base, which is not presently the case. MIEM has a considerable mass of geological data, but most of it is not catalogued and there are no facilities for potential investors to obtain copies of data.

10. The mining sector is now at a critical stage where transition from a sector with a very restricted investment climate to an open sector welcoming private investment, both local and foreign, is feasible and should be supported. The geological framework of the island suggests that private investment could be attracted and the Government should now select options to encourage this. Madagascar has three principal priorities in the mining sector. They are:

(i) to establish the administrative, legal, fiscal and geological framework necessary to attract investment in the exploration for and development of its mineral resources. For example, the legislation should be modified to provide automaticity for potential investors with regard to at least the minimum fiscal incentives;

(ii) to preserve the earning potential of the sector by managing efficiently government enterprises in the sector and improving relationships with private investors both foreign and local. The role of the Government as a partner in several on-going exploration/feasibility ventures with private sector and foreign investors is currently being exercised in the ilmenite mining project and in a gold project with
the French Bureau de Recherches Géologiques et Minières (BRGM). The adequate representation of Government interests in the initial negotiations for joint-ventures is a most important and responsible task, as it is at this time that the ground rules for the mineral development are set; and

(iii) to direct resources to those projects most likely to benefit the national economy in the short to medium term. In Madagascar, this can be interpreted to mean projects for relatively high value commodities in areas where the necessary infrastructure already exists. The Government is becoming increasingly aware of this as witnessed by the downgrading of priority for the iron and bauxite projects and the high priority currently being given to mineral sands on the southeast coast, gold and quartz.

11. The outlook for increasing mineral production is particularly good because of the proposed large-scale titanium-bearing mineral sands project to be developed as a joint-venture by OMNIS and QIT, a Canadian subsidiary of BP/Minerals which is a major player in the titanium dioxide slag industry controlling about 40 percent of the world market. The proposed OMNIS/QIT Ilmenite Mining Project to produce concentrates for export from the Fort-Dauphin area of southeast Madagascar is the most significant new mining activity under consideration in Madagascar for over 20 years and is the first major new venture in the sector with either foreign or private participation for some years.

B. PROJECT FORMULATION AND PREPARATION

Project Origin

12. The presence of heavy mineral sand deposits in southeastern Madagascar was established in the 1950s and commercial quantities of monazite were produced in that area during early 1960s. Detailed exploration campaigns for heavy mineral sand deposits were conducted by a number of private companies, including US Steel, in the early 1970s along the eastern coast of Madagascar. These programs established the presence of significant reserves of ilmenite as well as commercially important quantities of zircon and monazite. The US Steel program conducted in 1974-75 had outlined a 25 million metric tons reserve of low-alkali secondary ilmenite in the southeast corner of Madagascar, in the Fort-Dauphin area. QIT acquired US Steel geological data and associated feasibility studies and, in 1986, set up a joint-venture with OMNIS to explore, develop and market the titanium-bearing sands on the east coast.
13. The Government of Madagascar requested Bank involvement in the proposed ilmenite mining project during a 1987 mining sector review mission in Madagascar. The mission concluded that the Bank could play a key role in bringing to fruition this important and attractive project for Madagascar and in providing technical assistance to OMNIS for project preparation and monitoring. In May 1987, representatives of the Government of Madagascar, OMNIS, QIT, and its parent company visited the Bank and made a presentation on the overall project schedule and goals. The Government indicated that it would welcome from the Bank not only financing to the OMNIS/QIT project but also technical assistance. Ways in which financing and technical assistance could be made available to OMNIS were then reviewed. Subsequently in July 1987, the Government addressed a formal request for a PPF advance to finance consultancy services to assist OMNIS prepare, evaluate and monitor the project. In September 1987, a mining sector mission held discussions with OMNIS in Madagascar and reached agreement on the work to be financed. The PPF amounting to $750,000 provides inter alia general assistance to OMNIS for consultant services in the areas of mining, financial and economic analysis, organization, legal affairs and marketing. The PPF was granted in October 1987. The question of a possible engineering credit was initially discussed at the May 1987 meeting referred to above, during the September 1987 mission and at a meeting held in Montreal in December 1987 between representatives of OMNIS, QIT and the Bank. Following an official request of the Government in January 1988, the engineering credit was appraised in January/February 1988.

**Status of Project Preparation**

14. **Phase I** (evaluation phase of the exploration period) of project preparation (May 1986 to February 1987) financed entirely by QIT (US$2.2 million) focused on determining the quantity, grades and product qualities of the ore body. Moreover, exploratory drilling revealed additional reserves of heavy mineral-bearing sands underlying the reserves previously identified by US Steel. Drilling work of the whole deposit had to be repeated to establish an accurate picture of the lower deposit. Although this work delayed the project by several months, it resulted in probable geological reserves of ilmenite being increased from 25 to 60 million tons. As work continues in Madagascar it is expected that estimates of probable geological reserves will be enlarged beyond 60 million tons of ilmenite. Heavy mineral sand reserves in Madagascar are now considered amongst the largest in the world. In addition to ilmenite, the deposit contains zircon, rutile and monazite, in the approximate ratios 60 ilmenite: 3 zircon: 3 rutile: 1 monazite. A preliminary project feasibility study was also prepared and sufficient process flowsheet definition provided to permit preparation of a capital estimate within a 30 percent range and a preliminary economic assessment for the proposed operation.
15. The results were encouraging enough to justify proceeding with Phase II of the project (feasibility phase of the exploration period) which started in March 1987 and is expected to be completed in November/December 1988. The on-going work under Phase II includes:

(i) completion of all drilling at the Mandena sector and confirmation drilling at the Ste. Luce deposit in the Fort-Dauphin area;

(ii) definition and evaluation of the Mandena deposit;

(iii) preliminary mine planning for a 20 year period;

(iv) production of test samples by the Wet Pilot Plant at Mandena;

(v) closed circuit testing at site to enable initial spiral selection to be made;

(vi) further testing of mineral separation process to firm up preliminary flowsheet and equipment selection for a pilot plant;

(vii) environmental assessment;

(viii) gathering of necessary geographic and marine data to commence study for selection of best loading/shipping location;

(ix) updating of prefeasibility estimate and economics;

(x) obtaining of Phase III approval. Requesting quotes for Phase III activities and selection of engineering firms.

16. Activities under Phase II are proceeding steadily. This program is expected to be completed by the end of 1988 and will cost about US$12.8 million compared to an original budget estimate of US$7.4 million as a result of the additional drilling to delineate the lower ore body. By the end of Phase II, QIT will have invested about US$15 million compared to the original budget estimate of about US$10 million. Satisfactory results would lead to approval of Phase III which will start in January 1989 through March 1990. This phase, described below (para. 18), will include the completion of preliminary and basic engineering, and a revised capital cost estimate. This is the phase which will be partly financed by the proposed engineering credit.
17. **Phase IV** (mine development period) which will follow completion of **Phase III** and a decision by the partners to proceed with the project would include procurement and detailed engineering followed by construction, commissioning and start-up of the mining operation to the point where 75 percent of the designed production capacity is achieved. Phase IV will cover the period March 1990 to April 1994 (the envisaged plant start-up date is November 1992).

**Project Description**

18. In order to assist preparation of the ilmenite mining project the engineering credit would finance OMNIS's share of the following work:

   (i) completion of preliminary and basic engineering to a point where detailed design and tendering can commence for the: (a) dredge and concentrator plant, (b) mineral separation plant, (c) power plant, (d) dock/harbor, (e) other infrastructure facilities;

   (ii) setting up of a Wet Pilot Plant and Mineral Separation Pilot Plant to optimize and confirm flowsheets developed during **Phase II**;

   (iii) preparation of a capital cost estimate and an estimate of mine start-up and operating costs. The capital cost estimate will be based on detailed quantity take-offs from layouts and budget price quotations for major equipment, in addition to utilization of current data-bank pricing for standard materials. The operating cost estimate will be developed from detailed itemization of all cost centers;

   (iv) preparation of market analysis and marketing strategy;

   (v) complementary drilling and ore body delineation to improve definition of mineable reserves at Mandena;

   (vi) infrastructure, in particular road and bridge construction for improved access to the location of the mineral processing and product facility;

   (vii) completion of an environmental impact study.
19. The total cost of Phase III activities to be financed under the engineering credit has been estimated at US$16.2 million equivalent including contingencies. OMNIS has requested IDA financing for approximately US$8.55 million. Key milestone dates in the overall project implementation plan are as follows:

- completion of site investigation, metallurgical and environmental studies and update of prefeasibility estimate and economics December 1988
- completion of preliminary/basic engineering October 1989
- approval to proceed with detailed design and construction March 1990
- initial ilmenite production November 1992
- 75 percent production capacity achieved April 1994

C. IMPACT OF MADAGASCAR ILMENITE MINING PROJECT ON WORLD MARKET

Demand for Titanium Dioxide (TiO2) Pigments

20. Approximately 95 percent of world's annual production of titanium minerals, goes to make white titanium dioxide pigment. It is not poisonous and has excellent qualities of opacity and brightness. It is the major pigment for nearly all white paint and it is also used in paper, plastics, textiles and ceramics. The other five percent of world's annual production of titanium minerals goes to make titanium metal. The titanium dioxide industry has seen a substantial turn round in the past four years, after ten years of low growth. In the 1950s and 1960s this white pigment enjoyed secure markets which grew steadily at five percent per year world-wide and, due to the fact that there was no real alternative to TiO2 as a pigment, its future seemed secure. The first oil-shock terminated this outlook abruptly in 1974, when demand for TiO2 fell 30 percent almost overnight, in line with the fall in demand for consumer products. The next ten years saw a slow recovery, with a second check occurring in 1980 after a further hike in oil prices. The low growth and the fact that the industry was obliged to meet increasingly stringent environmental controls made many producers question their continuing participation in the TiO2 business. Some companies divested their interest in TiO2, several old plants closed, and the construction of new plants virtually stopped. By 1983, TiO2 demand and the available capacity to produce it (about 2.6 million tons), were again reasonably in balance. Pigment prices, which had fallen sharply during the oversupply years, returned to better levels and allowed producers to improve profitability, or return
to a profit making situation. In the period from 1983 to date pigment demand recovered significantly. In the last four years the average growth in consumption has exceeded 5 percent in the U.S.A compared to an average annual growth rate of 1.1 percent during the proceeding seven years.

21. By 1986 production resources were strained and new capacity was required once again. The first step in responding to the increased demand was debottlenecking of existing capacity which could be carried out relatively quickly and cheaply. It is believed that debottlenecking of some sort, if only by rationalization of grades produced, was practiced by almost all the world's major pigment plants in 1986 and 1987 and that at least 330,000 tons per year (TPY) of new capacity, or about 12 percent of the 1986 total will be added to world productive capacity in the period 1986-89. It is estimated that TiO₂ demand will grow by about 2-3 percent per annum in the period 1988-93.

22. Production of titanium dioxide pigment is split between the "sulfate process" and "chloride process", representing respectively 2/3 and 1/3 of pigment capacity in 1983. Most of the world's chloride process capacity is located in the U.S. at present, but through new plants and conversions of sulfate plants growth in the less environmentally sensitive chloride route is expected in other areas during the late 1980s and early 1990s. In the sulfate process, ilmenite or titanium slag is reacted with sulfuric acid, a portion of the iron sulfate formed is crystallized and removed, and the titanium hydroxide is precipitated by hydrolysis, filtered and calcined. In the chloride process, rutile is converted to titanium tetrachloride by chlorination at 850° to 950° C in the presence of petroleum coke. Rutile is the preferred raw material for making titanium tetrachloride, although ilmenite and titanium slag can be used for this purpose. Titanium tetrachloride so prepared may be used either in making pigment, or with additional purification, for reduction to metal. For the past twenty years chloride process pigment production has been growing rapidly, but at the same time many sulfate process plants have been very successful. A supplier of TiO₂ raw materials, must be concerned not only with the growth in total demand for TiO₂ pigment, but also with the proportion of the total demand which is likely to be supplied from either the sulfate or the chloride process. One of the advantages of low alkali TiO₂ slags (the product supplied by QIT group) is that either chloride or sulfate process plants can be satisfactorily supplied with this product.

Changes in the Raw Material Supply Pattern

23. Titanium is the ninth most abundant element in the earth's crust and there is, therefore, little question of any scarcity of this element in the foreseeable future. What has changed over the past twenty years and will continue to do so in future, is the relative importance of the titaniferous feedstocks produced. The two basic ores are rutile and ilmenite and the latter can be transformed by smelting or beneficiation into upgraded ilmenite (UGI), of which slag and synthetic rutile (SR) are the two main types.
FIGURE 1

TiO₂ RAW MATERIAL TRENDS 1978-88

000 MT contained TiO₂

- Rutile
- Synthetic
- Ilenite (net of UGI)
- Slag

Year: 78, 80, 82, 84, 86, 88
Figure I shows that over the last ten years, the proportion of synthetic rutile and particularly of slag increased largely at the expense of ilmenite. The key factors in explaining these trends are:

(i) **rutile reserves are being depleted.** Production will be stable or decline and UGI (slag and synthetic rutile) will become progressively more important for the chloride process. This trend has already been going on for ten years and has also been assisted by the fact that rutile prices have tended to be volatile. Chloride process operators have tried to minimize their exposure to this risk by diversification;

(ii) **sulfate process** operators have, in many instances, moved towards higher TiO2 feedstocks by either using pure slag or a blend of slag and ilmenite, in place of ilmenite alone. This has given them the advantages of higher plant throughput, and capital and operating cost reduction, and a means of addressing environmental constraints, by eliminating the production of ferrous sulfate during the process. All these factors continue to be important and the trend towards slag in the sulfate process is forecast to continue;

(iii) in the case of **chloride process** operators, the use of chloride-slag or synthetic rutile can be approached from two directions. For plants designed to use secondary (60 percent TiO2 plus) ilmenite as a feedstock, the admixture or substitution of a higher grade feedstock such as slag provides higher chlorinator capacity and, by producing less waste chlorides, lowers environmental control costs. For plants originally designed for rutile, slag and synthetic rutile allow process operators to minimize their exposure to the risk of high rutile prices because, as mentioned above, rutile prices have tended to be much more volatile.

**QIT Corporate Strategy**

24. In looking forward to the 1990s, QIT intends to maintain its policy of providing the TiO2 industry with a range of products. In addition, QIT will aim for as much flexibility as possible within that range, in order to permit customers to address changing feedstock needs caused by environmental and other constraints. The first major development for QIT outside its traditional operation at Sorel, in Quebec province, producing sulfate-route slag from Lac Allard ore (Quebec, Canada), was the Richards Bay Minerals partnership in South Africa, which in ten years has grown to be the second most important source of high-grade slag suitable for the sulfate and the chloride process pigment production. In February 1988, QIT sold its equity
share of Richards Bay Minerals to another BP affiliate. At Sorel, expansion until 1969 was by construction of new furnaces, whereafter it has been the result of process refinement and modification. The slag produced has been progressively improved from 70 percent TiO2 to 78-80 percent TiO2 at present. Between 1979 and 1988, capacity of QIT operations will have increased by about 30 percent from 780,000 to 1,025,000 metric tons. Given that low alkali TiO2 slags is suitable for either chloride or sulfate process plants, QIT is planning to add more low alkali slag to its product line so that it can respond to future demand from either sector of the industry. QIT geologists have concluded that a substantial opportunity lay in the development of the mineral sand deposits of Madagascar, which would in particular make it possible for QIT to increase the output of chloride process feedstock from the QIT Sorel operation.

25. Before the end of 1988, QIT will have completed a facility expansion at Sorel which will raise its 80 percent titanium dioxide (sorelslag) capacity to 1,025,000-1,050,000 tons per annum. Three of QIT nine furnaces will have been modernized, and engineering is in progress to modernize the rest of the furnaces to raise the slag capacity to approximately 1,400,000 tons per annum. QIT is simultaneously proceeding with plans at Sorel to build a slag drying and sizing plant to be commissioned in 1990 for the production of low alkali chloride grade slags. This plant will have a design capacity of 400,000-500,000 tons per annum of chloride slag, out of the total of 1.4 million tons per annum mentioned above. By the mid-1990's the preponderant source of beach sand ilmenite consumed in Sorel is planned to be from QIT-Madagascar Minerals. QIT is also considering the installation of a synthetic rutile production unit capable of economically converting 85 percent TiO2 slag into a 94-95 percent TiO2 product. QIT is positioning itself to be able to offer the following range of products for the 1990s:

- 60 percent ilmenite
  suitable for the chloride process;

- 80 percent sorelslag
  suitable as feed for the sulfate process;

- 85 percent
  low alkali slag suitable for chloride process;

- 95 percent synthetic rutile
  suitable for chloride process pigment plants
  and as a substitute for natural rutile.

While in the past, consumers have tended to consider natural rutile, synthetic rutile, ilmenite and slag as distinct and separate sources of supply, today they consider all as sources of feedstock and take into account the cost and suitability of each material and blend of materials before deciding which is most suited to their process.
The Effect of Madagascar Minerals on the Market

26. The timing of the Madagascar project is being planned to coincide with forecast market needs. Against the backdrop of a limited number of mine expansion projects in Australia planned to be brought on stream by 1989-90, thereby satisfying the industry's immediate needs for new feedstock requirements, the start-up of the Madagascar mine is planned to follow this new Australian capacity. Due to the comprehensive range of products that can be made from the 60 percent Madagascar ilmenite, primarily for the chloride route but with the flexibility to provide for the sulfate route, QIT foresees a ready market acceptance for the products of Madagascar Minerals, whether as ilmenite or Upgraded Ilmenite (UGI). Figure II shows the supply-demand relationship through the end of the century, with Madagascar in a position to provide a substantial part of additional requirement from the early 1990s onwards. Although there are other TiO₂ raw materials, such as the aforementioned Australian operations, anatase from Brazil and ilmenite from a number of deposits around the world, there are strong indications to believe that the quality of Madagascar ilmenite and QIT unique technology will enable it to offer customers feedstocks tailored to individual requirements at prices which are fully competitive. The Madagascar ilmenite project will allow QIT and its affiliates to provide a complete range of products, backed by the most extensive reserves in the industry.
FORECAST OF TiO$_2$ FEEDSTOCK DEMAND AND SUPPLY

000 MT TiO$_2$ Content

- Demand
- New LA Slag
- Existing Slag
- New SR
- Existing SR
- Rutile
- Ilmenite & Other Ores

Year: 88, 90, 92, 94, 96, 98, 2000
Background

1. A key issue related to the proposed mining project is how to minimize the environmental damage to the Mandena area, situated approximately 10 km north of Fort-Dauphin, where Madagascar Minerals, the operator for the joint-venture, intend to commence mining for mineral sands by late 1992. The proposed operation will require careful planning to avoid long-term environmental damage to the areas being mined which include one of the remaining tracts of littoral tropical rain forest.

Environmental Impact Study (EIS)

2. OMNIS and QIT are aware of the importance of having an environmental impact study and an acceptable plan of actions prepared by a specialized independent consultant firm combining not only the know-how on environmental problems related to the mining of mineral beach sands but also of the Malagasy ecosystems. The mining and primary concentration methods envisaged will be a pond dredging operation followed by a floating concentrator plant. Separation of heavy minerals from the sand will be accomplished on helical sluices on the floating concentrator. The heavy mineral concentrates will be pumped to land-based stockpiles after removal of trace amounts of magnetite. The sand tailings will be returned to the rear of the mining pond, thereby reclaiming the mined-out area. Environmental planning will address the problems of minimizing the environmental damage through the choice of the most suited mining method and through a well-planned and well-managed rehabilitation program. IDA’s environmental experts will be working closely with OMNIS and QIT Madagascar Minerals to ensure that a state-of-the-art environmental study is undertaken. IDA experts have emphasized the importance of including among the consultants selected to undertake the EIS internationally recognized experts in the Malagasy ecosystems (a special note prepared by staff is on file in the project office). The EIS should enable all interested parties to identify the best scenario to minimize the environmental impact.

3. The environmental impact study will proceed as follows:

(i) detailed baseline information including all ecological, hydrological, topographical and climatological data needed to evaluate land stability and erosion, development and costing of the detailed rehabilitation plan. Floral and fauna surveys also to be undertaken;

(ii) simulation of the project area for a without project case;

(iii) definition of the different alternatives for mining and assessment for each of the likely environmental impacts;
(iv) costing of each alternative with the environmental impact and selection of program on the basis of integration of mine requirements, ecological considerations and cost efficiency.

4. A condition of effectiveness of the engineering credit will be commitment to undertake an environmental impact study according to terms of reference acceptable to IDA.
Annex III
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Project Execution

Background

1. The OMNIS/QIT partnership contract established in 1986 is an unincorporated joint-venture in which each party retains its separate identity, accountability vis-à-vis its creditors and tax authorities, and outright ownership of the assets proportionate to its equity participation. QIT-MADAGASCAR MINERALS LTD. ET CIE, a firm registered and domiciled in Madagascar which is the operator for the joint-venture partners, will be the operator for the proposed engineering credit. The unincorporated joint-venture agreement was chosen to make it possible for QIT to be a more effective manager/operator. The agreement has been ratified by Madagascar's Parliament. The proposed organization chart for the preparation and implementation of the project is attached. A special project group QIT-MADAGASCAR MINERALS PROJECT has been formed which reports to the operator of QIT-MADAGASCAR MINERALS. QIT is an experienced partner, with extensive experience in the production, processing and marketing of titanium minerals, which is expected to execute the project in a professional and cost effective way.

2. Under the PPF granted to OMNIS by IDA in October 1987, consultancy services will be provided to assist OMNIS set-up its own project control organization which will fulfill the following functions:

   (i) act as technical and administrative supervisor;

   (ii) ensure that OMNIS is supplied with complete technical and economic information; and

   (iii) ensure that OMNIS is adequately informed on all decisions contemplated or taken that affect the project.

A condition of effectiveness of the credit will be a legal agreement between OMNIS, QIT, QIT-Madagascar Minerals as operator for the joint-venture acceptable to IDA, spelling out the specific obligations of the partners to the joint-venture and of the operator for the carrying out of the engineering credit.

Reporting

3. OMNIS would submit to the Association the monthly reports which it receives from the operator QIT-Madagascar Minerals, quarterly reports on its activities financed under the Credit (within one month of the completion of each quarter), and annual reports on the implementation of the project in a format acceptable to the Association. After completion of the project, OMNIS would prepare a report on the execution of the project no later than six months after the Credit closing date. The Government and OMNIS would select an independent auditor satisfactory to IDA to prepare annual audits of the project's accounts, including the Statement of Expenditures.
MADAGASCAR MINERALS PROJECT

JOINT VENTURE ORGANIZATION

QIT

OMNIS

COMITE DE DIRECTION

Chairman, Capitaine de Vaisseau
R. Ratsimandresy

Members, R. Andrianaivomanana
S.F. Prest
M.H. Thibodeau

QIT MADAGASCAR MINERALS LTD. ET CIE
(OPERATOR)

President - S.F. Prest
Vice-President, Administration - G.P. Larin

QIT MADAGASCAR MINERALS PROJECT

Project Manager
M.G. Mower

QIT MARKETING
ILMENIT® MINING ENGINEERING CREDIT

MADAGASCAR MINERALS PROJECT

Project Director
S.F. Prest

Project Manager
M.G. Mower

Technical Manager
L.J. Beerman

Operations Manager
(VACANT)

QIT MM LTD. CIE
G.P. Larin
MADAGASCAR
PRINCIPAL MINERAL AREAS

- Paved roads
- All weather roads
- Railroads
- Airports
- Forests
- National capital
- Rivers
- Prefecture boundaries
- Province boundaries

Gold
Chromite
Quartz
Mineral sands
Graphite
Mica
Coal

All weather roads:
- Chromite
- Quartz
- Mineral sands
- Graphite
- Mica
- Coal

Airports:
- Mineral sands

Rivers:
- Forests

Prefecture boundaries:
- National capital

Province boundaries:
- National capital

Miles
Kilometers

MADAGASCAR

AFRICA

INDIAN OCEAN

ATLANTIC OCEAN