

## 卷末資料

1. プレエバリュエーション・レポート
2. エバリュエーション・ミニッツ



1. プレエバリユエーション・レポート



Pre-evaluation of the project

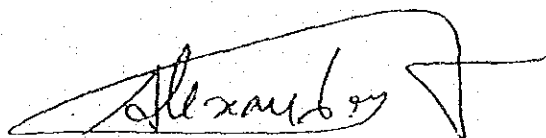


The representatives of the Departamento Nacional de Producao Mineral- DNPM and the specialists from the Japan International Cooperation Agency - JICA had a series of discussions on the achievement and effectiveness of the Technical Cooperation for the project on the pollution control for mining and quarrying activities which was conducted for four (4) years from september 2nd, 1981 to september 1st, 1985, on the basis of the Record of Discussions signed on september 2nd, 1981, between JICA and DNPM.


As the result of the discussions, both sides, taking account of the Technical Cooperation referred to in Annex I.II,III, which were completed through the cooperative pre-evaluation, jointly recognized that the the Project had made a great contribution to the development of pollution control for mining and quarrying activities through human resurces development in the Federative Republic of Brazil.

In the course of the discussions on the achievement and effectiveness of the project, the DNPM strongly requested to give favorable consideration to the implementation of the newly requested project, requested on may, 1985, for a Training Center for Pollution Control in Mining Activities.

Brasilia, 04 de junho de 1985.



ALEXANDER TRAJANO DE ARRUDA



YOSHIO USUI

## Annex I Achievement and effectiveness of the technical cooperation

### 1) The list phase

#### A. Effectiveness of technical transfer and the reports (referred to Annex II)

The reports were elaborated by engineers of JICA and DNPM after full exchange of opinions concerning cooperation for technical transfer activities in offices and laboratories and on site.

- (1) Training in the use of meters and analyzers to counterpart engineers was conducted by explanation actual practice according to the appropriate manual - A-(a) in offices and laboratories. This was followed by training in the field including mine sites in order to enable counterpart engineers to study mining pollution on their own.
- (2) Contamination of rivers was investigated by meters and analyzers referred to in paragraph (1) above in order to pinpoint the mines which had actually polluted river water by its discharge of tailing, drainage, used water, reject, waste rock etc., providing counterpart engineers with field training including the analysis of data so obtained. The study of the quality of river water was very useful in recognizing the level of contamination by effluents of mines, and figured importantly in explaining pollution caused by the mines to the responsible engineers of the mines. (Reports in group B(a))
- (3) Study of the mines was performed according to the information obtained in the manner described in paragraph (2) above. The causes of pollution were confirmed together jointly by the engineers of both JICA and DNPM and were communicated to the engineers responsible for mining operations or pollution control. Technical study was made on the means to eliminate the causes of pollution by the engineers of JICA and DNPM through various discussions. Reports in group B-(C,d) were elaborated by the engineers of JICA and DNPM and includes technical considerations



and recommendations. The Engineers of DNPM followed this by sending official letters to the mines, on their own responsibility, based on the recommendations for improvements in pollution measures by the mines, and monitored the measures taken by the mines according to the letters. Some examples of mines which took adequate countermeasures to control pollution are as follows:

(a) Mines situated in the Das Velhas River and the Paraopeba River Basins

- Adequate countermeasures taken.

' Sociedade Mineira de Mineração Ltda - SMM.

' Mina Água Preta de Companhia Siderurgica Nacional

' Bemil

' Mineração Morro Velho S.A.

- Plans for adequate countermeasures submitted to DNPM

' Mina de Fabrica de Ferteco

(b) Mines which are situated outside the des Velhas River and the Paraopeba River Basins

- Plans for adequate countermeasures submitted to DNPM

' Companhia de Estanho Minas Brasil - The das Mortes River Basin.

However, middle and small scale mines with small ore reserves, are not taking adequate countermeasures due to lack of qualified engineers and adequate financing.

(4) Study of the present situation of water pollution in the Das Velhas River and the Paraopeba River was performed using. 2 water quality monitors.

As system to monitor effluents of the mines was also studied.

These studies are summarized in the reports in group B-(b).

The monitors were applicable only to water up to 200 ppm in turbidity, but the riverwater indicated more than 200 ppm.

Although the capacity of the monitors was enhanced 500 ppm, various problems in operation and maintenance still remain.

- (5) Some technical considerations to help pollution control of the mines are proposed in the reports in group A-(b). The proposals will be studied with a view to their application in future work on pollution control of the mines.

#### B. Contribution to Human Resources Development

- (1) Technical transfer to the counterparts through training in offices, laboratories and in the fields, analysis of data obtained and elaboration of reports contributed to Human Resources Development, by enabling counterparts to obtain the knowhow and technology necessary to the control of pollution caused by mines.
- (2) Training of engineers of DNPM in Japan also contributed to Human Resources Development.
- (3) The greatest difficulty was caused by the resignation from DNPM after the completion of the training of one (1) counterpart engineer and one (1) counterpart technician 3 or 4 months before completion of the 1st phase of the project.

## 2) The 2nd and 3rd Phase

### A. Effectiveness of the technical transfer and the reports (referred to annex II)

The reports were elaborated by engineers of JICA and DNPM after a full exchange of opinions concerning cooperation for technical transfer activities in offices and laboratories and on site.

(1) Training in the use of meters and analyzers to counterpart engineers was conducted by explanation and actual practice according to the appropriate manual A-(a) in offices and laboratories. This was followed by training in the fields and on mine sites in order to enable counterpart engineers including those from the head office of the DNPM to study mining pollution.

(2) Study of quarries situated near

Urban areas based on the training referred to in paragraph (1) above was performed to investigate actual pollution by noise, vibration and suspended fine particles with counterpart engineers. Reports in group B-(2) will clarify the present situation of pollution by noise, vibration and suspended fine particles from the quarries.

(3) Study of the present situation of air pollution by suspended fine particles by 4 monitors is carried out together with counterpart engineers. These studies are summarized in the reports in group B-(1).

(4) Technical guidelines for the study of quarry mine will be completed in the 3rd phase of the Project in order to help engineers of DNPM study pollution caused by quarrying.

(5) The study of laws and regulations concerning mining pollution is being carried out jointly by engineers of JICA and DNPM including those from the head office of the DNPM. During the study information concerning laws and regulations is being presented to DNPM, which will help the future study of laws and regulations by DNPM.

This study is scheduled to continue into August, including the comparison of the existing laws and regulations of Brazil and Japan to be included in group B-(3) which should be highly useful as a means for reference.

B. Contribution to Human Resources Development

- (1) Technical transfer to the counterparts through training in offices, and laboratories and the field, and the analysis of data obtained and elaboration of reports contributed to Human Resources Development, by enabling counterparts to obtain the knowhow and technology necessary for control of pollution caused by mines.
- (2) Training of engineers of DNPM in Japan also contributed to Human Resources Development.
- (3) The joint study and analysis of laws and regulations concerning mining pollution by Brazil and Japan should contribute to Human Resources Development.

Annex II Report

1) Reports in the 1st phase of the project

A. Handling of meters and analyzers, and the study of mining pollution

(a) Manual

(1) pH

- Portable Glass Electrode pH meter HM - 1F  
Operating Instructions
- Digital pH Meter, Model HM-10K  
Instruction Manual

(2) Suspended Solid

- Instruction Manual Portable type turbidity  
Meter, Model TB-1A

(3) Dissolved Oxygen

- Explicação sobre aparelho portátil para medir qualidade da  
água nos rios, WAC-1A

(4) Ion

- Instruction Manual for Ion Meter, IM-7B
- Yoshi Test

(5) Monitor for Water Quality

- Instruction Manual for Water Quality Monitoring system,  
Wara-22
- Procedimento para operar na calibração e limpeza dos monitor  
de qualidade de água, Wara-22

(b) Proposal for technical guideline (rough draft)

- (1) Proposta para a ante projeto de regulamento de construção de  
barragens nas minerações-02.03.84.
- (2) Proposta para o ante projeto de regulamento de beneficiamento  
nas minerações em face de controle de poluição-05.01.84.

## B. Reports

### (a) Study of river pollution caused by mining operations

- (1) Relatório sobre os afluentes do Rio das Velhas, referente a Controle de Poluição em atividades de Mineração no período de seca - 09.12.83.
- (2) Relatório sobre controle de poluição causada pelas atividades de mineração na Bacia do Rio Paraopeba durante o tempo da seca - 09.02.83.
- (3) Relatório sobre o Rio Das Velhas e seus afluentes, referente ao Controle da Poluição em atividades de mineração no período chuvoso - 25.08.83.
- (4) Relatório sobre o Rio Paraopeba e seus afluentes, referente ao Controle de Poluição em atividades de mineração no período chuvoso.- 20.07.83.

### (b) Monitoring

- (1) Relatório sobre instalação dos monitores da qualidade da água nos Rios Paraopeba e Rio Das Velhas - 03.08.82.
- (2) Relatório sobre medição com os monitores da qualidade da água nos Rios das Velhas e Paraopeba - 11.04.84.
- (3) Relatório sobre controle e monitoração de qualidade da água, pelos monitores, nos Rios das Velhas e Paraopeba. - 01.06.84.

### (c) Study of the mines which are in the Das Velhas River and Paraopeba River Basins

- (1) Relatório sobre controle de poluição em atividades de mineração - 05.08.82
  - . Bemil - Beneficiamento de Minérios Ltda
  - . Joao Izis Guimarães
  - . Minas de Serra Geral S.A
  - . Itaminas Comércio de Minérios S.A
  - . Minerações Brasileiras Reunidas S.A
  - . Lafersa S.A
  - . Siderúrgica Barra Mansa S.A

- (2) Relatório sobre controle de poluição em atividades das Empresas de Mineração em Nova Lima e Mutuca - 20.09.82.
  - (3) Relatório sobre controle de poluição em atividades das Empresas de Mineração em Itatíainçu na bacia do Rio Paraopeba - 29.12.82.
  - (4) Relatório sobre controle de poluição em atividades das Empresas de Mineração em Brumadinho na bacia do Rio Paraopeba - 06.01.83.
  - (5) Relatório sobre controle de poluição em atividades das Empresas de Mineração em Congonhas na bacia do Rio Paraopeba - 13.01.83.
  - (6) Relatório sobre controle de poluição em atividades de mineração na bacia do Rio Paraopeba em Conselheiro Lafaiete - 10.02.83.
  - (7) Relatório sobre as barragens nas bacias dos Rios Das Velhas e Paraopeba referente ao controle de poluição em atividades de mineração - 19.08.83.
  - (8) Relatório sobre beneficiamento nas bacias dos Rios das Velhas e Paraopeba, referente ao controle de poluição em atividades de mineração - 05.11.83.
  - (9) Cadastramento das minas que foram estudadas sobre o controle de poluição durante o tempo chuvoso.
    - a1 - Bacia do Rio das Velhas - 28 minas
    - b1 - Bacia do Rio Paraopeba - 39 minas
  - (10) Cadastramento das minas que foram estudadas sobre o controle de poluição durante o tempo da seca.
    - a1 - Bacia do Rio das Velhas - 12 minas
    - b1 - Bacia do Rio Paraopeba - 18 minas
- (d) Study of the mines which are out of the Das Velhas River and Paraopeba River Basins.
- (1) Relatório sobre controle de poluição da Mineração Tijucana S.A no Rio Jequitinhonha - 11.05.82.

- (2) Relatório sobre controle de poluição em atividades das Empresas de Mineração - 15.06.82.
  - Companhia de Estanho Minas Brasil - MIBRAS
  - Companhia Sinterúrgica de Mogi das Cruzes - COSIM
  - Sociedade Mineira de mineração Ltda - SMM
- (3) Relatório sobre controle de poluição em atividades das empresas de mineração - 18.06.82.
  - Alcoa Alumínio S.A
  - Mineração Curimbaba Ltda
- (4) Relatório sobre controle de poluição em atividades das empresas de mineração - 09.07.82.
  - Samarco Mineração S.A.
  - S.A Mineração da Trindade - SAMITRI
- (5) Relatório de vistoria de depósito de estéril da Samarco, DNPM nº 1721/67 - 14.11.82.
- (6) Relatório sobre controle de poluição em atividades das empresas de mineração.
  - Eletro Manganês Ltda
  - Companhia Nacional de Grafite
- (7) Cadastramento das minas que foram estudadas sobre o controle de poluição durante o tempo seco.
  - Bacia do Rio Maynard e Rio das Mortes - 11 minas
- (8) Relatório de visita ao 2º Distrito do DNPM em São Paulo sobre preparação para o projeto de controle de poluição no Estado de São Paulo - 24.11.83.

(e) Explication of the project and final report

- (1) Projeto sobre controle de poluição em atividades de mineração - 07.06.82.
- (2) Relatório final das atividades do projeto de controle de poluição causada pelas atividades de mineração no 3º Distrito do DNPM. - 15.10.84.



2) Reports in the 2nd and 3rd phase of the project

A. Handling meters and analyzers and the study of mining pollution

(a) Manual

(1) Suspended particles

- Manual do amostrador portátil de ar para pequeno volume, L-20
- Manual do "Low Volume Air Sampler" - Amostrador de Ar para pequeno volume, LT-20
- Manual do "High Volume Air Sampler", HVC-1000
- Manual do Amostrador tipo "Andersen" anexo ao "High Volume Air Sampler", AH-600
- Manual do Medidor de Vazão do Ar tipo Orifício
- Manual do Digital Medidor de poeira tipo P-5L2 e P-5H2

(2) Wind

- Manual do equipamento portátil que mede a direção e intensidade do vento

(3) Humidity

- Manual de "Assmans Aspiratory Psychrometer"

(4) Vibration

- Manual do Medidor de Nível de Vibração, VM-14B
- Operation Manual for High-speed level Recorder Model LR-04

(5) Noise

- Manual do Medidor de Ruído NA-20

(6) Microscope

- Instructions of Biological Microscope OPTIPHOT

(7) Balance

- Instruction Manual for electronic Analytical Balance LIBROR AEL-160 series

(8) Monitor

- Manual do Monitor de Poeira Digital, AP-632 e AP-635
- Atmospheric pollution analyzer Model GRH-72
- Instruction and Maintenance Manual of Clean Vame MV-110-F
- Instruction Manual for long term event recorder Model LD-1

- Manual do medidor fixo de direção e intensidade de vento-  
MV-110p F type
- Manual do medidor de precipitação pluviométrica.

(b) Technical guideline

- Technical guideline to study quarry mine (under writing)

B. Reports

(1) Monitoring

(2) Study of quarries

- Noise
- Vibration
- Suspended fine particles (under writing)

(3) Laws and regulations

- Relatório sobre comparação de sistema das leis estatais sobre controle de poluição entre Brasil e Japão (under writing)
- Relatório sobre comparação dos padrões de meio ambiente e emissão entre Brasil e Japão (under writing)
- Relatório sobre comparação das Leis e Regulamentos entre Brasil e Japão (under writing)
- Leis japonesas traduzidas ao português para estudar comparação das leis sobre mineração e controle de poluição entre Brasil e Japão
  - . Lei Basica para controle de poluição ambiental
    - Lei nº 182 de 03.02.1967
  - . Lei do controle da poluição do ar - Lei nº 97, de 01.06.1968
  - . Lei de controle da poluição da água-Lei nº 138, de 02.12.1970
  - . Lei que define obrigações pecuniárias das empresass no custo de obras de proteção ambiental-Lei nº 133, de 25.12.1970
  - . Lei de segurança de mina-Lei nº 70 de 16.05.1949
  - . Lei para processo extraordinário que define medidas de controle de poluição pela atividade de mineração de minério metálico, etc. - Lei nº 26 de 01.05.1973 (under writing)
  - . Código de mineração - Lei nº 289 de 20.12.1950

- . Código de mineração de rocha - Lei nº 291 de 20.12.1950
- . Código de mineração de extração de areia - Lei nº 74 de 30.05.1968 (under writing)
- . Regulamento de Código de mineração de extração de areia - Portaria Ministerial nº 244 de 15.07.1968 (under writing).

(4) Final report

Annex III Records of implementation of the project

Japanese Fiscal Year		1980	1981	1982	1983	1984	1985
Items	Phase			1st		2nd	3rd
				(Study on iron and gold mines)		(Study on quarries)	(Study on laws)
	Location			Belo Horizonte		Rio de Janeiro	
Dispatch of Japanese Survey Team	Preliminary survey team	↔					
	Implementation Survey Team		↔				
	Consultation team			↔			
	Consultation team					↔	
	Consultation team						↔
	Evaluation team						↔
Dispatch of Japanese Experts	Chief Advisor (Laws and regulation)					↔	↔
	Mining			↔		↔	↔
	Mineral processing			↔		↔	↔
	Pollution control			↔		↔	↔
	Civil			↔		↔	↔
	Monitor				↔	↔	
Disposition of Brazilian Staff	Organizer (Mining)			↔		↔	
	Geology			↔		↔	
	Chemistry			↔		↔	
	Technician			↔		↔	
	Organizer (geology)					↔	↔
	Mining					↔	↔
	Geology					↔	↔
	Geology					↔	↔
	Technician					↔	↔
	Technician					↔	↔
	Technician					↔	↔
Mining					↔	↔	
Mining					↔	↔	
Acceptance of Brazilian Counterpart Personnel in Japan				2 persons ↔	2 persons ↔	4 persons ↔	3 persons ↔
				2 persons			
Provision of Machinery and Equipment				↔	↔	↔	↔

## 1. Chronological Review of the Project

1980. Aug. 14. (1) Official Request from the Government of the Federative Republic of Brazil
1981. Feb. 3 to 22 (1) Dispatch of preliminary survey team  
Aug. 16 to Sep. 5 (2) Dispatch of Implementation survey team  
Sep. 2 (3) Signing of the record of discussion and tentative schedule of implementation  
Nov. 1 (4) Dispatch of one (1) Japanese expert (Mineral Processing)  
Nov. 26 (5) Disposition of one (1) Brazilian staff
1982. Mar. 22 (1) Dispatch of three (3) Japanese Experts.  
Mining  
Pollution Control  
Civil  
May 1 (2) Disposition of two (2) Brazilian staff  
Jul. 15 (3) Dispatch of one (1) Japanese Expert  
Chief Adviser - Laws and regulation on pollution control  
Sep. 16 to (4) Acceptance of Brazilian counterpart personnel in Japan (two (2) persons, two (2) months)  
Nov. 22  
Nov. 21 to (5) Dispatch of implementation survey team  
Dec. 8  
Dec. 1 (6) Disposition one (1) Brazilian staff  
Dec. 2 (7) Signing of the annual work plan of the project from April 1982 to March 1984
1983. Feb. 1 (1) Disposition one (1) Brazilian staff  
Mar. 27 to (2) Acceptance of Brazilian Counterpart Personnel in Japan (two (2) persons, half (1/2) month)  
Apr. 14  
Jan. 12 to (3) Dispatch of one (1) Japanese expert  
Aug. 11 Monitor

Sep. 1 to Oct. 31	(4) Acceptance of Brazilian Counterpart Personnel in Japan (two (2) persons, two (2) months)
1984. Apr. 1	(1) Transference of two (2) Japanese experts from 3 <sup>o</sup> Distrito do DNPM (Belo Horizonte) to 9 <sup>o</sup> Distrito do DNPM (Rio de Janeiro)
Apr. 2	(2) Disposition of one (1) Brazilian staff
Apr. 16	(3) Dispatch of one (1) Japanese expert Mining
May 115	(4) Disposition of one (1) Brazilian staff
May 16 to 28	(5) Dispatch of consultation team
May 24	(6) Signing of the annual work plan of the project from April 1984 to March of 1985
Jun. 11	(7) Dispatch of one (1) Japanese expert pollution control
Jul. 15	(8) Nomination of one (1) Japanese expert Chief - Adviser - Laws and regulation on pollution control
Jul. 30 to Aug. 24	(9) Dispatch of one (1) Japanese expert Monitor
Aug. 15	(10) Disposition of one (1) Brazilian staff
Aug. 31	(11) Dispatch of one (1) Japanese expert Mineral processing
Aug. 30 to Oct. 30	(12) Acceptance of Brazilian counterpart personnel in Japan (two (2) persons, (2) months)
Sep. 15 to Oct. 31	(13) Acceptance of Brazilian counterpart personnel in Japan (two (2) persons, one half (1.5) months)
Sep. 20	(14) Disposition of one (1) Brazilian staff
1985. Jan. 1	(1) Disposition of one (1) Brazilian staff
Mar. 20	(2) Disposition of one (1) Brazilian staff
Mar. 24 to 29	(3) Dispatch of consultation team
Jul.	(4) Dispatch evaluation team

- |            |   |
|------------|---|
| Aug. 25 to | (5) Acceptance of Brazilian counterpart                   |
| Oct. 25    | Personnel in Japan (three (3) persons,<br>two (2) months) |
| Sep. 1     | (6) Termination of the project                            |

## 2. Dispatch of Japanese Survey Teams

### (1) Preliminary survey team (Feb. 3 to 22, 1980)

Leader	Hidemasa	Kubo
	Masao	Tatsugami
	Junji	Iwasaki
	Noriyuki	Aizawa
	Kaoru	Mikami

### (2) Implementation survey team (Aug. 16 to Sep. 5, 1981)

Leader	Yoshio	Hisatome
	Hiroshi	Okada
	Hiroshi	Matsumoto
	Nobuo	Matsui
	Koji	Sato

### (3) Consultation team (Nov. 21 to Dec. 8, 1982)

Leader	Taira	Sunami
	Kazuhiko	Shoji
	Tadao	Hashimoto

### (4) Consultation team (May 16 to 28, 1984)

Leader	Toshikazu	Miura
	Nobuo	Matsui
	Kozo	Hoteiya
	Senya	Mori

### (5) Consultation team (Mr. 24 to 29, 1985)

Leader	Keiji	Iimura
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### (6) Evaluation team

Leader

### 3. Dispatch of Japanese Experts

(1) Nov. 1, 1981 to Jul. 15, 1984

Yoshio Usui                      Mineral Processing

(2) Mar. 22, 1981 to Mar. 21, 1984

Takehisa Fujie                  Mining

Hiroshi Matsumoto              Pollution Control

Hitoshi Makita                  Civil

(3) Jul. 15, 1982 to Jul. 14, 1984

Kanji Kakinuma-*chief Advisor (Laws and Regulations)*

(4) Jun. 12, to Aug. 11, 1983

Masashi Watanabe              Monitor

(5) Apr. 16, 1984 to Sep. 1, 1985

Kazuhiro Chimura              Mining

(6) Jun. 11, 1984 to Sep. 1, 1985

Yoshio Aikawa                  Pollution Control

(7) Jul. 15, 1984 to Sep. 1, 1985

Yoshio Usui                      Chief Advisor-Laws and Regulations on pollution  
control

(8) Jul. 30 to Aug. 24, 1984

Minoru Yoshikawa              Monitor

(9) Aug. 31, 1984 to Sep. 1, 1985

Yasusuke Nakano                Mineral Processing



#### 4. Disposition of Brazilian staff

- |                                    |                                  |            |
|------------------------------------|----------------------------------|------------|
| (1) Nov. 26, 1981 to Mar. 31, 1983 | Geraldo Ratton Mascarenhas       | Mining     |
| (2) May 1, 1982 to Dec. 31, 1983   | Jairo Guimarães                  | Chemistry  |
| (3) May 2, 1982 to Mar. 31, 1983   | José Mácio Falcão Ferreira       | Geology    |
| (4) Dec. 1, 1982 to Nov. 30, 1983  | Adriano Alves De Avelar          | Technician |
| (5) Feb. 1, 1983 to Mar. 31, 1983  | Francisco Arnaldo de Figueredo   | Technician |
| (6) Apr. 1, 1984 to Sep. 1, 1985   | Noé Medeiros                     | Geology    |
| (7) May 15, 1984 to Dec. 31, 1984  | João de Cristo                   | Technician |
| (8) Aug. 15, 1984 to Sep. 1, 1985  | Gilson Lucio Rodrigues           | Mining     |
| (9) Sep. 20, 1984 to Sep. 1, 1985  | Valmir de Souza                  | Technician |
| (10) Jan. 1, 1985 to Sep. 1, 1985  | Cleber Pinto Teixeira            | Geology    |
| (11) Mar. 20, 1985 to Sep. 1, 1985 | Vânia Maria P.S. Marques Marinho | Geology    |
| (12) Feb. 1, 1985 to Sep. 1, 1985  | Alexandre Trajano de Arruda      | Mining     |
|                                    | Ruben Sardou Filho               | Mining     |

## 5. Acceptance of Brazilian Counterpart Personnel in Japan

(1) Sep. 16 to Nov. 22, 1982 (at Metal Mining Agency of Japan and so on)

- Geraldo Ratton Mascarenhas - Coordenador de Controle de Poluição no 3º Distrito do DNPM (Belo Horizonte).
- Jairo Guimaraes - Engenheiro químico na equipe de controle de poluição no 3º Distrito do DNPM (Belo Horizonte).

(2) Mar. 27 to Apr. 14, 1983

- Maria Helena Pereira T. Mendes - Directora do 2º Distrito do DNPM (São Paulo)
- Aécio Ronald Gomes da Costa - Director do 9º Distrito do DNPM (Rio de Janeiro)

(3) Sep. 1 to Oct. 31, 1983

- Marcos Vinício Teixeira de Melo - Chefe da Seção de Fomento da Produção Mineral do 3º Distrito do DNPM (Belo Horizonte).
- José Mácio Falcão Ferreira - Geólogo na equipe de controle de poluição no 3º Distrito do DNPM (Belo Horizonte).

(4) Aug. 30 to Oct. 30, 1984

- Alexandre Trajano de Arruda - Chefe da Seção de Lavra e Beneficiamento na Sede do DNPM (Brasília).
- Noé Medeiros - Coordenador de controle de poluição no 9º Distrito do DNPM (Rio de Janeiro).

(5) Sep. 15 to Oct. 31, 1984

- Sylvio Baeta Neves - Director do 3º Distrito do DNPM (Belo Horizonte).
- Paulo Brandão - Assessor do Director Geral do DNPM (Brasília).

(6) Aug. 25 to Oct. 25, 1985

Gilson Lucio Rodrigues

Carlos Alfredo Bortoluzzi

Ruben Sardou Filho

- Engenheiro de minas na equipe de controle de poluição no 9º Distrito do DNPM (Rio de Janeiro).
- Director do 11º Distrito do DNPM
- Engenheiro de minas na Seção de Lavra e Beneficiamento da Sede do DNPM (Brasília).

## 6. Provision of Machinery and Equipment

### (A) Machinery and Equipment provided in Japanese fiscal 1985 and 1983

#### (1st phase)

#### (a) Measuring Equipment

(1) pH		4
(2) Suspended solid		1
Turbidity		3
(3) Dissolved oxygen		4
(4) Ion		4
Yoshi test	Fe	8
	Zn	9
	Hg	10
	Cd	9
	Mn	7
	Pb	9
	As	9
	S	4
	Cu	9
	Cr	5
	CN	5
	T.CN	2
	Ph	4
Conductivity		2
Electronic balance		1
(5) Sulphurous acid gas		2
(6) Microscope for biotics		1
(7) Soil test set		1
(8) Civil work		1
(b) Monitors		
(1) For quality of water		2
(c) Supplementary equipment		
(1) Reader printer for microfilm		1
(2) Denstometer		1
(3) Appatch card mounter		1
(4) Jacketer		1

(B) Machinery and equipment provided in Janese fiscal 1984 (2nd phase)

(a) Measuring Equipment

(1) Suspended solids	1
(2) Microscope	2
(3) Suspended fine particles	
Digital dust indicator	4
(4) Wind	3
(5) Humidity	3
(6) Electronic balance	2
(7) Wind screen	2
(8) Vibration	2
(9) Noise	4
(10) 1/3 Octave frequency analyzer	1
(11) Level recorder	2
(12) Pocket computer and printer	3

(b) Monitors

(1) For quality of air	
Digital dust indicator	4
High volume air sampler	2
Andersen sampler for high	
Volume air sampler	2
Orifice flowmeter set	2
Low volume air sampler	2
Dust jar	4
Deposit gauge	4
Clean vane	4
Raingauge	2
Prefabricated house	4
Maximum minimum thermometer	3

(c) Masks

(1) For protecting dust	4X10
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(C) Machinery and equipment provided in Japanese fiscal 1985 (3rd phase)

(a) Measuring Equipment

(1) Adaptor for vibration	2
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## 2. エバリュエーション・ミニッツ





R / D 配 載 当 初 計 画				ミニラン記載エピソード	
技術協力項目	第1フェーズ		第2フェーズ		第3フェーズ
	技術協力内容	最終報告及び勧告	技術協力内容	最終報告及び勧告	
鉱山および採石活動に起因する鉱害の現状および今後の予測に関する調査の実施	大気、河川および土壌などの汚染状況調査	踏データの収集・解析	踏データの収集・解析	最終報告及び勧告	第1フェーズ 最終報告及び勧告
	廃水・塵・ガス・騒音・廃棄物などがもたらす鉱害の発生原因の調査 鉱害汚染地域の環境改善のための調査	水質・土壌・土地の公害問題の調査・検討	大気・土壌・土地の公害問題の調査・検討		
鉱害防止に関連した技術および知識の移転	適正な分析・監視技術による鉱害の現状調査	河川の水質監視装置の開発	大気汚染の監視装置の開発		1-1(3) 業務計画段階IおよびIIのフォローアップ
	採鉱・選鉱・鉱山保安等の各分野での鉱害防止に関する新技術の移転	公害規制のシナリオと分析の開発	公害規制のシナリオと分析の開発	公害防止と環境保全のための技術開発と環境基準法規制	2-1(2) 2-2
現行法令の調査および現行法令の改善のための助言	既存鉱山・採石場の鉱害防止・保護のための採掘方法の改善に係る助言	公害に関する採鉱・選鉱の採掘上の現状問題と新しい技術の調査・検討	公害に関する採鉱・選鉱の採掘上の現状問題と新しい技術の調査・検討	公害に関する採鉱・選鉱の採掘上の現状問題と新しい技術の調査・検討	2-1(1) 2-2
	鉱害防止に係る現行法令の調査およびこれらの改善に関する助言	会議、シンポジウム、セミナーおよび現地訓練での上記鉱害防止技術・知識の使用		法律と規制の研究	3-1(1)
				調査研究結果の他の地域への適用	3-2

MINUTES OF DISCUSSIONS  
BETWEEN  
THE EVALUATION TEAM  
OF  
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)  
AND  
THE DEPARTAMENTO NACIONAL DA PRODUCAO MINERAL (DNPM)  
OF  
THE FEDERATIVE REPUBLIC OF BRAZIL  
WITH RESPECT TO  
THE TECHNICAL COOPERATION FOR THE PROJECT ON  
THE POLLUTION CONTROL FOR  
THE MINING AND QUARRYING ACTIVITIES

I. The Evaluation Team ( hereinafter referred to as "The team") organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") and headed by Mr. Keiji Iimura, visited the Federative Republic of Brazil in July 1985, and exchanged views and had a series of discussions with the Departamento Nacional da Producao Mineral ( hereinafter referred to as "DNPM") on the achievement and effectiveness of the Technical Cooperation for the Project on the Pollution Control for Mining and Quarrying Activities (hereinafter referred to as "the Project") which was conducted for four (4) years from September 2nd, 1981 to September 1st, 1985, on the basis of the Record of Discussions (hereinafter referred to as "R/D") signed in September 1981, between JICA and DNPM.

II. As a result of the discussions, both sides, taking account of the Technical Cooperation referred to in Annex I, II, and III, which were completed through the cooperative evaluation, jointly recognized that the Project had made a great contribution to development of Pollution control through the human resources development in the Federative Republic of Brazil, and accordingly agreed to recommend to their respective Governments that the Project has completely achieved the initially anticipated purposes and would be terminated on September 1st, 1985, as scheduled.

Brazilia, July 30th, 1985

飯村 圭司

KEIJI IIMURA  
Leader,  
Evaluation Team,  
Japan International Cooperation Agency

Jose Belfort dos Santos Bastos

JOSE BELFORT DOS SANTOS BASTOS  
Diretor Geral do  
Departamento Nacional da Producao Mineral

## Annex I

### Achievement and Effectiveness of the technical cooperation.

#### I. THE FIRST PHASE

##### 1. Investigation of present and future situation of the pollution and contamination caused by mining and quarrying activities.

###### 1-1. Effectiveness of technical transfer and the reports.

The reports were elaborated by engineers of both JICA and DNPM after full exchange of opinions concerning cooperation for technical transfer activities in offices and laboratories and on sites. ( referred to item 2 below )

The reports, without exemption, have been well accepted by DNPM and the reports' contribution is considered good one.

(1) Contamination of river was investigated by meters and analyzers in order to pinpoint the mines which had actually polluted river water by its discharge of tailing, drainage, waste water, reject and waste rock etc. providing the engineers of DNPM with the field training including the analysis of data obtained.

The study of the quality of river water was effective for the engineers of DNPM to recognize the level of contamination by effluents of mine and to figure importance of explaining pollution caused by the mines to the responsible engineers of the mines. ( reports in group B-(a) of Annex II )

(2) Study of the mines was performed according to the information obtained in the manner described in paragraph (1) above. The causes of pollution were confirmed jointly by the engineers of both JICA and DNPM and were communicated to the engineers responsible for mining operations and pollution control.

The technical study was made on the means to eliminate the causes of pollution by the engineers of both JICA and DNPM through various discussions and reports in group B-(c)(d) of Annex II including technical considerations and recommendations were elaborated by the engineers of both JICA and DNPM.

The engineers of DNPM followed this up by sending official letters to the mines, on their own responsibility, based on the recommendations for improvement in pollution measures by the mines, and monitored the measures taken by the mines according to the letters. Some examples of mines which took adequate countermeasures to control pollution are as follows:

(a) Mines situated in the Das Velhas river and the Paraopeba river basins.

- Adequate countermeasures taken

"Sociedade Mineira de Mineracao Ltda -SMM"

"Mina Agua Preta de Companhia Siderurgica Nacional"

"Bemil"

- Plans for adequate countermeasures submitted to DNPM

"Mina de Fabrica de Ferteco"

(b) Mines which are situated outside the Das Velhas river and the Paraopeba river basins.

- Plans for adequate countermeasures submitted to DNPM

"Companhia do Estanho Minas Brasil" ( the Das Mortes river basin )

Middle and small scale mines with small ore reserves, however, have not taken adequate countermeasures due to lack of qualified engineers and adequate financing.

(3) Study of the present situation of water pollution in the Das Velhas river and the Paraopeba river was performed using two (2) monitors for water quality.

A system to monitor effluents of the mines was also studied and was summarized in the reports in group B-(b) of Annex II which have been and will be useful for the engineers of DNPM to control pollution in future.

2. Transfer of the technology and knowledge related to the control of the pollution and contamination

2-1. Effectiveness of technical transfer and the reports

Transfer of the technology and knowledge related to the control of the pollution and contamination was performed through the training of the engineers of DNPM with the engineers of JICA.

As the result of technical transfer, the engineers of DNPM acquired technical know-how for investigation and analysis of pollution and contamination. These know-how will be expected greatly to be applied in future work on pollution control by the engineers of DNPM on their own responsibility.

(1) Training in the use of meters and analyzers to the engineers of DNPM was conducted by explanation actual practice according to the appropriate manual in group A-(b) of Annex II in offices and laboratories.

This was followed up by training in the field including mine sites in order to enable the engineers of DNPM to study mining pollution by themselves.

(2) Some technical considerations to help pollution control of the mines are proposed in the reports in group A-(b) of Annex II. The proposals will be studied with a view to their application in future work on pollution control of the mines by the engineers of DNPM on their own responsibility as described in item 1-1-(2) above.

2-2. Contribution to Human resources development

(1) Technical transfer to the engineers of DNPM through training in offices, laboratories and in the fields, analysis of data obtained and elaboration of reports contributed to Human resources development by enabling counterpart engineers to acquire the know-how and technology necessary to the control of pollution caused by mines.

(2) Training of the engineers of DNPM in Japan also contributed to Human resources development.

(3) The greatest difficulty was the resignations of one (1) counterpart engineer and one (1) counterpart technician from DNPM after the completion of the training three or four months before completion of the first phase of the Project.

## II . THE SECOND PHASE

### 1. Investigation of present and future situation of the pollution and contamination caused by mining and quarrying activities.

#### 1-1. Effectiveness of technical transfer and the reports.

The reports were elaborated by engineers of both JICA and DNPM after full exchange of opinions concerning cooperation for technical transfer activities in offices and laboratories and on sites. ( referred to item 2 below )

The reports, without exemption, have been well accepted by DNPM and the reports' contribution is considered good one.

(1) Study of quarries situated near urban areas based on the training of the engineers of DNPM was performed to investigate actual pollution by noise, vibration and suspended fine particles. Study and its reports in group B-(2) of Annex II clarify the present situation of pollution by noise, vibration and suspended fine particles from the quarries and will be effective for the engineers of DNPM to recognize the level of pollution.

(2) Study of the present situation of air pollution by suspended fine particles with four (4) monitors has been carried out together with counterpart engineers summarized in the reports in group B-(1) of Annex II which have been and will be useful for the engineers of DNPM to control pollution in future.

### 2. Transfer of the technology and knowledge related to the control of the pollution and contamination

#### 2-1. Effectiveness of technical transfer and the reports

Transfer of the technology and knowledge related to the control of the pollution and contamination was performed through the training of the engineers of DNPM with the engineers of JICA.

As the result of technical transfer, the engineers of DNPM acquired technical know-how for investigation and analysis of pollution and contamination. These know-how will be expected greatly to be applied in future work on pollution control by the engineers of DNPM on their own responsibility.

(1) Training in the use of meters and analyzers to the engineers of DNPM was conducted by explanation actual practice according to the appropriate manual in group A-(b) of Annex II in offices and laboratories.

This was followed up by training in the field including mine sites in order to enable the engineers of DNPM to study mining pollution by themselves.

(2) Technical guidelines for the study of quarry mines will be completed in the third phase of the Project.

They illustrate know-how of investigation and analysis of data obtained for the pollution caused by quarry mines and will effectively support the pollution control activities of the engineers of DNPM with their acquired technical know-how.

## 2-2. Contribution to Human resources development.

(1) Technical transfer to the engineers of DNPM through training in offices, laboratories and in the fields, analysis of data obtained and elaboration of reports contributed to Human resources development by enabling the engineers of DNPM to acquire the know-how and technology necessary to the control of pollution caused by quarry mines.

(2) Training of the engineers of DNPM in Japan also contributed to Human resources development.

## 3. Investigation of the laws and regulations in force and to provide adequate advice on their improvement.

### 3-1. Effectiveness of technical transfer and the reports.

(1) The study of laws and regulations concerning mining pollution is being carried out jointly by the engineers both JICA and DNPM including those from the head office of DNPM, which will help the future study of laws and regulations by DNPM.

This study, including the comparison of the existing laws and regulations related to the pollution control of both Brazil and Japan, is scheduled to continue until the termination of the Project and will be followed up by the counterpart engineer who will attend the training in Japan for two (2) months since August, 1985.

Repts in group B-(3) of Annex II will be completed before the termination of the Project and will be highly effective as a means for reference.

### 3-2. Contribution to Human resources development

The joint study and analysis of laws and regulations of both Brazil and Japan concerning mining pollution will contribute to Human resources development.

## Annex II

### 1. Reports in the first phase of the Project.

#### A. Handling of meters and analyzers and the study of mining pollution.

##### (a) Manual

###### (1) pH

- Portable glass electrode pH meter HM-1F operating instructions
- Digital pH meter model HM-10K instruction manual

###### (2) Suspended solid

- Instruction manual portable type turbidity meter model TB-1A

###### (3) Dissolved oxygen

- Explicacao sobre aparelho portatil para medir qualidade da agua nos rios WAC-1A

###### (4) Ion

- Instruction manual for Ion meter IM-7B
- Yoshi test

###### (5) Monitor for Water quality

- Instruction manual for Water quality monitoring system WARA-22
- Procedimento para operar na calibracao e limpeza dos monitor de qualidade de agua WARA-22

##### (b) Proposal for technical guideline

- (1) Proposta para a ante projeto de regulamento de construcao de barragens nas mineracoes -02.03.84.

- (2) Proposta para o ante projeto de regulamento de beneficiamento nas mineracoes em face de controle de poluicao -05.01.84.

#### B. Reports

##### (a) Study of river pollution caused by mining operations

- (1) Relatorio sobre os afluentes do Rio das Velhas, referente a controle de poluicao em atividades de mineracao no periodo de seca -09.12.83.

- (2) Relatorio sobre controle de poluicao causada pelas atividades de mineracao na bacia do Rio Paraopeba durante o tempo da seca -09.02.83.

- (3) Relatorio sobre o Rio Das Velhas e seus afluentes, referente ao controle da poluicao em atividades de mineracao no periodo chuvoso -25.08.83.

- (4) Relatorio sobre o Rio Paraopeba e seus afluentes, referente ao controle de poluicao em atividades de mineracao no periodo chuvoso -20.07.83.

##### (b) Monitoring

- (1) Relatorio sobre instalacao dos monitores da qualidade da agua nos Rio Paraopeba e Rio das Velhas -03.08.82.

- (2) Relatorio sobre medicao com os monitores da qualidade da agua nos Rios das Velhas e Paraopeba -11.04.84.

- (3) Relatorio sobre controle e monitoracao de qualidade da agua, pelos monitores, nos Rios das Velhas e Paraopeba -01.06.84.

##### (c) Study of the mines which are in the Das Velhas river and Paraopeba river basins

- (1) Relatorio sobre controle de poluicao em atividades de mineracao

-05.08.82.

. Bemil -Beneficiamento de Minerios Ltda

. Joao Izis Guimaraes



- . Minas de Serra Geral S.A.
  - . Itaminas Comercio de Minerios S.A.
  - . Mineracoes Brasileiras Reunidas S.A.
  - . Lafersa S.A.
  - . Siderurgica Barra Mansa S.A.
- (2) Relatório sobre controle de poluição em atividades das Empresas de Mineração em Nova Lima e Mutuca -20.09.82.
  - (3) Relatório sobre controle de poluição em atividades das Empresas de Mineração em Itatiaincu na bacia do Rio Paraopeba -29.12.82.
  - (4) Relatório sobre controle de poluição em atividades das Empresas de Mineração em Brumadinho na bacia do Rio Paraopeba -06.01.83.
  - (5) Relatório sobre controle de poluição em atividades das Empresas de Mineração em Congonhas na bacia do Rio Paraopeba -13.01.83.
  - (6) Relatório sobre controle de poluição em atividades de mineração na bacia do Rio Paraopeba em Conselheiro Lafaiete -10.02.83.
  - (7) Relatório sobre as barragens nas bacias dos Rios das Velhas e Paraopeba referente ao controle de poluição em atividades de mineração -19.08.83.
  - (8) Relatório sobre beneficiamento nas bacias dos Rios das Velhas e Paraopeba, referente ao controle de poluição em atividades de mineração -05.11.83.
  - (9) Cadastramento das minas que foram estudadas sobre o controle de poluição durante o tempo chuvoso.
    - a) -Bacia do Rio das Velhas -28 minas
    - b) -Bacia do Rio Paraopeba -18 minas
- (d) Study of the mines which are out of the Das Velhas river and Paraopeba river basins.
- (1) Relatório sobre controle de poluição da Mineração Tijucana S.A. no Rio Jequitinhonha -11.05.82.
  - (2) Relatório sobre controle de poluição em atividades das empresas de mineração -15.06.82.
    - Companhia de Estanho Minas Brasil -MIBRAS
    - Companhia Siderurgica de Mogi das Curzes -COSIM
    - Sociedade Mineira de mineração Ltda -SMM
  - (3) Relatório sobre controle de poluição em atividades das empresas de mineração -18.06.82.
    - Alcoa Alumínio S.A.
    - Mineração Curimbaba Ltda
  - (4) Relatório sobre controle de poluição em atividades das empresas de mineração -09.07.82.
    - Samarco Mineração S.A.
    - S.A Mineração da Trindade -SAMITRI
  - (5) Relatório de vistoria de depósito de esteril da Samarco, DNPM no 1721/67 -14.11.82.
  - (6) Relatório sobre controle de poluição em atividades das empresas de mineração
    - Eletro Manganês Ltda
    - Companhia Nacional de Grafite
  - (7) Cadastramento das minas que foram estudadas sobre o controle de poluição durante o tempo seco.
    - Bacia do Rio Maynard e Rio das Mortes -11 minas

- (8) Relatório de visita ao 2- Distrito do DNPM em São Paulo sobre preparação para o projeto de controle de poluição no Estado de São Paulo -24.11.83.
- (e) Explication of the Project and Final report
  - (1) Projeto sobre controle de poluição em atividades de mineração -07.06.82.
  - (2) Relatório final das atividades do projeto de controle de poluição causada pelas atividades de mineração no 3- Distrito do DNPM -15.10.84.

## 2. Reports in the second and third phase of the Project

### A. Handling meters and analyzers and the study of mining pollution

#### (a) Manual

##### (1) Suspended fine particles

- Manual do amostrador portátil de ar para pequeno volume, L-20
- Manual do "Low Volume Air Sampler"
  - Amostrador de ar para pequeno volume, LT-20
- Manual do "High Volume Air Sampler", HVC-1000
- Manual do Amostrador tipo "Andersen"
  - anexo as "High Volume Air Sampler", AH-600
- Manual do Medidor de Vazão de Ar tipo Orifício
- Manual do Digital Medidor de poeira tipo P-5L2 e P-5H2

##### (2) Wind

- Manual do equipamento portátil que mede a direção e intensidade do vento

##### (3) Humidity

- Manual de "Assmans Aspiratory Psychrometer"

##### (4) Vibration

- Manual do Medidor de Nivel de Vibração, VM-14B
- Operation Manual for High-speed level Recorder Model LR-04

##### (5) Noise

- Manual do Medidor de Ruído NA-20

##### (6) Microscope

- Instructions of Biological Microscope OPTIPHOT

##### (7) Balance

- Instruction Manual for electronic Analytical balance

LIBROR AEL-160 series

##### (8) Monitor

- Manual do Monitor de Poeira Digital, AP-632 e AP-635
- Atmospheric pollution analyzer Model GRH-72
- Instruction and Maintenance Manual of Clean Vane MV-110-F
- Instruction Manual for long term event recorder Model LD-1
- Manual do medidor fixo de direção e intensidade de vento-MV-110p F type
- Manual do medidor de precipitação pluviométrica

#### (b) Technical guideline

- Technical guideline to study quarry mine

B. Reports

(a) Monitoring

(b) Study of quarries

(1) Noise

(2) Vibration

(3) Suspends fine particles

(c) Laws and regulations

- Relatorio sobre comparacao de sistema das leis estatais sobre controle de poluicao entre Brasil e Japao

- Relatorio sobre comparacao dos padroes de meio ambiente e emissao entre Brasil e Japao

- Relatorio sobre comparacao das leis e regulamentos entre Brasil e Japao

- Leis japonesas traduzidas ao portugues para estudar comparacao das leis sobre mineracao e controle de poluicao entre Brasil e Japao

. Lei Basica para controle de poluicao ambiental -Lei no 182 de 03.02.67.

. Lei de controle da poluicao do ar -Lei no 97 de 01.06.68.

. Lei de controle da poluicao da agua -Lei no 138 de 02.12.70.

. Lei que define obrigacoes pecuniarias das empresas no custo de obras de protecao ambiental -Lei no 133 de 25.12.70.

. Lei de seguranca de mina -Lei no 70 de 16.05.49.

. Lei para processo extraordinario que define medidas de controle de poluicao pela atividade de mineracao de minerio metalico, etc.

-Lei no 26 de 01.05.73.

.Codigo de mineracao -Lei no 289 de 20.12.50.

.Codigo de mineracao de rocha -Lei no 291 de 20.12.50.

.Codigo de mineracao de extracao de areia -Lei no 74 de 30.05.68.

.Regulamento deCodigo de mineracao de extracao de areia

-Portaria Ministerial no 244 de 15.07.68.

(d) Final report

Annex III

Records of Implementation of the Project

Items	Japanese Fiscal Year	1980	1981	1982	1983	1984	1985
Phase							
Project Site							
Dispatch of Japanese Survey Team	Preliminary Survey Team Implementation Survey Team Consultation Team Consultation Team Evaluation Team	↔		I		II	III
				Belo Horizonte			Rio de Janeiro
Dispatch of Japanese Experts	Chief Adviser (Laws and regulations) Mining Mineral Processing Pollution Control Civil Monitor						
Disposition of Brazilian Staff	Organizer (Mining) Geology Chemistry Technician (Geology) Organizer (Geology) Mining Geology Technician Technician Mining Mining						
Acceptance of Brazilian Counterpart Personnel in Japan				4 psns ↔	2 psns ↔	4 psns ↔	3 psns ↔
Provision of Machinery and Equipment							

1. Chronological review of the Project

1980. Aug. 14.	1) Official request from the Government of the Federative Republic of Brazil.
1981. Feb. 3 to 22	1) Dispatch of Japanese preliminary survey team.
Aug. 16 to Sep. 5	2) Dispatch of Japanese implementation survey team.
Sep. 2	3) Signing of the Record of Discussions and Tentative Schedule of Implementation.
Nov. 1	4) Dispatch of one (1) Japanese expert (Mineral Processing).
Nov. 26	5) Disposition of one (1) Brazilian staff.
1982. Mar. 22	1) Dispatch of three (3) Japanese experts. (Mining, Pollution control, Civil)
May. 1	2) Disposition of two (2) Brazilian staffs.
Jul. 15	3) Dispatch of one (1) Japanese expert. (Chief adviser -Laws and regulations on pollution control)
Sep. 16 to Nov. 22	4) Acceptance of Brazilian counterpart personnel in Japan. (two (2) persons, two (2) months)
Nov. 21 to Dec. 8	5) Dispatch of Japanese consultation team.
Dec. 1	6) Disposition one (1) Brazilian staff.
Dec. 2	7) Signing of the Annual Work Plan of the Project from April 1982 to March 1984.
1983. Feb. 1	1) Disposition one (1) Brazilian staff.
Mar. 27 to Apr. 14	2) Acceptance of Brazilian counterpart personnel in Japan. (two (2) persons, half month)
Jun. 12 to Aug. 11	3) Dispatch of one (1) Japanese expert. (Monitor for quality of water)
Sep. 1 to Oct. 31	4) Acceptance of Brazilian counterpart personnel in Japan. (two(2) persons, two (2) months)
1984. Apr. 1	1) Transference of two (2) Japanese experts from 3-Distrto do DNPM (Belo Horizonte) to 9- Distorito do DNPM (Rio de Janeiro).
Apr. 2	2) Disposition of one (1) Brazilian staff.
Apr. 16	3) Dispatch of one (1) Japanese expert. (Mining)
May. 15	4) Disposition of one (1) Brazilian staff.
May. 16 to 28	5) Dispatch of Japanese consultation team.
May. 24	6) Signing of the Annual Work Plan of the Project from April 1984 to March 1985.
Jun. 11	7) Dispatch of one (1) Japanese expert. (Pollution control)
Jun. 15	8) Nomination of one (1) Japanese expert. (Chief adviser -Laws and regulations on pollution control)
Jun. 30 to Aug. 24	9) Dispatch of one (1) Japanese expert. (Monitor for quality of air)
Aug. 15	10) Disposition of one (1) Brazilian staff.

	Aug. 30 to Oct. 30	11) Acceptance of Brazilian counterpart personnel in Japan. (two (2) persons, two (2) months)
	Aug. 31	12) Dispatch of one (1) Japanese expert. (Mineral processing)
	Sep. 15 to Oct. 30	13) Acceptance of Brazilian counterpart personnel in Japan. (two (2) persons, one and half months)
	Sep. 20	14) Disposition of one (1) Brazilian staff.
1985.	Jan. 1	1) Disposition of one (1) Brazilian staff.
	Mar. 20	2) Disposition of one (1) Brazilian staff.
	Mar. 24 to 29	3) Dispatch of Japanese consultation team.
	Jul. 22 to Aug. 2	4) Dispatch of Japanese evaluation team.
	Aug. 2 to Oct. 2	5) Acceptance of Brazilian counterpart personnel in Japan. (three (3) persons, two (2) months)
	Sep. 1	6) Termination of the Project.

## 2. Dispatch of Japanese Survey Teams

- (1) Preliminary survey team ( Feb. 3 to 22, 1981 )
- |        |          |           |
|--------|----------|-----------|
| Leader | Hidemasa | KUBO      |
|        | Masao    | TATSUGAMI |
|        | Junji    | IWASAKI   |
|        | Noriyuki | AIZAWA    |
|        | Kaoru    | MIKAMI    |
- (2) Implementation survey team ( Aug. 16 to Sep. 5, 1981 )
- |        |         |           |
|--------|---------|-----------|
| Leader | Yoshio  | HISATOME  |
|        | Hiroshi | OKADA     |
|        | Hiroshi | MATSUMOTO |
|        | Nobuo   | MATSUI    |
|        | Koji    | SATO      |
- (3) Consultation team ( Nov. 21 to Dec. 8, 1982 )
- |        |          |           |
|--------|----------|-----------|
| Leader | Taira    | SUNAMI    |
|        | Kazuhiko | SHOJI     |
|        | Tadao    | HASHINOTO |
- (4) Consultation team ( May. 16 to 28, 1984 )
- |        |           |         |
|--------|-----------|---------|
| Leader | Toshikazu | MIURA   |
|        | Nobuo     | MATSUI  |
|        | Kozo      | HOTEIYA |
|        | Senya     | MORI    |
- (5) Consultation team ( Mar. 24 to 29, 1985 )
- |        |       |        |
|--------|-------|--------|
| Leader | Keiji | IIMURA |
|--------|-------|--------|
- (6) Evaluation team ( Jul. 22 to Aug. 2, 1985 )
- |        |       |          |
|--------|-------|----------|
| Leader | Keiji | IIMURA   |
|        | Toru  | ISHIHARA |
|        | Osamu | TOMITA   |
|        | Hideo | MIURA    |
|        | Senya | MORI     |

### 3. Dispatch of Japanese Experts

- (1) Nov. 1, 1981 to Jul. 15, 1984  
Yoshio USUI Mineral Processing
- (2) Mar. 22, 1981 to Mar. 21, 1984  
Takehisa FUJIE Mining  
Hiroshi MATSUMOTO Pollution Control  
Hitosi MAKITA Civil
- (3) Jul. 15, 1982 to Jul. 14, 1984  
Kanji KAKINUMA Chief Adviser - Laws and Regulations
- (4) Jun. 12 to Aug. 11, 1983  
Masashi WATANABE Monitor for Quality of Water
- (5) Apr. 16, 1984 to Sep. 1, 1985  
Kazuhiro CHIMURA Mining
- (6) Jun. 11, 1984 to Sep. 1, 1985  
Yoshio AIKAWA Pollution Control
- (7) Jul. 15, 1984 to Sep. 1, 1985  
Yoshio USUI Chief Adviser - Laws and Regulations
- (8) Jul. 30 to Aug. 24, 1984  
Minoru YOSHIKAWA Monitor for Quality of Air
- (9) Aug. 31, 1984 to Sep. 1, 1985  
Yasusuke NAKANO Mineral Processing

### 4. Disposition of Brazilian Staffs

- (1) Nov. 26, 1981 to Mar. 31, 1984  
Geraldo Ratton Mascarenhas Mining
- (2) May. 1, 1982 to Dec. 31, 1983  
Jairo Guimaraes Chemistry
- (3) May. 2, 1982 to Mar. 31, 1984  
Jose Macio Faicao Ferreira Geology
- (4) Dec. 1, 1982 to Nov. 30, 1983  
Adriano Alves de Avelar Technician
- (5) Feb. 1, 1984 to Mar. 31, 1984  
Francisco Arnaldo de Figueredo Technician
- (6) Apr. 1, 1984 to Sep. 1, 1985  
Noe Medeiros Geology
- (7) May. 15, 1984 to Dec. 31, 1984  
Joao de Cristo Technician
- (8) Aug. 15, 1984 to Sep. 1, 1985  
Gilson Lucio Rodrigues Mining
- (9) Sep. 20, 1984 to Sep. 1, 1985  
Valmir de Souza Technician
- (10) Jan. 1, 1985 to Sep. 1, 1985  
Cleber Pinto Teixeira Geology
- (11) Mar. 20, 1985 to Sep. 1, 1985  
Vania Maria P.S. Marques Marinho Geology
- (12) Feb. 1, 1985 to Sep. 1, 1985  
Alexandre Trajano de Arruda Mining  
Ruben Sardou Filho Mining

5. Acceptance of Brazilian Counterpart Personnel in Japan

(1) Sep. 16 to Nov. 22, 1982

Geraldo Ratton Mascarenhas

Jairo Guimaraes

- Coordenador de controle de poluicao no 3- Distrito do DNPM (Belo Horizonte)
- Engenheiro quimico na equipe de controle de poluicao no 3- Distrito do DNPM (Belo Horizonte)

(2) Mar. 27 to Apr. 14, 1983

Maria Helena Pereira T.Mndes

Aecio Ronald Gomes da Costa

- Diretora do 2- Distrito do DNPM (Sao Paulo)
- Diretor do 9- Distrito do DNPM (Rio de Janeiro)

(3) Sep. 1 to Oct. 31, 1983

Marcos Vinicio Teixeira de Melo

Jose Macio Falcao Ferreira

- Chefe da Secao de Fomento da Producao Mineral do 3- Distrito do DNPM (Belo Horizonte)
- Geologo na equipe de controle de poluicao no 3- Distrito do DNPM (Belo Horizonte)

(4) Aug. 30 to Oct. 30, 1984

Alexandre Trajano de Arruda

Noe Medeiros

- Chefe da Secao de Lavra e Beneficiamento na Sede do DNPM (Brasilia)
- Coordenador de controle de poluicao no 9- Distrito do DNPM (Rio de Janeiro)

(5) Sep. 15 to Oct. 31, 1984

Sylvio Baeta Neves

Paulo Brandao

- Diretor do 3- Distrito do DNPM (Belo Horizonte)
- Assessor do Diretor Geral do DNPM (Brasilia)

(6) Aug. to Oct. , 1985

Gilson Lucio Rodrigues

Carlos Alfredo Bortoluzzi

Ruben Sardou Filho

- Engenheiro de minas na equipe de controle de poluicao no 9- Distrito do DNPM (Rio de Janeiro)
- Diretor do 11- Distrito do DNPM (Santa Catarina)
- Engenheiro de minas na Secao de Lavra e Beneficiamento da Sede do DNPM (Brasilia)



6. Provision of Machinery and Equipment

A. Machinery and Equipment provided in Japanese fiscal 1982 and 1983  
( the first phase of the Project )

(a) Measuring Equipment

- (1) pH
- (2) Suspended solids  
Turbidity
- (3) Dissolved oxygen
- (4) Ion  
Yoshi test - Fe, Zn, Hg, Cd, Mn, Pb, Aa, S, Cu, Cr, CN, T-CN, Phenol  
Electric conductivity  
Electronic balance
- (5) Sulphurous acid gas
- (6) Microscope for biotics
- (7) Soil test set
- (8) Civil work

(b) Monitor

- (1) For quality of water

(c) Supplementary equipment

- (1) Reader printer for microfilm
- (2) Denstometer
- (3) Patch card mounter
- (4) Jacketer

B. Machinery and Equipment provided in Japanese fiscal 1984  
( the second phase of the Project )

(a) Measuring Equipment

- (1) Suspended solids
- (2) Microscope
- (3) Suspended fine particles
  - Wind
  - Digital dust indicator
  - Humidity
  - Electronic balance
- (4) Vibration
  - 1/3 Octave frequency analyzer
- (5) Noise
  - Wind screen
  - Level recorder
- (6) Pocket computer and printer

(b) Monitor

- (1) For quality of air
  - Digital dust indicator
  - High volume air sampler - Andersen sampler
  - Low volume air sampler
  - Orifice flowmeter
  - Dust jar
  - Deposit gauge
  - Clean vane
  - Raingauge
  - Maximum and minimum thermometer
  - Prefabricated house

(c) Mask

- (1) For protecting dust

C. Machinery and Equipment provided in Japanese fiscal 1985  
( the third phase of the Project )

(a) Measuring Equipment

- (1) Suspended solids
- (2) Humidity
  - Wind
- (3) Parts for machinery and equipment provided







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