

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

INSTITUTE FOR RESEARCH AND DEVELOPMENT OF CERAMIC INDUSTRY (IRDCRI),
MINISTRY OF INDUSTRY AND TRADE, THE REPUBLIC OF INDONESIA

**STUDY ON
DEVELOPMENT OF
RAW MATERIAL OF CERAMIC INDUSTRY
IN
THE REPUBLIC OF INDONESIA**

FEBRUARY 1997

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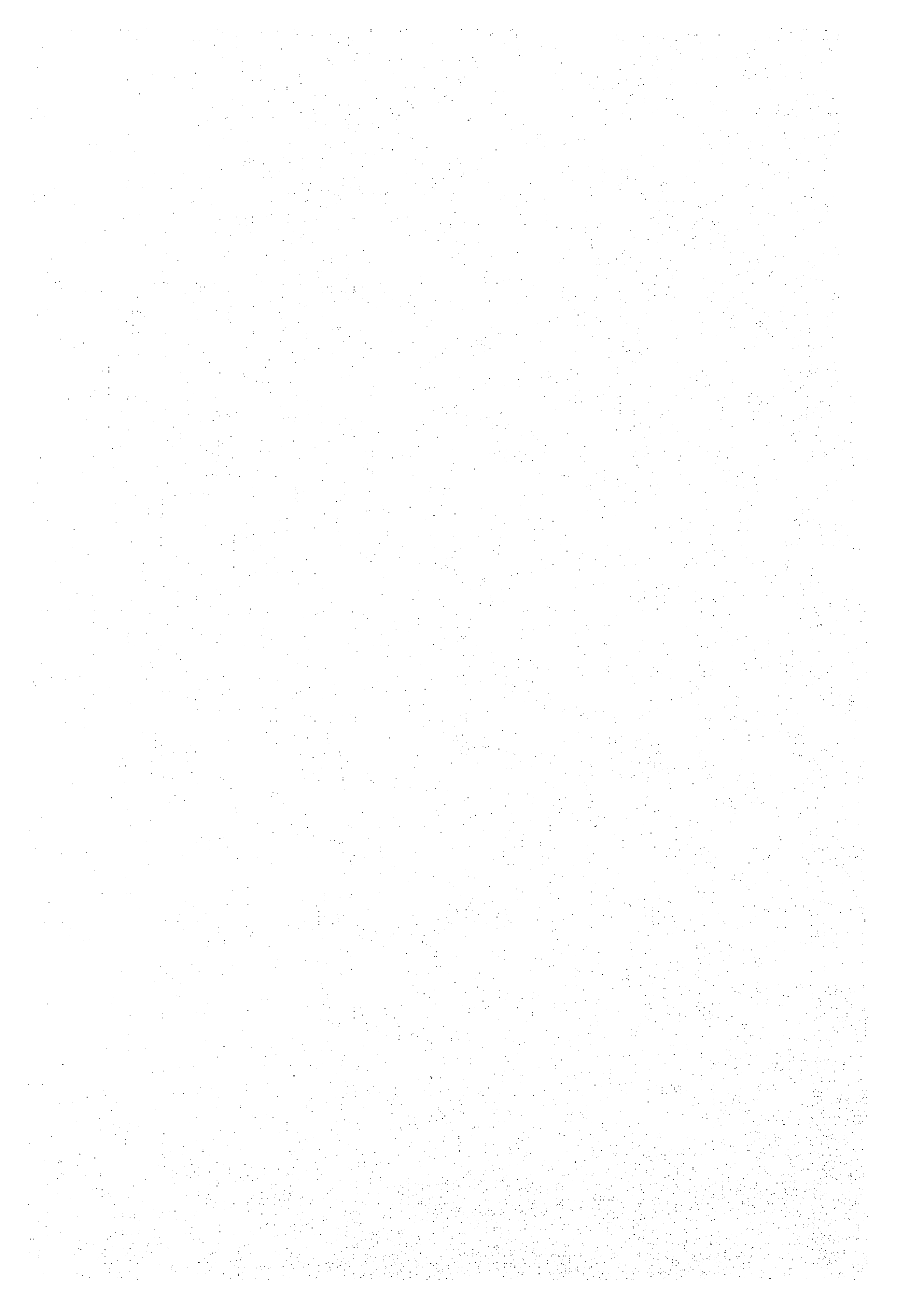
**UNICO INTERNATIONAL CORPORATION
KITAKYUSHU INTERNATIONAL TECHNO-COOPERATIVE ASSOCIATION**

TOKYO, JAPAN

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Preface

In response to a request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct the Study on Development of Raw Material of Ceramic Industry in the Republic of Indonesia, and entrusted the study to Japan International Cooperation Agency (JICA).

JICA sent a study team, led by Mr. Tetsuo Inooka of UNICO International Corporation and constituted by members of the UNICO International Corporation and Kitakyushu International Techno-Cooperative Association, to the Republic of Indonesia five times from August 1995 to December 1996.

The team held discussions with the officials concerned of the Government of the Republic of Indonesia, and conducted related field surveys. After returning to Japan, the team conducted further studies and compiled the final results in this report.

I hope this report will contribute to development of raw material of ceramic industry in the Republic of Indonesia and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation throughout the study.

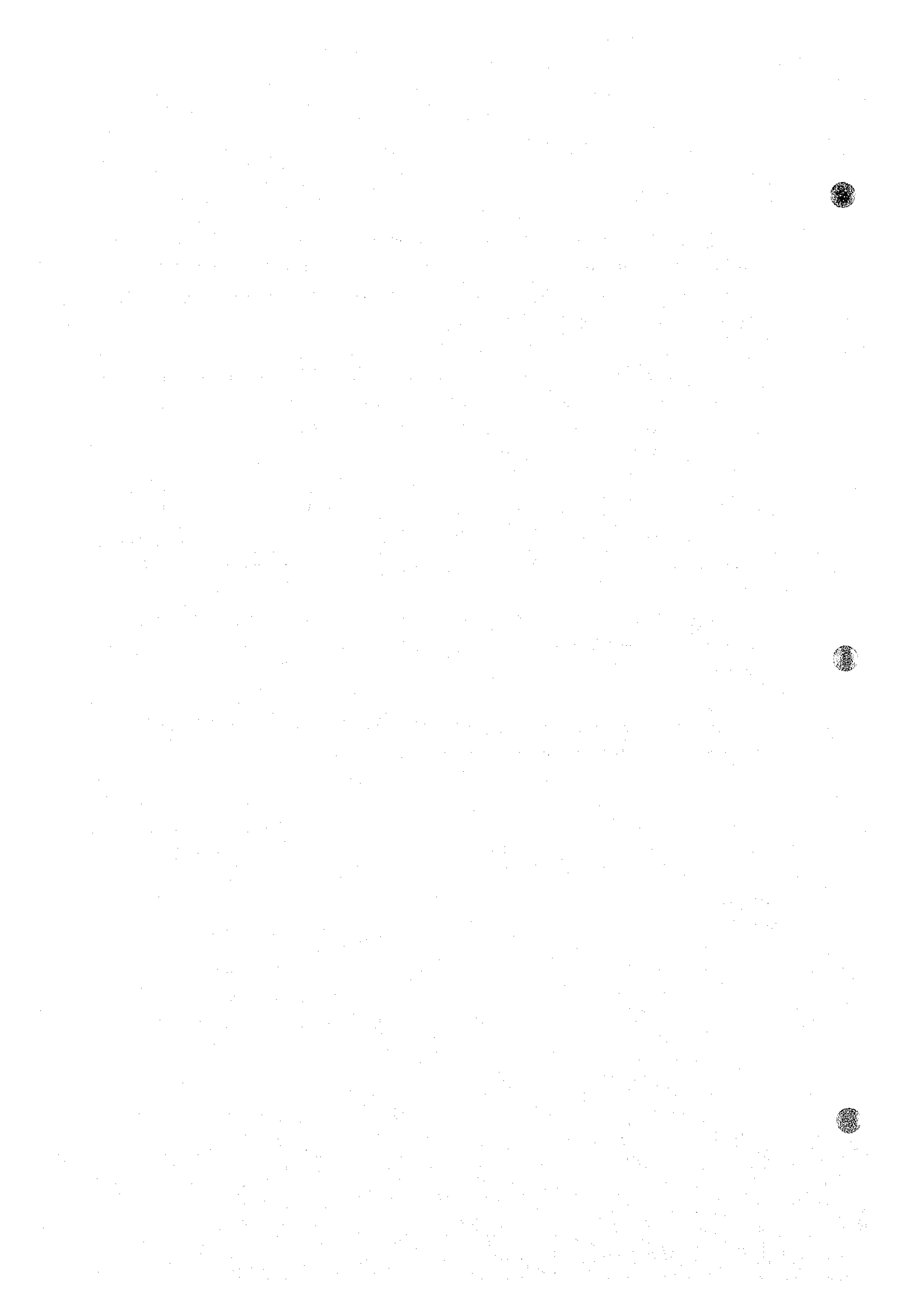
February 1997



Kimio Fujita

President

Japan International Cooperation Agency



February 1997

Mr. Kimio Fujita
President
Japan International Cooperation Agency
Tokyo, Japan

Dear Mr. Fujita

Letter of Transmittal

We are pleased to submit to you the final report on the Study on Development of Raw Material of Ceramic Industry in the Republic of Indonesia. The study was carried out with an objective to formulate a plan to establish a system for supplying ceramic raw materials of better quality. The present report recommends the projects to supply clay and feldspar of consistent quality, and a project to supply premixed body to small-scale novelty goods manufacturers, on the basis of analysis of industry needs for quality raw materials, and technical and economic evaluation of the raw materials locally available in view of their potential use and limitations for these projects.

Due to the limited quality of raw materials available, it is not recommended to establish a beneficiation and supply system of quality materials. Nevertheless, the above projects will satisfy the needs particularly of tile manufacturers who showed great interest in establishing a system of supplying consistent quality materials, and establishing a supply system of premixed body will also help the small-scale novelty manufacturers to upgrade their products.

The Indonesian side has shown significant interest in implementing these projects. I believe, however, your further support in the future in the following areas will be very useful as a prerequisite for promotion of these projects; namely, (1) a supplementary technical study to gather additional data which are necessary for making the final decision but these data were not available during the present study, and (2) strengthening of the IRDCRI (Institute of Research and Development for Ceramic Industry) of their function and competence in providing technical support for the project implementation.

We are also certain that the transfer of technology conducted during the Study by the Team members to the counterparts on raw material analysis and evaluation will be useful for future technology development in Indonesia.

We wish to take this opportunity to express our sincere gratitude to your Agency, the Ministry of Foreign Affairs, and the Ministry of International Trade and Industry for valuable advice and support provided on behalf of this study. We also wish to express our deep gratitude to IRDCRI; the Directorate of Non-metal Mineral Industry, Directorate General of Metal, Machinery and Chemicals, MOIT; ASAKI, the industrial association for the ceramic industry; and other authorities concerned of the Republic of Indonesia for the close cooperation and substantial assistance rendered to us during the performance of this study.

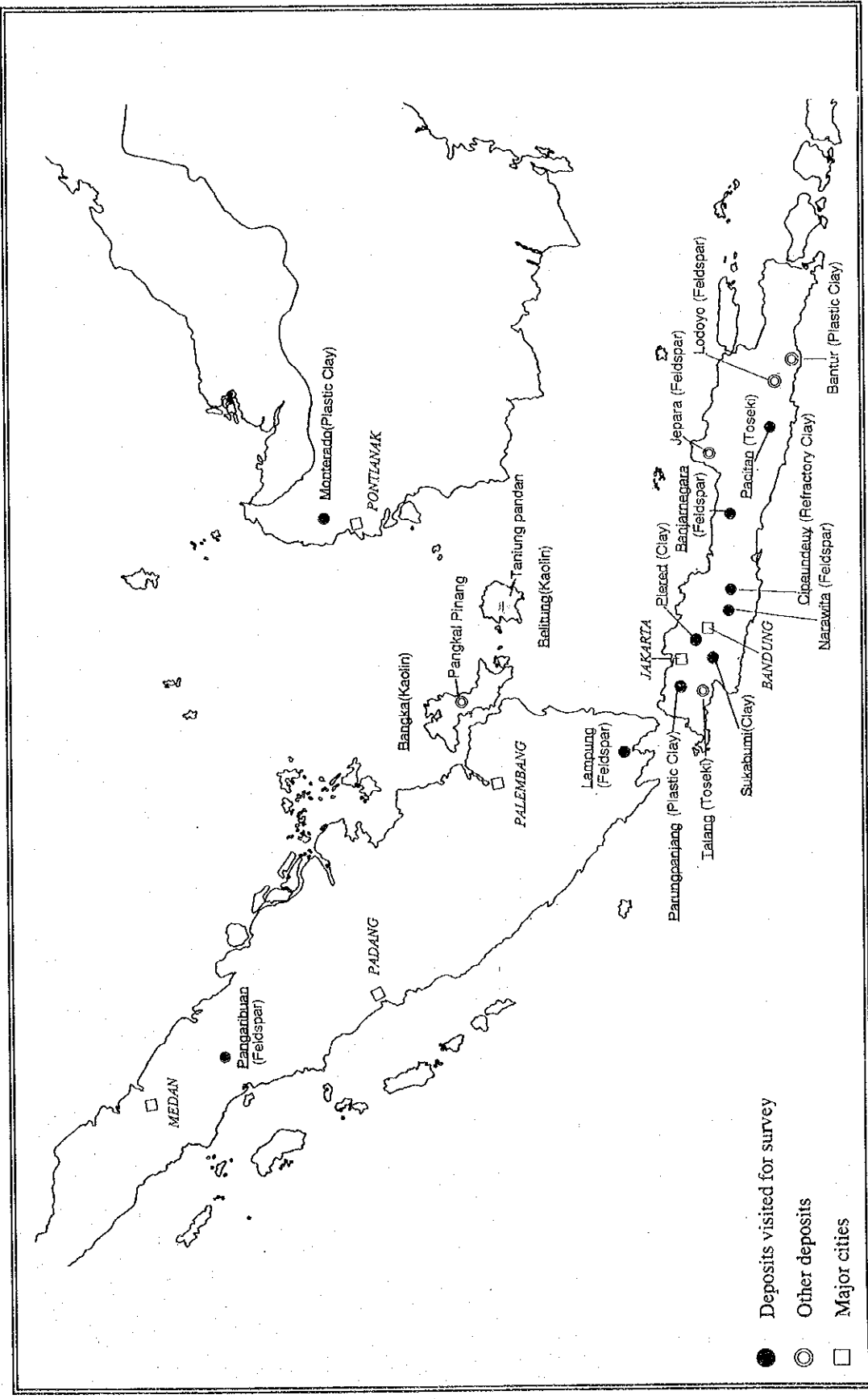
Very truly yours,



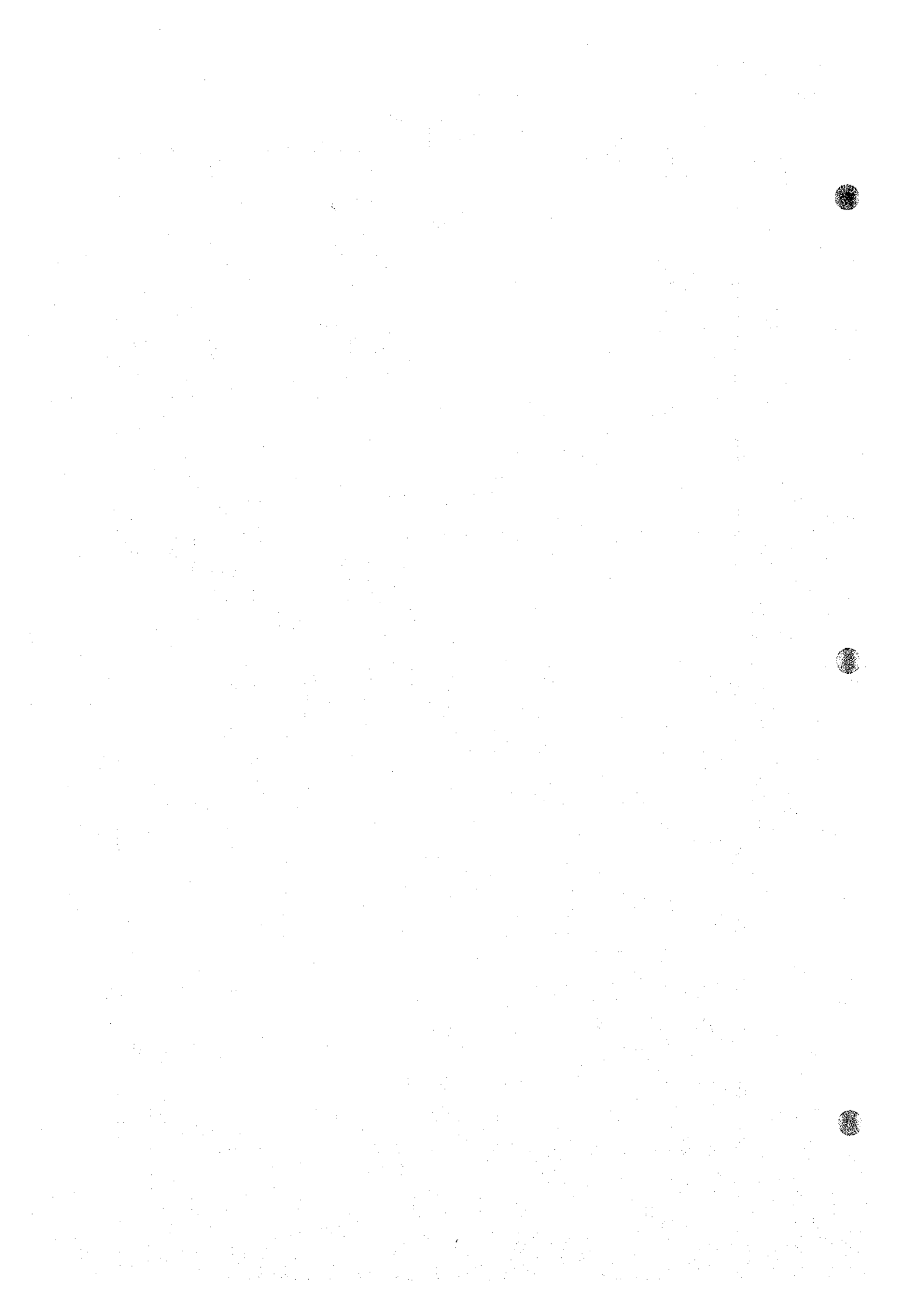
Tetsuo Inooka

Team Leader, Study on Development of
Raw Material of Ceramic Industry
in the Republic of Indonesia

Major Ceramic Raw Material Deposit in Indonesia



- Deposits visited for survey
- ⊙ Other deposits
- Major cities



Abbreviation (*)

3PG	Geological Research and Development Center: GRDC (Pusat Penelitian dan Pengembangan Geologi)
AAS	Atomic Absorption Spectrometer
ADB	Asian Development Bank
APTALI	Association of Clay Supplier
ASAKI	Indonesian Ceramic Industries Association (Asosiasi Aneka Industri Keramik Indonesia)
ASTM	American Society for Testing and Materials
BAPIK	Agency for Development of Small-scale Industries (Badan Pengembangan Industri Kecil)
BAPPEDA	Regional Planning and Development Agency
BBK	Institute for Research and Development of Ceramic Industries: IRDCRI (Balai Basar Penelitian dan Pengembangan Industri Keramik)
BC	Belt Conveyor
BE	Bucket Elevator
BOD	Biological Oxygen Demand
BPIIP	Research and Development Agency for Industry and Trade
BPPIS	Laboratory and Testing Institute for Industrial Products Semarang: LTIIPS (Balai Penelitian dan Pengembangan Industri Semarang)
BPPISu	Laboratory and Testing Institute for Industrial Products Surabaya: LTIIPSu (Balai Penelitian dan Pengembangan Industri Surabaya)
BPPT	Agency for Assessment and Application of Technology (Badan Pengkajian dan Penerapan)
BPS	Central Bureau of Statistics (Biro Pusat Statistik)
CMC	Carboxyl Methyl Cellulose
COD	Chemical Oxygen Demand
CSFU	Common Service Facility Unit
DMR	Directorate of Mineral Resources (Direktorat Sumberdaya Mineral: DSM)
DO	Dissolved Oxygen

(*) Descriptions in parentheses show the names in Indonesian.

DPE	Department of Mines and Energy (Departemen Pertambangan dan Energi)
DSM	Directorate of Mineral Resources: DMR (Direktorat Sumberdaya Mineral)
EIRR	Economical Internal Rate of Return
EPMA	Electron Probe X-ray Microanalyser
FIRR	Financial Internal Rate of Return
GDP	Gross Domestic Product
GIRIN	Government Industrial Research Institute Nagoya
GRDC	Geological Research and Development Center (Pusat Penelitian dan Pengembangan Geologi: 3PG)
ICDD	International Center for Diffraction Data
ICP	Atomic Emission Spectrochemical Analysis
IKAD	PT. Angsa Daya
IMF	International Monetary Fund
IMOLA	PT. Indopenta Sakti Teguh
IR	Infrared
IRDCRI	Institute for Research and Development of Ceramic Industries (Balai Basar Penelitian dan Pengembangan Industri Keramik : BBK)
IRR	Internal Rate of Return
ISO	International Organization for Standardization
ITB	Bandung Institute of Technology
ITTT	Institute for Transfer of Industrial Technology
JICA	Japan International Cooperation Agency
JIS	Japanese Industrial Standards
LGPN	National Mining and Geology Institute
LIPI	Indonesian Institute of Science
LTIIPS	Laboratory and Testing Institute for Industrial Products Semarang (Balai Penelitian dan Pengembangan Industri Semarang: BPPIS)
LTIIPSu	Laboratory and Testing Institute for Industrial Products Surabaya (Balai Penelitian dan Pengembangan Industri Surabaya: BPPISu)
MDCM	Manpower Development Center for Mines
MIDC	Metal Industrial Development Center
MOI	Ministry of Industry
MOIT	Ministry of Industry and Trade

MTDC	Mineral Technology Development Center
MTRDC	Mineral Technology Research and Development Center (Pusat Penelitian dan Pengembangan Teknologi Mineral: PPPTM)
NEDO	New Energy Development Organization
OEM	Original Equipment Manufacturer/Manufacturing
PDII	Indonesian Scientific Document Center
PJP	Long Term (25 years) Development Plan
PPPTM	The Mineral Technology Research and Development Center: MTRDC (Pusat Penelitian dan Pengembangan Teknologi Mineral)
PUSTAN	Center for Industrial Standardization (Pusat Standardisasi Industri)
PV	Polyvinyl
QACS	Quality Assurance Certification Scheme
R/D	Research and Development
REPELITA	Five Years Development Plan (Rencana Pembangunan Lima Tahunan)
S/W	Scope of Work
SCRL	Saga Ceramics Research Laboratory
SEM	Scanning Electron Microscope
TG/DTA	Thermogravimetry / Differential Thermal Analyzer
TOC	Total of Carbon
TSU	Technical Service Unit (Unit Pelayanan Teknis: UPT)
UPT	Technical Service Unit: TSU (Unit Pelayanan Teknis)
UV	Ultraviolet
WBB	Watts Blake Bearne & Co., PLC
XRD	X-ray Diffraction

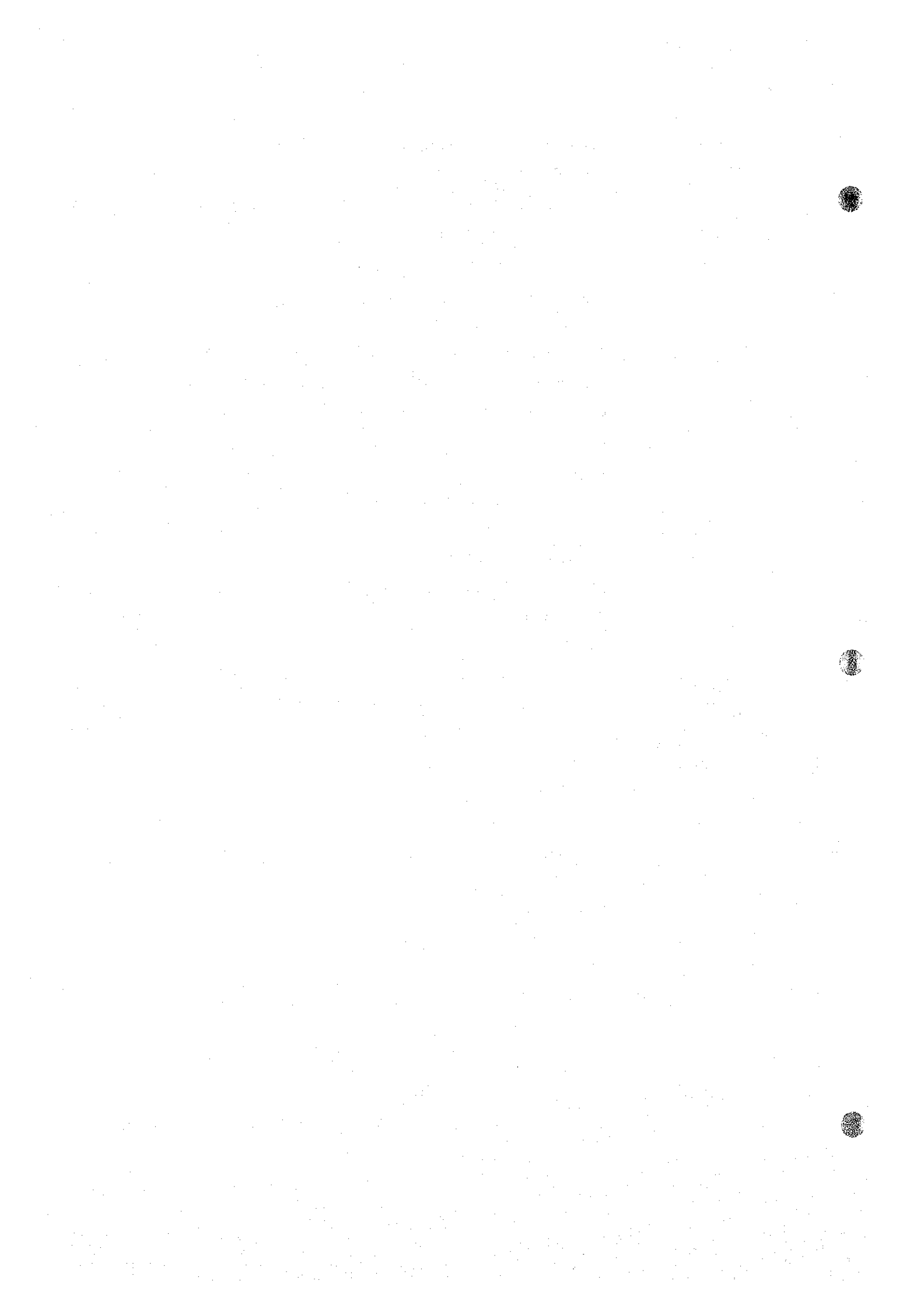


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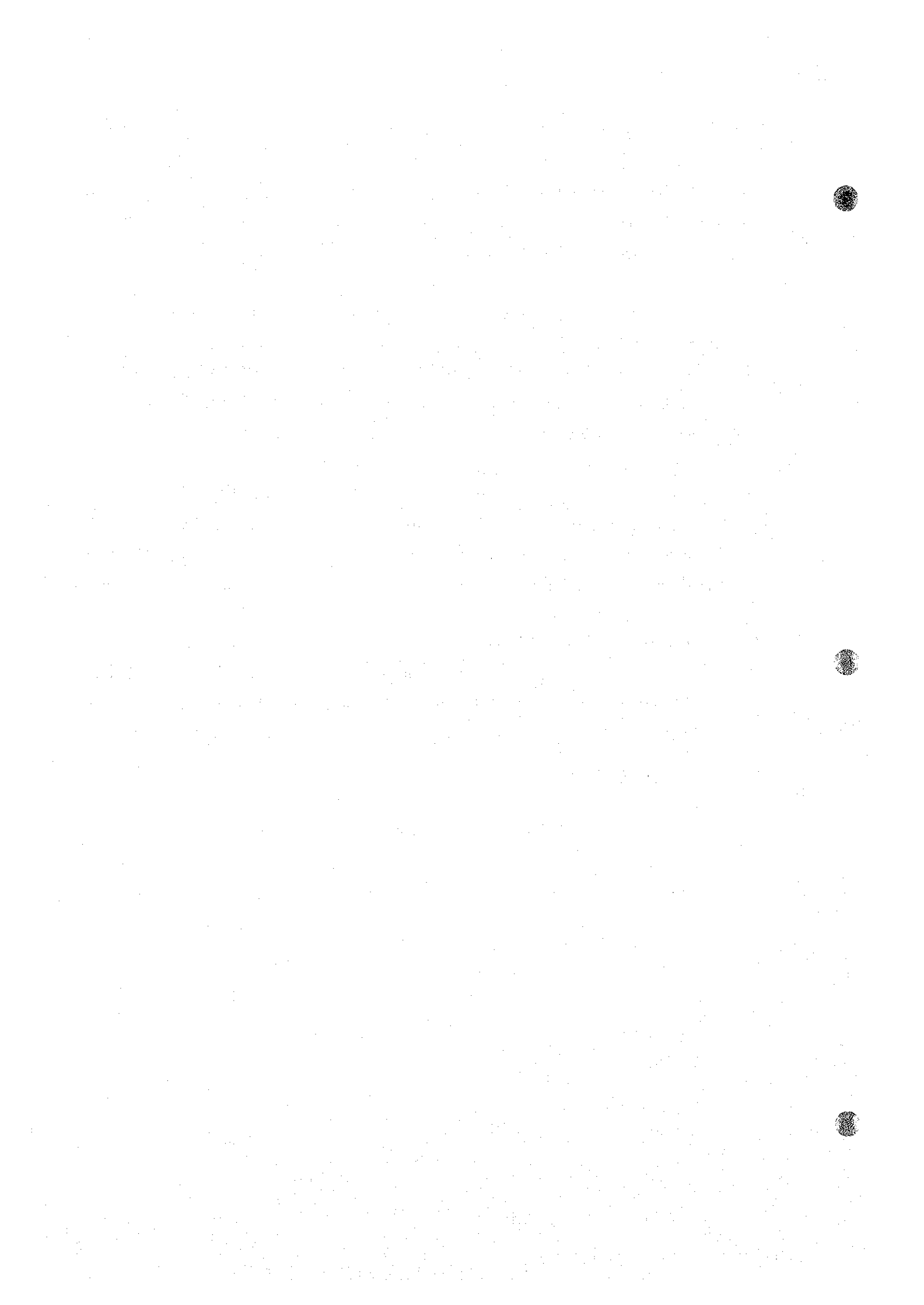


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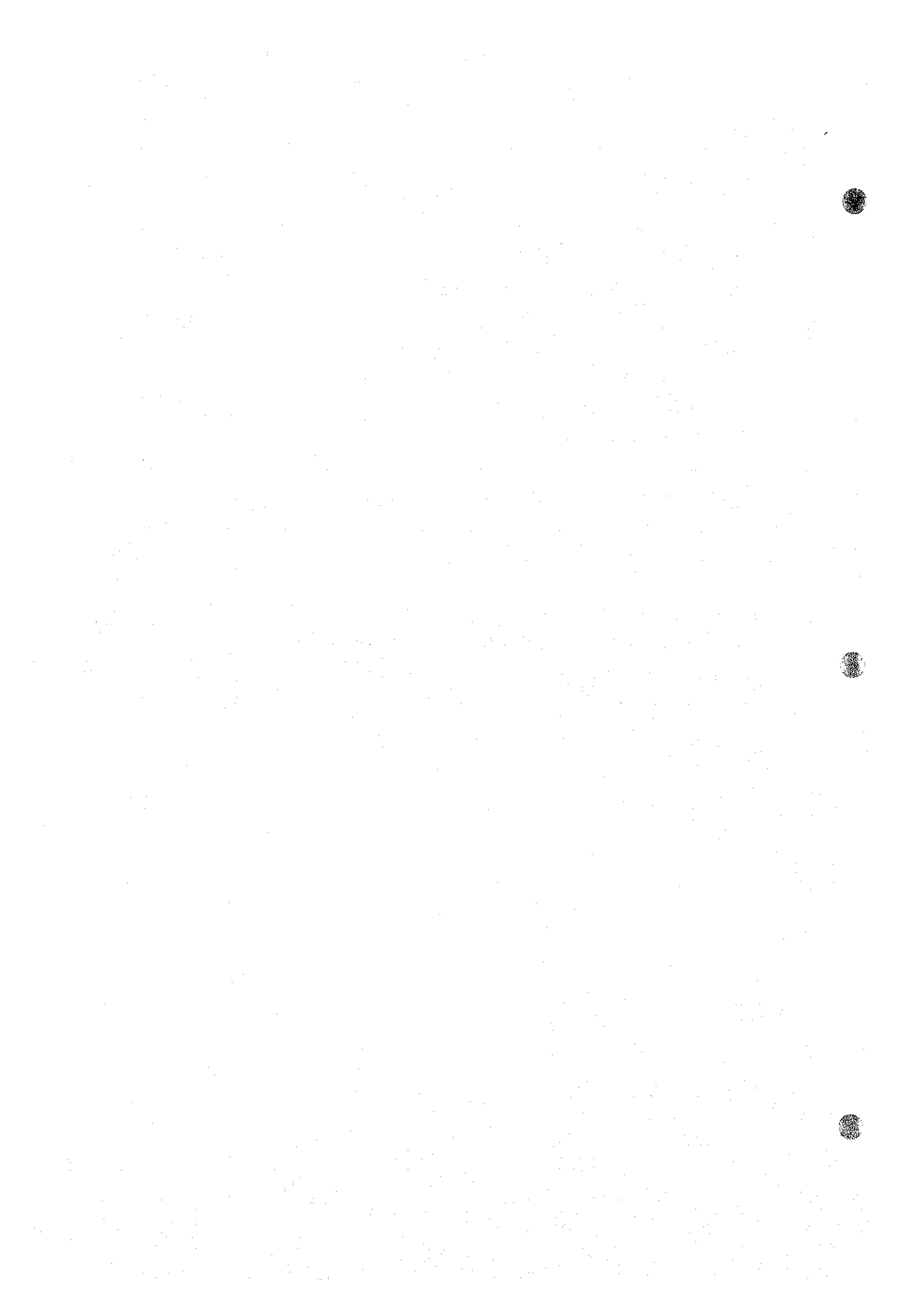
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● **PART I Introduction**

1 Background, Objective, and Scope of the Study

1.1 Background and Objective of the Study

The primary objective of the study is to develop a plan for establishment of a reliable supply system of better-grade ceramic raw materials as part of efforts to promote the ceramic industry, particularly the tableware, novelty, tile, and sanitary ware manufacturing industries in Indonesia.

The ceramic industry in Indonesia is a capital intensive process industry and is divided into several subsectors: (1) the sanitary ware subsector; (2) the wall/floor tile and glazed roof tile subsector which also produce unglazed roof tiles as one part of their product mix (referred to as the tile subsector), both led by large enterprises; (3) the subsector specialized in unglazed roof tile, and (4) the novelty subsector, both mainly consisting of small- and medium-sized enterprises and characterized by labor-intensive operation; and (5) the tableware subsector characterized as an intermediate type of operation of the above (1), (2) and (3), (4).

Major issues facing the ceramic industry are quality assurance and productivity improvement. Raw materials have significant influence on both issues. Current problems related to local raw materials in the country are as follows:

- (1) Difficulty in obtaining raw materials of consistent quality because of poor resource conditions in mines;
- (2) Inconsistency of raw materials quality from one supply lot to the next because of the small scale of operation of raw material quarrying, and
- (3) Poor grade of raw materials available.

As a result, ceramic manufacturers use imported materials or blend imported and local materials according to the intended use. They also purchase local materials from remote sources when required. These supply conditions lead to high material costs, and to difficulty in maintaining process control so as to manufacture products with stable quality. They also lead to a high rejection rate.

In 1991, a subsector development study was conducted on the Indonesian ceramic industry by JICA at the request by the Indonesian government. The study conclusion pointed out the importance of stable supply of better-grade raw materials and sub-materials for development of the ceramic industry. The Indonesian government, while conducting

follow-up research and study under the leadership of IRDCRI (Ceramic Research Institute) to identify local sources of raw materials, has recognized that the identifying of resources is not sufficient and that development of a supply system of raw materials having quality sufficient for use in final products, in addition to physical exploration, are needed. Thus, the government requested the Japanese government for support to establish a ceramic raw material development plan.

JICA sent a preparatory study team in March 1995 and agreed with the Indonesian government by signing the Scope of Work (S/W) agreement covering the scope and content of the study. Based on the S/W, JICA assigned a study team consisting of UNICO International Corporation and Kita-kyushu International Techno-Cooperative Association. The present report compiles the results of the study conducted by that team.

1.2 Scope of the Study

On March 29, 1995, the scope of the study set forth in the S/W agreed on between the preparatory study team and the Indonesian government is summarized as follows.

1. Ceramic Industry in Indonesia

1-1 Current State of the Ceramic Industry

1-1-1 Supply and demand situation of ceramic products

- Domestic markets

- Export and import markets (analysis of existing data and literature research)

1-1-2 Recent development of the ceramic industry

1-1-3 The role of the ceramic industry in the country's industrial sector

1-2 Breakdown of the Ceramic Industry (domestic and export/import markets)

1-2-1 Tableware and novelty goods

1-2-2 Sanitary ware

1-2-3 Tiles

1-2-4 Others

1-3 Demand Forecast of Ceramic Products

1-3-1 Domestic markets

1-3-2 Export and import markets (analysis of existing data and literature research)

1-4 Review of present institutional framework and policy relevant to promotion of the ceramic industry

2. Current State of Development of Ceramic Products and Raw Materials in Indonesia, and Major Issues
 - 2-1 Existing ceramic raw material resources (sites), reserves, and grade
 - 2-1-1 Analysis of existing data and literature research
 - 2-1-2 Study on raw material sources for ceramic manufacturers
 - 2-2 Distribution of Ceramic Raw Materials
 - 2-2-1 Transportation routes
 - 2-2-2 Means of transportation
 - 2-2-3 Transportation costs
 - 2-2-4 Storage
 - 2-2-5 Storage costs
 - 2-3 Supply of Ceramic Sub-Materials (Pigment, Glaze, Etc.)
 - 2-3-1 Analysis of existing data and literature research
 - 2-3-2 Study on sub-material sources for ceramic manufacturers
 - 2-4 Ceramic Raw Material Development Organization in Indonesia
 - 2-4-1 Organization
 - 2-4-2 Administration
 - Human resource development
 - Financial management
 - 2-4-3 Relationships between development organizations, private enterprises, research institutes, universities, and other relevant organizations
 - 2-4-4 Technical capabilities and R&D resources of development organizations
 - Chemical analysis, property evaluation, and geological analysis
 - Selection process of toseki, feldspar, cobble stone, and others
 - Blending and beneficiation technologies
 - Prototype testing of beneficiated and blended materials
3. Selection of Ceramic Products and Raw Materials with Competitive Advantages
 - 3-1 Selection of Competitive Ceramic Products
 - 3-1-1 Demand forecast for ceramic products
 - 3-1-2 Opportunity for development of ceramic products which have not been localized
 - 3-1-3 Competitive advantages of ceramic raw materials and sub-materials from quality and volume perspectives
 - 3-2 Evaluation of Ceramic Raw Materials Available at the Sites with Development Potential - Quality and Quantity Perspectives

- 3-2-1 Systematic sampling
 - 3-2-2 Qualitative and quantitative forecast of raw materials
 - 3-2-3 Evaluation of mining methods
 - 3-2-4 Evaluation from environmental and socioeconomic perspectives
4. Formulating the Ceramic Raw Material Development Promotion Plan for Stable Supply of Quality Raw Materials
- 4-1 Formulating Improvement Plans for Ceramic Raw Material Distribution System
 - 4-1-1 Opportunity for raw material blending and beneficiation businesses
 - 4-1-2 Formulating improvement measures for the distribution system
 - 4-2 Reinforcing Government Involvement and Role
 - 4-2-1 Improvement measures for development of ceramic raw materials
 - 4-2-2 Reinforcement of IRDCRI
 - Analysis and testing services
 - Technical guidance
 - Human resource development
 - Information service
 - 4-2-3 Reinforcement of regional research organizations other than IRDCRI

2 Outline of the Study and Organization of the Report

2.1 Basic Framework of the Study

The study (1) involved the following investigative and analytical activities in technical and economic fields to collect data and information required for formulation of the ceramic raw material development plan, and (2) formulated the development plan.

1) Field survey of raw material sites and sampling

Field surveys were conducted for major raw material sites currently mined, and prospective sites, to check availability and distribution of minerals, to evaluate the current state of mining and usage, to examine possible improvement measures, and to collect samples for laboratory analysis and evaluation. Ore reserves were estimated by mainly relying on survey data and information available, and information concerning resource distribution furnished by quarrying operators, and no physical exploration including boring survey was conducted.

Raw material sites visited by the study team are:

- 1) Clay materials: Parungpanjang, Sukabumi, Cipeundeuy, Monterado
- 2) Feldspar materials: Narawita, Banjarnegara, Pangaribuan, Lampung
- 3) Toseki/agalmatolite: Pacitan
- 4) Kaolin: Belitung

2) Analysis and evaluation of raw material samples

Raw material samples were analyzed and evaluated to collect data on raw material resources, as required to prepare the ceramic raw material development plan. Analysis and evaluation were mainly conducted at IRDCRI, jointly by the study team and the institute's staff. The study team brought testing equipment and tools which were not available at the institute. Some samples were brought back to Japan for comparative analysis, and additional tests were conducted in Japan for some items for which results were not reliable due to problems related to precision of testing equipment available at the institute.

3) Interview survey on ceramic manufacturers and their association

To identify marketability of ceramic products currently produced in the country as well as consumption and distribution of raw materials, the study team visited ceramic manufacturers and their association, including tile manufacturers, sanitary ware

manufacturers, tableware manufacturers, and clusters of novelty producers.

- 4) Survey on R&D and technical support organizations related to ceramic products and raw materials

To secure organizational support in the technical aspects of ceramic raw material development, surveys were conducted for existing research and technical support organizations in the related fields to collect data and information on their equipment, manpower, activity, and financial status.

- 5) Policy survey related to the ceramic industry

Government policy affecting the ceramic industry was studied, particularly that of MOIT, including discussions with related authorities.

2.2 Field Survey

The study conducted four phases of field surveys, based on which conceptual design of the plan was developed and then, defined in detail.

- (1) First field survey

The first field survey was conducted for approximately three weeks in August and September 1995, and served as a preliminary study prior to the development of detailed survey plans for the second and subsequent field surveys, focusing on the following activities:

- 1) Examination of data on resource availability and distribution;
- 2) Identification of raw material sites for field survey and selection of sampling methods;
- 3) Selection of methods for raw material analysis and evaluation; and
- 4) Agreement on methods for transferring raw material evaluation and analysis technologies.

Other activities include preliminary surveys on the ceramic industry, on IRDCRI and on its equipment, as required by the study team for the subsequent surveys, and on raw material sites to determine the methods for sampling, analysis, and evaluation.

- (2) Second field survey

The second field survey, conducted for 36 days from the end of October 1995, included raw material site surveys, and collection of samples for raw material evaluation

and analysis to be conducted during the third and later field surveys. Also, various companies and organizations were visited to collect data and information related to the ceramic industry and market, and the current state of raw material demand, supply, and distribution. At the same time, the study team visited other research organizations engaged in development of ceramic materials.

(3) Third field survey

The third field survey was conducted for 38 days from mid-February 1996, and analysis of samples was conducted at IRDCRI. Also, supplemental surveys were conducted on raw material demand, supply, and distribution.

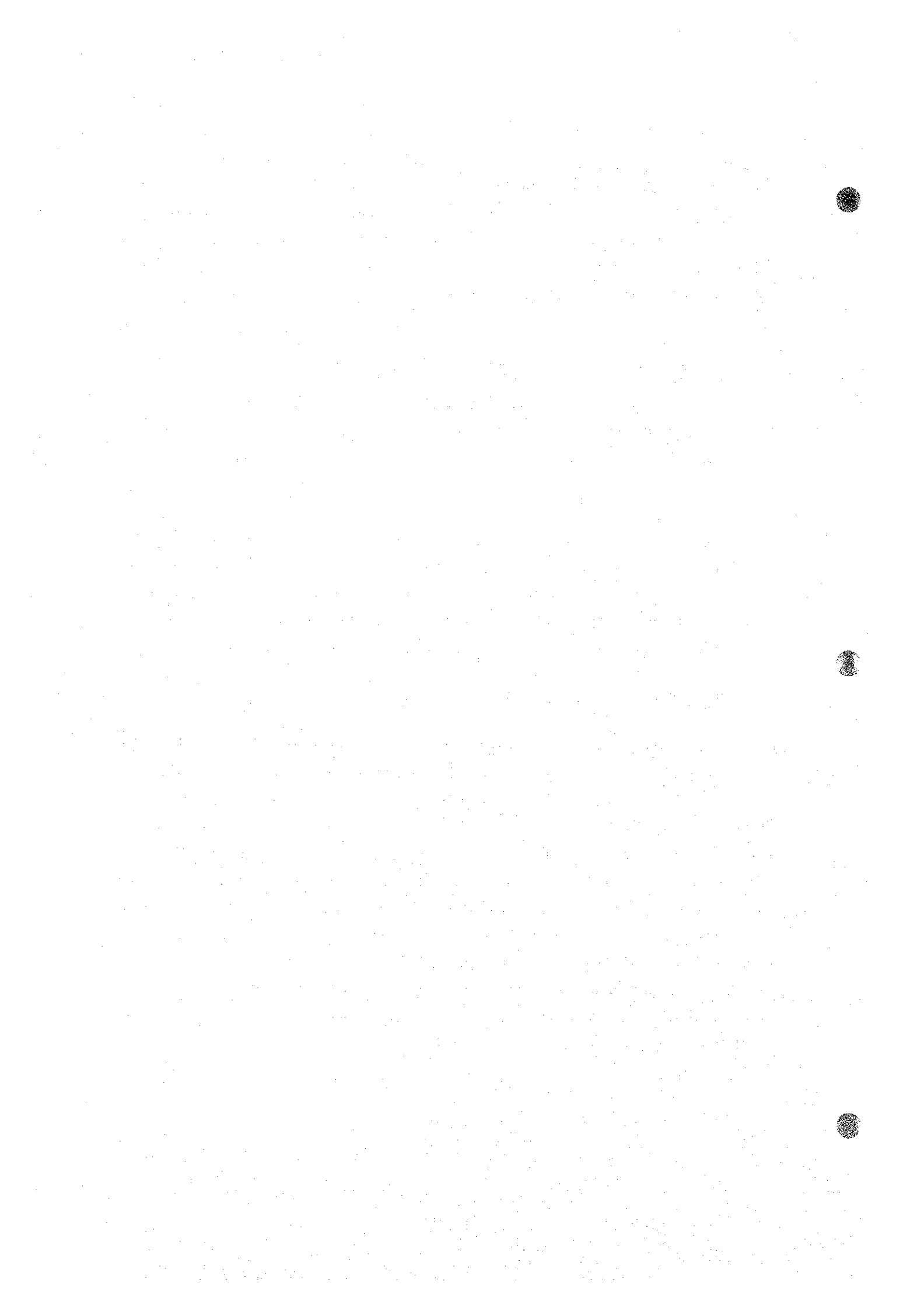
During the period, the study team held a seminar on the ceramic raw material distribution system in Japan.

(4) Fourth field survey

The fourth field survey was conducted for more than three months from late June 1996, including a period of interruption.. Evaluation and analysis of raw material samples were conducted at IRDCRI by use of testing equipment brought there for that purpose; the work was done, mainly from the perspective of raw material development.

2.3 Organization of the Report

This report consists of two volumes, "Summary" and "Main Report." The main report is divided into "Introduction," "Conclusion and Recommendations," and "Detailed Discussions." "Introduction" describes the objective, background, and scope of the study. "Conclusion and Recommendations" discusses the need for formulation of the ceramic raw material development plan, and possibility of development of local materials as well as limitations, and presents the draft plan with major benefits expected from its implementation, and evaluation of financial and economic feasibility. Also, recommendations cover activities deemed absolutely necessary for implementation of the plan, and other activities which are important from the viewpoint of promoting the ceramic industry, although not directly related to ceramic raw material development. Finally, "Detailed Discussions" presents the details of evaluation and analysis as the basis of the conclusions and detailed data for to each specific subject of the study.



3 Current Status of Ceramic Industry in Indonesia

3.1 Indonesian Economy, Industrial Sector and Ceramic Industry

(1) Industry structure

The GDP in 1994 was recorded at Rp.377,400 billion. It was equivalent to US\$ 174,600 million and US\$ 908 per Capita, at the conversion rate Rp.2,161/US\$ (the average in 1994).

The GDP was composed of shares of 23.9% (1994 value) from the industrial sector, 17.4% from agriculture, forestry and fisheries, and 8.3% from the mining and quarrying sector. These three sectors accounted for 49.6% of the GDP (Table 3-1).

Table 3-1 GDP by Industry Subsector

(Unit: Billion Rp at Current Market Prices)

Industrial Origin	1989	1990	1991	1992	1993	1994
1. Agriculture, Livestock, Forestry and Fisheries	39,163.9	42,148.7	44,720.8	50,733.1	58,963.4	65,821.2
2. Mining and Quarrying	21,822.5	26,119.0	31,402.6	29,907.2	31,497.3	31,381.0
3. Manufacturing Industries	30,323.3	38,910.2	47,665.5	56,541.6	73,556.4	90,206.8
4. Electricity, Gas and Water Supply	1,008.3	1,258.1	1,750.2	2,147.7	3,290.2	3,912.8
5. Construction	8,884.2	10,748.5	12,902.1	15,305.2	22,512.9	27,942.2
6. Trade, Hotels and Restaurants	28,855.5	32,999.7	36,953.8	42,731.5	55,297.6	62,561.5
7. Transportation and Communications	9,305.5	10,999.6	13,908.0	17,099.3	23,248.9	26,927.0
8. Banking and Other Financial Intermediaries	6,666.7	8,287.1	10,157.6	12,499.7	18,352.7	22,320.3
9. Ownership of Dwellings	4,151.1	4,890.8	5,924.7	6,595.9	9,695.1	11,239.0
10. Public Administration and Defense	11,174.2	12,801.4	14,621.6	17,309.4	22,458.1	22,817.7
11. Services	5,829.5	6,434.1	7,443.2	9,013.9	10,903.4	12,224.9
12. Gross Domestic Product	167,184.7	195,597.2	227,450.2	259,884.5	329,775.9	377,354.3
13. Annual Growth Rate(*)	7.5	7.2	7.0	6.5	6.5	6.6

Source: BPS

Note: (*) At 1983 Constant Market Prices

The most remarkable change in industrial structure is a relative decline of the agricultural sector, rapid growth of the industrial sector and a decelerated growth of the petroleum and gas sector. In other words, the economy has successfully accomplished rapid industrialization while becoming less dependent upon the oil sector.

The share of the industrial sector in GDP rose appreciably in the 1980s, reaching 12-13% in the early 80s. In 1991 it exceeded 21%.

Among the industry sector, the ceramic industry subsector¹ contributed an extremely small share, as shown in Table 3-2.

Table 3-2 Production and Raw Materials Used in the Ceramic Subsector
(Unit: Billion Rp.)

	Goods produced (A)	Raw materials used (B)	(A - B)
Manufacturing Industries total (a)	114,508.6	62,926.2	51,582.4
Ceramic Industries total (b)	776.6	190.7	585.9
• Household Wares (Industry code:36111)	131.5	41.8	89.7
• Structural Materials (Industry code:36112)	645.1	148.9	496.2
(b/a) (%)	0.7	0.3	1.1

Source: BPS, Large and Medium Industrial Statistics, 1993

(2) Current economic development plan

Indonesia's economic development plan consists of REPELITA (the five year economic plan) which sets forth medium-term policy objectives (or basic policy for economic operation), and the 25-year PJP (long term development program) which is composed of long term visions. Actual government activities are undertaken based on the national budget compiled each fiscal year² in accordance to these two plans.

PJP I which has a planning period of 25 years, started in 1969 and ended in 1993. During the period, REPELITA I to V were undertaken. In 1994, PJP II was launched and is expected to last until 2018 based on which REPELITA VI (between 1994 and 1998) has been ongoing.

PJP II (Second Long Term Development Program)

The previous PJP I period is considered as a preparation stage in the Indonesian economic development process in building the foundation for taking off towards economic self-reliance. The PJP II period meanwhile, is defined to involve the take-off process. The plan calls for mobilization of all the efforts toward the goal of self-reliance, while simultaneously fulfilling the objectives of growth, fairness and stability in the process.

¹ Large and medium size manufacturers only.

² Financial year is from April to March.

During this period, the plan has the target economic growth rates of 6.2% in REPELITA VI and 8.7% in REPELITA X, averaging 7% throughout the period (6.8% during the PJP I period). The plan also aims to achieve a quadrupling of GDP per capita³.

Sector-wise, continued industrialization and less dependence upon the oil sector are emphasized. While the agricultural sector is targeted to grow at 3% in real terms, high growth rates are set for the manufacturing industry 9%, and for the non-petroleum and non-gas manufacturing sector 10%. As a result, the share of the agricultural sector is expected to be less than 10% in the final stage of PJP II, while that of the manufacturing sector will exceed 30%⁴.

REPELITA VI

The plan envisages economic growth of 6.2% per annum over the five-year period.

The major engine for economic growth will be the manufacturing sector with a target growth rate of 9.4%⁵, compared to 3.4% of the agricultural sector. As a result, the percentage share of the manufacturing sector in GDP by the end of the plan period will rise to 24.1% (21.3% for the non-oil/gas sector), which is comparable to that of Thailand (26%) and Malaysia (27%) in 1990.

As for the employment structure, the agricultural sector will continue to play an important role as it accounts for 48.2% of total, compared to 12.6% by the manufacturing sector. At the end of the plan period, these shares are forecast to change to 44.0% and 14.3%, respectively.

In establishing the development goal, REPELITA VI pointed out the following factors affecting the rapid changes in world economic structure, and consequently, the industrial sector in Indonesia:

- 1) Globalized trade and economic practices, and
- 2) Rapid advance in technology.

In view of the above, the plan pointed out that the comparative advantage of Indonesia, namely, a huge labor force and abundant natural resources can no longer be relied on, because of the following:

³ Based on the actual income of \$650 in the final year of PJP I, the target income level is \$2,600. The present income level of Malaysia is slightly more than \$2,000.

⁴ The share of the manufacturing sector in South Korea and Taiwan is 29% and 34% respectively in 1990. It appears that the plan intends to achieve the same level of industrialization in these countries.

⁵ Including the oil and gas sector. 10.3% growth is assumed for the non-oil/gas industry sector alone.

- 1) More and more technologies available in Indonesia are fastly becoming obsolete, owing to rapid advance in technology. This translates to shorter life span of industrial products;
- 2) Natural resources are being depleted in terms of types, volumes and qualities;
- 3) Investment funds are becoming scarcer;
- 4) Human resources availability is becoming a more important determinant of success in competing with counters.

Under such a situation, the following challenges need to be addressed to establish the competitive edge of Indonesia:

- 1) Reduction of production costs, and product diversification through improvement of human resources quality
- 2) Increase in capability of experts and technicians to master and acquire various technologies by motivating the work force and enhancing their creative and innovative skills, in order to cope with faster change and the shorter life span of technology
- 3) Mobilization of public funds and its application to productive investments in the industrial sector (the existing cost-effective industrial workers and abundant natural resources could no longer be depended upon to attract foreign investment)
- 4) Creation of institutional instruments which will enable the industrial sector to respond to, and possess the capacity to deal with, developments and changes
- 5) Acceleration of targeted, integrated and effective growth by small and medium industries, enabling them to function as the backbone of national industry
- 6) Determination of policies which accurately enable sustainable industrial development and appropriately protect the environment

Ceramics industry under REPELITA VI

Table 3-3 shows the production target of ceramic industry under REPELITA VI with the estimated actual figure until 1995. Eighteen percent average annual growth is targeted.

Table 3-3 Production Target of Ceramic Industry under PELITA VI

	(Unit: Million Rp.)				
	1994	1995	1996	1997	1998
Sanitary Ware					
• Plan	73,467	84,618	97,416	112,185	129,195
• Actual	48,600	67,500			
Floor/wall Tile					
• Plan	1,070,510	1,282,430	1,536,400	1,840,770	2,205,570
• Actual	1,050,000	1,400,000			
Tableware					
• Plan	348,047	400,714	461,353	531,013	611,374
• Actual	180,000	286,062			
Roof Tile					
• Plan	48,233	55,709	64,344	74,317	85,837
• Actual	52,500	88,199			

Source: MOIT

The industrial policy for the ceramic industry is reportedly still under preparation. As an outcome of the present study it is necessary to formulate the basic direction of the proposed ceramic raw material development plan in line with the above industrial policy on the industrial sector.

3.2 Ceramic Subsectors by Product and its Size, Structure and Characteristics⁶

The major ceramic products produced in Indonesia are classified into (1) floor and wall tiles, (2) sanitary ware, (3) tableware, (4) novelties products, (5) building bricks, and (6) roof tiles. Bricks and roof tiles are excluded from the current study, since these are produced using clay available locally, and have faced no significant problem regarding supply of raw materials.

3.2.1 Tiles

(1) Industry size

Major products are floor tiles, wall tiles and mosaic tiles. Production of floor and wall tiles grew significantly between 1992 and 1995, an average rate of over 10% annually⁷. This was a result of rapidly increased demand for these tiles due to the boom in construction of office buildings and large-scale apartment buildings in the country.

⁶ "Survey results on demand for ceramic products and the use of raw materials" is presented in Chapter 1, Part III.

⁷ According to data provided by MOI.

According to the Ministry of Industry (MOI), 46 companies are currently manufacturing floor and wall tiles in Indonesia, and one company produces mosaic tiles only. Table 3-3 shows tile production trends between 1994 and 1995 and projection up to 1998 on a value basis. According to these data, MOI expects tile production, with the baseline year in 1995, to grow at an annual 20% up to 1998.

Exports have shown growth but still remain in a minor position. According to the Bureau of Statistics (BPS), tile exports as a percentage of total production on a weight basis increased 0.6% in 1991 and soared 6.0% in 1992. After that, the growth rate slowed down again to 2.6% in 1993 (Table 3-4). The exports on a value basis accounted for 6.1% of total production in 1994 and 4.8% in 1995. Major importing countries are Australia, the US, Singapore, Malaysia, and Vietnam.

On the other hand, Indonesia's imports of tiles declined from 54,000 tons in 1991 to 46,000 tons in 1992 and 21,000 tons in 1993 (Table 3-5). According to the study team's interview survey, however, they appear to be on the rise after 1994, because of increased imports from Europe including Italy, Spain, and Germany. They are mainly used for high-grade exterior and interior finish at office buildings and hotels in large cities.

(2) Industrial structure

The tile industry in Indonesia emerged in the early 1970s. Tile manufacturers in Indonesia are dominated by local enterprises, and unlike sanitary ware makers, few foreign-affiliated manufacturers are operating. There are several reasons for this. First of all, compared to sanitary ware and tableware products, tile products are technologically easy to make. Secondly, the huge domestic market and relatively low quality requirements for raw materials and components have attracted local leading industry groups to invest in the industry from earlier. As a result, these tile manufacturers are relatively large production capacities and often employ more than 1,000 workers.

(3) Industry characteristics

Geographically, wall and floor tile manufacturers are concentrated in Jakarta and West Java, and the industry as a whole is characterized by its proximity to major markets.

Table 3-4 Export of Ceramic Products in Indonesia

Product	1991		1992		1993	
	Quantity (Ton)	Value ('000 Rp)	Quantity (Ton)	Value ('000 Rp)	Quantity (Ton)	Value ('000 Rp)
Floor/wall tile	5,580	1,883,835	32,497	10,998,194	31,369	11,247,469
Sanitary	8,600	13,844,944	6,521	9,169,647	8,683	13,272,681
Roof Tile	1,317	351,636	214	83,250	135	34,115
Tableware	13,923	19,161,337	15,456	42,998,925	3,846	10,363,938
Novelities & Others	2,233	7,093,406	2,316	10,206,337	3,809	13,348,047

Source: Bureau of Statistics, Export Statistics, 1991, 1992, and 1993

Table 3-5 Import of Ceramic Products in Indonesia

Product	1991		1992		1993	
	Quantity (Ton)	CIF Value (US\$)	Quantity (Ton)	CIF Value (US\$)	Quantity (Ton)	CIF Value (US\$)
Floor/wall tile	53,954	13,620,522	46,432	11,972,351	21,978	7,457,840
Sanitary	299	554,830	300	1,572,043	305	727,405
Roof Tile	160	60,540	350	66,153	120	42,802
Tableware	2,211	1,977,827	3,605	3,110,324	2,296	2,944,439
Novelities & Others	1,390	2,047,374	565	846,788	908	1,141,167

Source: Bureau of Statistics, Import Statistics, 1991, 1992, and 1993

Namely, construction of hotels, housing complexes, and office buildings - representing most of demand for floor and wall tiles - is concentrated in and around Jakarta, and as shown in Table 3-6, which presents production of floor and wall tiles in 1995 by region, tile production is concentrated in West and East Java.

Characteristically, this subsector obtains raw materials for tile body mostly from local sources. Locally available materials, however, present various problems including quality variation and unreliable supply capacity and schedule. On the other hand, other materials, including kaolin and feldspar used as glaze, pigments, and frit are mainly imported from Germany, the UK, Thailand and Italy.

3.2.2 Sanitary ware

(1) Industry size

Major product items in the sanitary ware industry are toilets and wash basins. Sanitary ware production recorded strong growth in the late 1970s and accelerated in the 1980s.

In Indonesia, 9 companies are manufacturing sanitary ware. Table 3-3 shows tile production trends between 1994 and 1995 and projection up to 1998 on a value basis. With 1995 as the baseline year, sanitary ware production is projected to grow at an average 15% up to 1998 according to MOI.

Exports also grew steadfastly. According to the data from BPS, sanitary ware exports in 1991 as a percentage of total production were 18.1% on a weight basis, 15.4% in 1992, and 26.1% in 1993 (Table 3-4). According to MOI's statistics, the value of exports on a US dollar basis as a percentage of total production was 26% in 1994 and 21% in 1995. Major importing countries include the US, Australia, and Japan. Although export growth will remain flat due to market saturation in importing countries and competition with other exporting countries, sanitary ware is still the prominent export-oriented product among other ceramic products.

Imports remain unchanged in recent years, but demand for high-grade products is on the rise, mainly for use in office buildings and hotels (Table 3-5). Since major domestic manufacturers produce sanitary ware with the same specifications for both export and domestic markets, exports can be diverted to domestic consumption if it is increased. As a result, imports are expected to remain flat or decline.

Table 3-6 Production of Ceramic Products by Region in Ton

(Unit: ton)

	1995					1998				
	Floor/wall tile	Sanitary Ware	Roof tile	Tableware	Tableware	Floor/wall tile	Sanitary Ware	Roof tile	Tableware	Tableware
Total	1,911,000	77,000	162,000	572,000	3,286,000	117,000	215,000	924,000		
Estimated Breakdown of Production by Region:										
Jakarta	69,000	7,000	0	8,000	118,000	11,000	0	13,000		
West Java	936,000	45,000	135,000	275,000	1,610,000	69,000	179,000	444,000		
Central Java	0	13,000	0	40,000	0	20,000	0	65,000		
East Java	688,000	12,000	27,000	69,000	1,183,000	18,000	36,000	111,000		
Bali/Riau	2,000	0	0	177,000	3,000	0	0	286,000		
South Sumatra	57,000	0	0	0	99,000	0	0	0		
West Kalimantan	34,000	0	0	3,000	59,000	0	0	6,000		
South Kalimantan	124,000	0	0	0	214,000	0	0	0		

Source: Estimate by the Study Team

(2) Industrial structure

In terms of ownership structure, the sanitary ware industry can be roughly divided into joint ventures between local and foreign companies and local enterprises wholly owned by local capital. Local enterprises serve the domestic market. Most of them are relatively small in terms of working capital and production capacity, and have around 100 employees. Few of them receive technical assistance from foreign companies and most of them have developed their own production technologies. Also, not many of them are specialized in sanitary ware production, and, rather, many manufacture other ceramic products including insulators, tiles, and refractors. Large manufacturers are joint ventures between local and foreign companies, particularly of the US and Japanese companies. These companies have modernized production equipment and technology and are maintaining advanced quality control systems for both raw materials and products. 50-80% of their products are sold under brands of parent companies (foreign companies) or as OEM products, including those shipped to the domestic market. They serve both the domestic and export markets. Because of a high level of emphasis on productivity improvement, the ratio of the use of imported material is comparatively higher, with using 50% of locally procured materials, but they are still competitive in the international markets due to their efforts to reduce total production costs.

(3) Industry characteristics

Approximately 60% of sanitary ware production is done in West Java that has a relatively high concentration of population, followed by Central Java (Table 3-6). This reflects locations of three joint ventures who represent most of sanitary ware production in Indonesia; two are located in West Java and one in Central Java.

Locally procured raw materials have various problems including quality variation and unstable supply systems, which are overcome by blending techniques and production technologies of each manufacturer. It should be noted, however, that some raw materials such as kaolin and feldspar (used as glaze), as well as sub-materials such as pigments, are mostly imported, partly because there are few local manufacturers producing and supplying these materials, and partly because locally available materials have quality variation and other problems.

The joint ventures are manufacturing products for domestic and export markets by using the same materials and production methods, although designs and types made are different.

3.2.3 Tableware

(1) Industry size

Production of tableware in Indonesia started in the 1930s and established its foundation as an industry after the Second World War. In the 1980s, joint ventures with foreign companies were established and modern production technologies were imported. Production grew rapidly. Today, the industry produces a wide range of products from plates and coffee cups to dinner sets, tea pots, coffee/tea sets. Tableware production has been on the rapid rise due to export expansion in addition to strong domestic demand.

At present, tableware is produced by 36 companies. Table 3-3 shows tableware production trends between 1994 and 1995 and projection up to 1998 on a value basis. According to MOIT's projection tableware production will expand at an average rate of 15% annually up to 1998, taking 1995 as the baseline year.

The growth of exports is insignificant in recent years. According to PBS's statistics, exports as a percentage of total export (on a weight basis) was 19.7% in 1991, 19.9% in 1992, and 8.3% in 1993 (Table 3-4). MOIT's statistics show that exports as a percentage of total production on a value basis (US dollar) were 68% in 1994 and 34% in 1995. Major importing countries are the US, Canada, and Australia. On the other hand, imports are leveling on a weight basis, while steadily rising on a value basis. For instance, the average import price per ton was \$894 in 1991 and \$860 in 1992, then surged to around \$1,300 in 1993, clearly indicating a significant increase in imports of high-grade products (Table 3-5). In particular, imports from the UK, Germany and Japan are on the rise.

(2) Industrial structure

Among tableware manufacturers in Indonesia, most of the midsize or larger companies have received, at their initial stage of operation, capital contribution and production technology from foreign companies including some from Japan and Taiwan. Some of them have terminated equity participation by foreign partners but are still receiving technical support. In contrast, there are companies that have accepted foreign capital, production technology and equipment at their startup, and have been continuing production on their own since then. The former companies often manufacture products both for domestic and export markets, which use most of raw materials and sub-materials with same or similar specifications. At the same time, they mostly supply final products of medium-grade or higher that target export markets and domestic market segments serving consumers with medium-level or higher income, hotels and restaurants. Companies in the latter category are mainly specialized in production of low-end

products for domestic general consumers. They often use locally available raw materials and sub-materials as far as available.

Tableware products in Indonesia are clearly divided into three segments, those for domestic, general consumers, those for business consumption by hotels and restaurants, and export products, which are often manufactured and shipped separately. Some manufacturers set up different production lines for these products of different categories, and adopt production methods and designs according to each segment. For instance, product design for the domestic market uses patterns created within the company, while design for export products is made by distributors or foreign partners according to the need of each importing country.

(3) Industry characteristics

Tableware production represents a typical market-oriented industry. As a result, most manufacturers are maintaining production bases in West Java, one of the most highly populated areas in Indonesia. A relatively high percentage of production is seen in Bali and Riau island areas (30% of total production in 1995), because they are major tourist resorts that also serve as major places of consumption (Table 3-6).

Compared to tile and sanitary ware manufacturers, tableware manufacturers are mostly small enterprises, because capital expenditures and production facilities required for the industry are relatively small. Company size varies greatly from small enterprises with around 20 employees to those employing more than 2,000 workers. Leading companies are joint ventures with foreign companies including some from Japan, Korea, and Taiwan.

On the other hand, local companies account for nearly one half of total. Many of them focus on domestic or regional markets, while some are targeting specialty markets such as hotels and restaurants.

3.2.4 Novelties

(1) Industry size

Major novelties products are ashtrays, earthen wares, ornaments, and small statutes. The manufacture of novelty products in Indonesia started in the 1930s and established its foundation as an industry after the Second World War. A large number of manufacturers began to introduce modern production technology from overseas in the 1970s. In the 1980s, production grew quickly.

The production scale is extremely hard to estimate since the product lines are diversified and the production sites are scattered throughout the country. The production figures of the Industrial Statistics vary year by year. Nevertheless, the

production in value is estimated equal to that of tableware.

(2) Industrial structure

Most of the novelty goods manufacturers in Indonesia are owned by local capital only. Unlike sanitary ware and tableware manufacturers, capital participation and technical introduction from foreign companies are very rare. Except for production machinery and equipment used, such as ball mills, most of raw materials and sub-materials are locally produced.

Novelty products are labor-intensive in nature, and thus investment in the industry has a very high job creation effect. Most of manufacturers are family operated and employ 20 or less workers. Major products are pots, ornaments, and ashtrays, most of which are shipped to the domestic market. Exports, although on the rise in recent years, are still small in volume (Table 3-4).

(3) Industry characteristics

Manufacturers of novelty products comprise a typical market-oriented industry. Most of them operate in highly populated areas of West Java and Central Java, as well as a major tourist resort in Bali Island. In particular, high concentration is seen in Plered in the suburbs of Bandung, West Java, Malang and Yogyakarta districts in Central Java, and Denpasar, Bali Island. The production of novelty goods has high potentiality to grow accordingly with increase in number of tourists.

3.3 Ceramic Raw Material Suppliers

Indonesian, ceramic raw material suppliers may be classified into some categories⁸.

In terms of ownership, most suppliers are private enterprises which have a mining license and employ workers for mining. These enterprises can be divided into several distinguishable types according to the type of operation and management.

The first type, as seen in Monterado and Lampung, is represented by medium- and large-enterprises with established management and financial position. Mines developed by these enterprises produce raw materials of sufficient levels of quality, and have commercial reserves. Basically, they can be successfully developed by these enterprises as judged from mining methods employed.

In the second type, ceramic manufacturers control mines, i.e., while they do not necessarily have a mining license or actually operate the mines, the mine supplies its

⁸ The detail by quarrying sites are given in 2.2, Part III.

products to a particular company only. However, raw materials from these mines do not meet all the quantity requirements of their customers because of quality problems or limited ore reserves. Nevertheless, mining operations can be managed by manufacturers as judged from the mining method.

The third type involves specialized suppliers operating in the form of one-man enterprises. They generally supply products to more than two customers. Mining is not carried out according to any production plan. Rather, they excavate an area which seems to contain higher-grade materials upon receipt of a customer's order. In fact, the raw materials that have quality problems are mainly quarried and supplied by this category of operators.

3.4 Policy and Programs Related to Promotion of the Ceramic Industry

As pointed out earlier, there is no industrial policy specific to the ceramic industry.

In fact, ceramic materials are not viewed as important minerals for the country's industrial activity.

The Indonesian government classifies mineral resources into three classes according to its policy priority. Crude oil and natural gas are primary examples of the most important resources, which are controlled and developed by the central government. Minerals for ceramic materials are classified as the third class and are under control of local government.

Thus, in developing ceramic raw materials, direct support from the central government cannot be expected. Most of local governments may be willing to provide support, as judged from their policy, but they do not have financial resources to provide sufficient support.

It should be pointed out, however, that the current classification of minerals is solely based on direct contribution to the national economy, and thus it does not necessarily reflect another important policy priority contemplated in the economic development plan, i.e., to avoid concentration of economic development efforts in a certain area or industry. It is important to reiterate that, from the viewpoint of promoting small enterprises or local industries, the development of relatively unimportant minerals, such as ceramic materials, creates an important value to the country's overall economic development objectives.

3.5 Organizational Set-up for Public Service, R&D, and Technical Guidance Related to the Ceramic Industry

There are several ministries which are associated with the plan and its implementation. The Ministry of Industry and Trade is responsible for the industry sector as a whole. The

Ministry of Minerals and Energy bears some responsibility for development of ceramic raw materials. As for promotion of small enterprises, the Ministry of Cooperatives and Small Industry Promotion shares responsibility with the Ministry of Industry and Trade.

The organization of the Ministry of Industry and Trade is shown in Figure 3-1. It consists of five Directorate Generals and four Agencies. The four Agencies are responsible for policy making, while five Directorate Generals implement policy.

The ceramic industry is under the jurisdiction of Directorate of Non-Metallic Minerals, Directorate General of Metal, Machinery and Chemical.

Among four agencies, Small Industry Development Agency has close relations with the present plan.

Another relevant agency, Research and Development Agency for Industry and Trade (BPPIP), is responsible for R&D in the fields of social and economic environment, technology, and international relations, which have direct impacts on industry and trade of the country. BBK (Institute for Research and Development on Ceramic Industry: IRDCRI) is operating under BPPIP. Small Industry Development Agency has UPT (Technical Service Unit) which is responsible for technical guidance in regions.

Finally, agencies related to ceramic raw material development are DSM and MRTDC under the Ministry of Minerals and Energy.

